



ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ ගැසට් පත්‍රය

අති විශේෂ

The Gazette of the Democratic Socialist Republic of Sri Lanka

EXTRAORDINARY

අංක 2401/28 - 2024 සැප්තැම්බර් මස 13 වැනි සිකුරාදා - 2024.09.13
No. 2401/28 - FRIDAY, SEPTEMBER 13, 2024

(Published by Authority)

PART I : SECTION (I) — GENERAL

Government Notifications

COAST CONSERVATION AND COASTAL RESOURCE MANAGEMENT DEPARTMENT

Sri Lanka Coastal Zone and Coastal Resource Management Plan 2024 - 2029

Prepared under Section 12(1) of the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981

THE Public are hereby informed that the Sri Lanka Coast Conservation and Coastal Resource Management Plan 2024 was approved by the Cabinet of Ministers on 12th August, 2024 and the Plan is implemented with effect from the date of Gazette Notification.

PRASANNA RANATHUNGA,
Minister of Urban Development of Housing.

Ministry of Urban Development,
Sethsiripaya,
Battaramulla.



List of Acronyms and Abbreviation

AD	Assistant Director
ADB	Asian Development Bank
AIA	Archaeological Impact Assessment
BC	Before Christ
BOD	Biochemical Oxygen Demand
BOI	Board of Investment
CBOs	Community-Based Organizations
CC&CRMAC	Coast Conservation and Coastal Resources Management Advisory Council
CC&CRMD	Coast Conservation and Coastal Resources Management Department
CCA	Coast Conservation Act
CCC	Community Coordination Committees
CCD	Coast Conservation Department
CEA	Central Environmental Authority
COD	Chemical Oxygen Demand
CRMP	Coastal Resources Management Project
CTB	Ceylon Tourist Board
CZ	Coastal Zone
CZ&CRMP.	Coastal Zone and Coastal Resource Management Plan
CZM	Coastal Zone Management
CZMP	Coastal Zone Management Plan
DANIDA	Danish International Development Agency
DCC	Director of Coast Conservation
DFC	Department of Forest Conservation
DI	Department of Irrigation
DFAR	Department of Fisheries and Aquatic Resources
DPL	Dune Protection Lines
DS	Divisional Secretaries
DSD	Divisional Secretary's Division
DWLC	Department of Wildlife Conservation
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ENSO	"El Nino" Southern Oscillation
EPC	Environmental Protection Committees
EPL	Environmental Pollution License
EPZ	Export Processing Zones
FAO	Food and Agriculture Organization
FD	Forest Department
FDPA	Forest Department Protected Areas
GBBOA	Glass-bottom Boat Owners Association
GCRMN	Globe Coral Reef Monitoring Network
GDP	Gross Domestic Product

GEF	Global Environmental Facility
GIS	Geographical Information System
GNP	Gross National Product
GOSL	Government of Sri Lanka
GSMB	Geological Survey and Mines Bureau
GTZ	German Technical Corporation
HICZMP	Hambantota Integrated Coastal Zone Management Project
IEC	Information Education and Communication
IEE	Initial Environmental Examination
IP	Industrial Parks
IPCC	International Panel on Climate Change
IRMP	Integrated Resources Management Programme
ITI	Industrial Technology Institute
IUCN	International Union for Conservation of Nature and Natural Resources
JBIC/ODA	Japanese Bank for International Cooperation/Oversea Development Administration
KEPZ	Katunayake Export Processing Zones
LAs	Local Authorities
LEI&CDP	Lunawa Environmental Improvement & Community Development Project
MOPS&A	Ministry of Ports, Shipping and Aviation
MOW&FRC	Ministry of Wildlife and Forest Resources Conservation
MOF	Ministry of Fisheries
MOT&L	Ministry of Tourism and Lands
MHWL	Mean High Water Line
MLWL	Mean Low Water Line
MOALF	Ministry of Agriculture, Land and Forestry
MOE	Ministry of Environment
MOFE	Ministry of Forestry and Environment
MOLGHC	Ministry of Local Government, Housing and Construction
MOTWA	Ministry of Transport, Environment and Womens' Affairs
MPCEM	Master Plan for Coastal Erosion Management
MPH	Miles Per Hour
MPPA	Marine Pollution Prevention Authority
NAQDA	National Aquaculture Development Authority
NARA	National Aquatic Resources Research and Development Agency
NDC	Nationally Determined Contribution
NEA	National Environment Act
NGO	Non-Governmental Organization
NPPD	National Physical Planning Department
NPPP	National Physical Planning Policy

NWP	North Western Province
NWSDB	National Water Supply and Drainage Board
PIU	Project Implementation Unit
PRA	Participatory Rural Appraisal
RETA	Regional Technical Assistance for Coastal & Marine Resource Management & Poverty Reduction in South Asia
RLFCS	Rekawa Lagoon Fisheries Cooperative Society
RLFMC	Rekawa Lagoon Fisheries Management Committee
RUK	Rekawa, Ussangoda, Kalametiya
SAMP	Special Area Management Plan
SAREC	Swedish Agency for Research Cooperation with Developing Countries
SIDA	Swedish International Development Co-operation Agency
SLLRDC	Sri Lanka Land Reclamation and Development Corporation
SLR	Sri Lanka Rupees
SLTDA	Sri Lanka Tourism Development Authority
SM	Shoreline Management
SMA	Special Management Area
SMP	Shoreline Management Plan
STP	Sustainable Township Programme
TCP	Turtle Conservation Project
TOR	Terms of Reference
UDA	Urban Development Authority
USAID	United States Agency for International Development
WHO	World Health Organization

Executive Summary

The Coastal Zone and Coastal Resources Management Plan of 2024-2029 is the fourth generation Plan, the earlier Management Plans being the ones presented in 1990, 1997, 2004, and 2018.

In conformity with the legal provisions of the CC&CRM Amendment Act, No.49 of 2011, the CZ&CRMP 2024 has been prepared through revision and updating the CZ&CRMP.

This Management Plan is presented in six chapters. The introductory chapter presents the scope for Coastal Zone Management, the Major Deviation from CZ&CRMP of 2018, the bio-physical characteristics of the Coastal Zone, the Role of the Department of Coast Conservation and Coastal Resources Management, and the Legal Mandate, the Preparatory Process of the plan and Outlines the Content of the Plan. Each of the following chapters is devoted to a major issue viz. Shoreline Management, Conservation of Coastal Ecosystems, Controlling Coastal Pollution, Special Management Areas and the Regulatory Mechanism.

Each of the issue chapters are structured to provide an introduction to the issue and its current nature and significance. The policies, plans, laws, and institutional arrangements that have been established to address the issues, the management objectives, policies and actions proposed, and the guidelines that will be followed in implementing the Plan.

Primarily, the implementation of the Plan will be through the permit process. The guidelines that will be followed in the processing of permit applications are detailed out in the Plan, as well as the methodology, TOR, the granting of permits under the variance procedures. The variance and exemption procedures cover special circumstances that cannot be recommended under the normal permit process.

The Plan aims to provide the stakeholders and proposers of development activities in the Coastal Zone, with the primary information required in the planning of such development in an environmentally sustainable manner, and to present them with the procedures that are legally mandated for the issue of permits by the Department of Coast Conservation and Coastal Resources Management.

Even though most of the issues addressed are technically complex and challenging, an effort has been made in this Plan to explain them in simple terms so that proposers of development activities can appreciate the complex and dynamic nature of the Coastal Zone and the rationale for the Management Process that is proposed in the Plan. The Plan is structured to achieve this objective.

CHAPTER 1- INTRODUCTION

1.1 THE SCOPE FOR THE COASTAL ZONE AND COASTAL RESOURCE MANAGEMENT

1.1.1 Context and Setting

With the increase in population and accelerated economic activities in the coastal region, the requirement of integrated management focused on conserving, developing, and sustainable utilization of Sri Lanka's dynamic and resource-rich coastal region has long been recognized. A formal management framework was first adopted by the Coast Conservation and Coastal Resource Management Department (CC&CRMD) through the first generation "Coastal Zone Management Plan (CZMP)" formulated and implemented in 1990 as mandated by Coast Conservation and Coastal Resource Management (CC&CRM) Act No.57 of 1981. Subsequently, the CZMP was revised and updated in 1997, 2004, and, 2018, as the Coastal Zone and Coastal Resource Management Plan (CC&CRMP). The CC&CRMP of 2018 was designed to ensure sustainable use of the coastal environment and its resources in the long term, consistent with the national development goals. While maintaining continuity, the CC&CRMP 2024 update has broadened the scope of the previous plan by incorporating climate change resilience aspects and streamlining with the international conventions and protocols. In addition, some sections of the Chapters on Regulatory Mechanism, SMA, Coastal Pollution, and Coastal Habitat Conservation of the CC&CRMP 2018 have been revised to ease the implementation and to clear ambiguities. Further, based on the implementation experience and the current national development requirements, several important guidelines were also introduced and/or revised to ensure sustainable management of the coastal resources.

The reviews and evaluations conducted by the CC&CRMD concerning the impacts and outcomes of the policy objectives, strategies, and actions, are framed on the identified issues of the past CZMPs. The implementation of past CC&CRMPs revealed some drawbacks in achieving desired targets. This was mainly due to several factors including, the inadequacy of the legally defined "Coastal Zone", the absence of legal provisions for proper planning, implementation, and institutionalization of the Special Management Areas, the inability to address issues beyond the legally defined Coastal Zone and lack of legal authority to protect conservation areas and public access. The inadequacies of the legal regime were fulfilled through legislative amendments when the 2018 CC&CRMP was formulated. Despite, remedial measures introduced for effective coastal resource management, implementation failures were visible due to several factors including the COVID pandemic that prevailed during 2020-2021 and macroeconomic issues confronted by the GOSL. Therefore, the outcome of the CC&CRMP 2018 was not up to a satisfactory level except for controlling development activities within the coastal zone.

During the plan implementation period, implementing setback specifications has become a challenge as there is a huge demand for coastal land for developments in some areas while the vulnerability level is being changed. Therefore, it has been identified that the setbacks implemented in the past may be reviewed based on a consolidated effort and there should be an unambiguity and clear protocol for setback implementation.

1.1.2 CZ&CRMP 2024 and Major Deviation from CZMP 2018

At present, coastal resource management in Sri Lanka, like in many other countries, faces significant challenges, especially in the wake of economic crises experienced in the recent past. The crises appeared in the form of macroeconomic issues in the country and negatively impacted planned and ongoing resource management initiatives due to financial constraints, inability to increase management capacity, and change of policy and priorities. Therefore, it does not envisage to consider major deviations from the 2018 CC&CRMP.

In view of the entirety of the social, economic, and dynamic environmental condition of the coastal zone, the 2024 CC&CRMP attempted to revise and update by incorporating policies, strategies, and actions including new guidelines and standards consistent with the current and future needs while excluding some of the incompatible policies, strategies and actions. In this respect, special attention has been placed on recognizing the link between economic

crises and climate change repercussions on coastal resources while contributing to climate change mitigation and adaptation through the implementation of updated NDCs.

In conformity with the legal provisions of the CC&CRM Amendment Act, No. 49 of 2011, the CC&CRMP 2024 has been revised and updated by the CC&CRMD. In considering the practicality, and the capacity of the CCCRMD, the 2024 plan also focused only on five major areas viz. Shoreline Management, Controlling Coastal Pollution, Management of Coastal Ecosystems, Special Management Areas, and Regulatory Mechanisms in the form of separate chapters similar to the 2018 CC&CRMP.

The title of the Chapter on Controlling Coastal Water Pollution has been changed to Controlling Coastal Pollution and broadened by addressing the management of coastal litter and solid waste not limiting to coastal water pollution. In addition, the issues related to sites of special significance and public access have been emphasized in Chapter 6 – Regulatory Mechanisms. Moreover, the updated CC&CRMP 2024 has broadened the scope of the previous management plan by incorporating climate change resilience aspects and streamlining with the international conventions, protocols, targets, and goals.

1.2 THE CHARACTERISTICS OF THE COASTAL ZONE

1.2.1 The Bio-physical Characteristics

The coastal environment of Sri Lanka is influenced by its location in the northern part of the Indian Ocean, between 5° 54' and 9° 52' North Latitude and 79° 39' and 81° 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) (CZMP 2018). 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. Sri Lanka has a coastline of approximately 1,620 km including the shoreline of bays and inlets, but excluding lagoons.

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 (CZMP 2018). The bay of Trincomalee on the North-Eastern coast described as “the most perfect natural harbour of the Indian Ocean is of particular significance. The Northwestern and South-Eastern coastlines exhibit lagoons, sandbars, banks, and spits that sometimes extend over many kilometers. 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. Some segments along the Southwest coastline are retreating due to the natural erosive action of the sea compounded by anthropogenic activities such as river sand mining and the destruction of protective coral reefs. In contrast, some areas of the North-Western and Southeastern coastlines are advancing due to accretion.

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. Sri Lanka has 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. These rivers transport large amounts of sand, silt, and clay essential for beach nourishment; but they are also carriers of pollutants that degrade the quality of coastal waters and habitats. Throughout its length, the Coastal Zone contains a variety of terrestrial habitats that include sandy beaches, barrier beaches, sand spits and dunes, rocky shores, mangroves, and salt marshes. Equally important are the coral reefs, lagoons, estuaries, and seagrass beds in the coastal waters. These systems help maintain vital physical processes, fulfill ecosystem services and functions, and provide land, goods, and services.

The northern coastal zone is unique due to the very shallow sea and the presence of islands. Wave conditions are very mild on the western side of the Jaffna Peninsula due to the sheltering effect of the islands and the limited depth of the sea. The shoreline remains generally stable, and the vast shallow nearshore area has become an ideal ground for fishing and aquaculture farming.

1.2.2 Exposure to Coastal Hazards

The coastal area of the country has been more exposed to several natural and man-induced coastal hazards in the recent past as elaborated below:

- **Tsunamis**

Among other coastal hazards, tsunamis are one of the major concerns of coastal communities based on the experience gained from the 2004 Asian Tsunami incident. Historical records of tsunamis in Sri Lanka are very vague as they are so rare. Most of them are only folklore stories about quick and forceful flooding due to the rising sea. Based on the sediment cores retrieved from Karagan Lagoon in the Southeast shoreline of Sri Lanka, Jackson et al, (2014) have estimated that tsunami recurrence, once in 181 to 517 years to 1045 ± 334 years, with a mean recurrence interval of 434 ± 40 years during the Holocene Period. Incidentally, the first recorded tsunami to have affected Sri Lanka was on 27th August 1883, due to the volcanic eruption of Krakatoa. Unusually high water levels followed by the receding beach were observed. However, the water level fluctuations were not severe and there was no significant inundation or records of damage. The second and the most devastating tsunami experience was the 26th of December 2004 Indian Ocean Tsunami where 38,000 people lost their lives and the economic loss was estimated to be about 01 billion US \$. It is the worst natural disaster in Sri Lanka in terms of the lives lost and the extent of destruction. About 5% of the total population of the country was affected, and coastal ecosystems and the coastal built infrastructure were devastated which had long-term consequences. Saltwater intrusion into the drinking water sources and farmlands, damage to wetland habitats, and sand deposits on coral reefs are some of the impacts on the physical environment that had severe consequences.

- **Cyclones and Storm Surges**

Only a limited number of atmospheric low-pressure systems generated in the Northern Indian Ocean have impacts on Sri Lanka, due to its relative proximity to the equator and as it has been placed on the outer limits of the cyclone zones of the Bay of Bengal and the Arabian Sea. During the past century, there have been 16 cyclones with landfalls in Sri Lanka. In 1964, over 1000 lives were lost due to a cyclone that had a maximum wind speed of about 160 km/hr while it is in Sri Lankan waters. The surge height was as high as 4 m at some places on the northwest coastline according to anecdotal evidence and model studies (Murthy et.al. 2004). In 1978, the cyclone that caused a devastating impact on the whole island had its landfall near Batticaloa on the east coast. It claimed 915 lives and damaged many households and other infrastructure facilities. The recorded maximum wind speed was 145 km/hr. Storm surge height was about 1.5 to 2 m in Batticaloa. In 1992, another cyclonic storm claimed 4 lives and damaged about 29,000 houses, in the southeastern coastline. The cyclone in the year 2000 was the strongest tropical cyclone to strike Sri Lanka since 1978. It had its landfall in eastern Sri Lanka, around Trincomalee with a maximum wind speed of 165 km/hr. At least 9 people lost their lives and about 500,000 became homeless. The cyclone in 2003 did not go across the island but went along a south-to-north path parallel to the eastern coastline and had landfall in South India. However, due to the heavy rainfall, floods, and landslides about 250 lost their lives (Srisangeerthan S. et al., 2015).

- **Coastal Pollution due to Marine Accidents**

As it is placed on the main east/west shipping route, 200 to 300 ships are passing the Sri Lankan waters daily. There have been several accidents leading to oil and hazardous spills threatening the coastline during the past few decades. MV X-Press Pearl, a container ship carrying 1,486 containers filled with chemicals, including 25 Metric Tons of nitric acid caught fire and sank in July 2021 close to Colombo Port, devastating parts of west and south coastlines. In September 2020 MT New Diamond, carrying over two million barrels of crude oil, caught

fire while approaching Sri Lanka's eastern coastline. Though the cargo tanks were not damaged, an oil slick had been sighted as it was towed away from the coastline. In April 2009, chemical tanker MT Gramba with its 6,250 tons of sulphuric acid, was towed off about 60 nautical miles off the east coast of Sri Lanka before it sank (Kelley, 2009). In 2006, MV Amanat Shah, a ship carrying thousands of tons of timber, sank off the Southwest coast, with 176 Metric Tons of fuel, polluting roughly a 15 km stretch of shoreline. In 1999, MV Meliksha sank off the southeast coastline with over 16,000 Metric Tons of chemical fertilizer and 200 Metric Tons of fuel (Kulathilaka, 2018).

1.3 THE ROLE OF THE CC&CRMD IN COASTAL ZONE AND COASTAL RESOURCE MANAGEMENT

From the inception of the coastal zone management programme by the CC&CRMD, an attempt has been made to balance the conservation objectives with the development needs of the country. The role of the CC&CRMD was somewhat different from the traditional notion of conservation performed by other government agencies responsible for the conservation of the environment. In considering the dynamic nature of the Coastal Zone, the multiplicity of coastal ecosystem services and functions, and benefits derived from the coastal environment, specific attention was placed on planned management not confined to written policy objectives but with wider stakeholder consultation. In the process of coastal resources management, particular concern is focused on ensuring the provision of basic needs for coastal communities without impediments from competing uses and improving the quality of life.

The planning decisions of the CC&CRMD always pay careful attention to the social cost of the command-and-control instrument used in coastal resource management and the unrecognized value of the services of the coastal ecosystems. Furthermore, a bottom-up collaborative approach is being promoted and adopted in resources management, where possible.

CC&CRMD aims to accomplish the Mission

“The sustainable development of coastal resources and the management of coastal processes to optimize the social, economic, and environmental status of Sri Lanka”

Desired Objectives:

To fulfill the Mission, the four objectives that drive the CC&CRMD are:

- To improve the 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

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

1.3.1 Key Achievements

The outstanding achievements of the CC&CRMD during the past three decades are given below:

- Mitigating impacts of coastal erosion up to a substantial level
- Considerably reducing illegal beach sand mining
- Complete halt of coral mining
- Ensuring application of the Environmental Impact Assessment/Initial Environmental Examination (EIA/IEA) process for coastal developments
- Ensuring permit compliance
- Establishing coastal access
- Enhancing awareness of coastal issues, including curriculum development for schools
- Enhancing community awareness and education on coastal resource management
- Promoting community participation in coastal resource management
- Introducing Special Management Areas as an effective supplementary Integrated Coastal Management tool
- Introducing a legal framework for collaborative coastal resource management
- Coordinating the coastal and marine pollution mitigating efforts.

1.3.2 External Technical Assistance

The CC&CRMD 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), NORAD funded HICZMP (1999-2001), GEF funded Rekawa Ussangoda Kalametiya Bio Diversity Conservation Programme (1994-1998) the USAID funded Coastal Resources Management Programme - Phases i and ii (1985 – 1991, 1991-1997), the CCD/GTZ funded Coast Conservation Project (1988-1996), ADB-GoN funded Coastal Resources Management Project (2001-2007) and GEF/IFAD funded Participatory Coastal Zone Restoration and Sustainable Management Project of the Eastern Province (2009-2016).

1.4 THE COASTAL ZONE AND COASTAL RESOURCES MANAGEMENT PLAN 2024

1.4.1 New Legal Provisions through 2011 CC Act Amendments

Since 01st October 1983 CC&CRM Act, No.57 of 1981 came into operation and the Coastal Zone, its resources, and the development activities taking place within the Coastal Zone were primarily managed, based on the provisions of the above Act. During the course of planning and implementation, it was realized that the vacuum of the provisions of the Principal Act has created negative impacts on the planning and management outputs and outcomes. Accordingly, an amendment to the Principal Act was made in 1988 through the Coast Conservation Amendment Act, No.64. The 1988 amendments were mainly directed at enhancing regulatory powers on coral and sand mining activities, right of public access to the beaches, and demolition of lime kilns located within the Coastal Zone.

With the expansion of scope of the coastal resource management over time and the increase of coastal issues due to both anthropogenic and natural phenomena, the requirement of new legal provisions has been long felt. The need for introducing new legal provisions surfaced in the areas of institutionalizing Special Management Area Process, legitimacy for community participation in collaborative management, expansion of legally defined Coastal Zone, managing human activities outside the Coastal Zone that have a direct impact on the Coastal Zone, managing public access and managing open spaces and access.

In view of the above, the government introduced a second amendment to the Principal Act through the Coast Conservation Amendment Act, No. 49 of 2011. The concerned areas of the amendments are;

- Redefining the “Coastal Zone” incorporating riparian land of the water bodies connected to the sea within the Coastal Zone.
- Preparation of a “Coastal Zone and Coastal Resources Management Plan”.

- Provisions for declaration of Affected Areas within or beyond the Coastal Zone.
- Provision for declaration of Beach Parks and Conservation Areas.
- Provision for designation and institutionalization of Special Management Areas.
- Provision for formulating a coastal access plan.

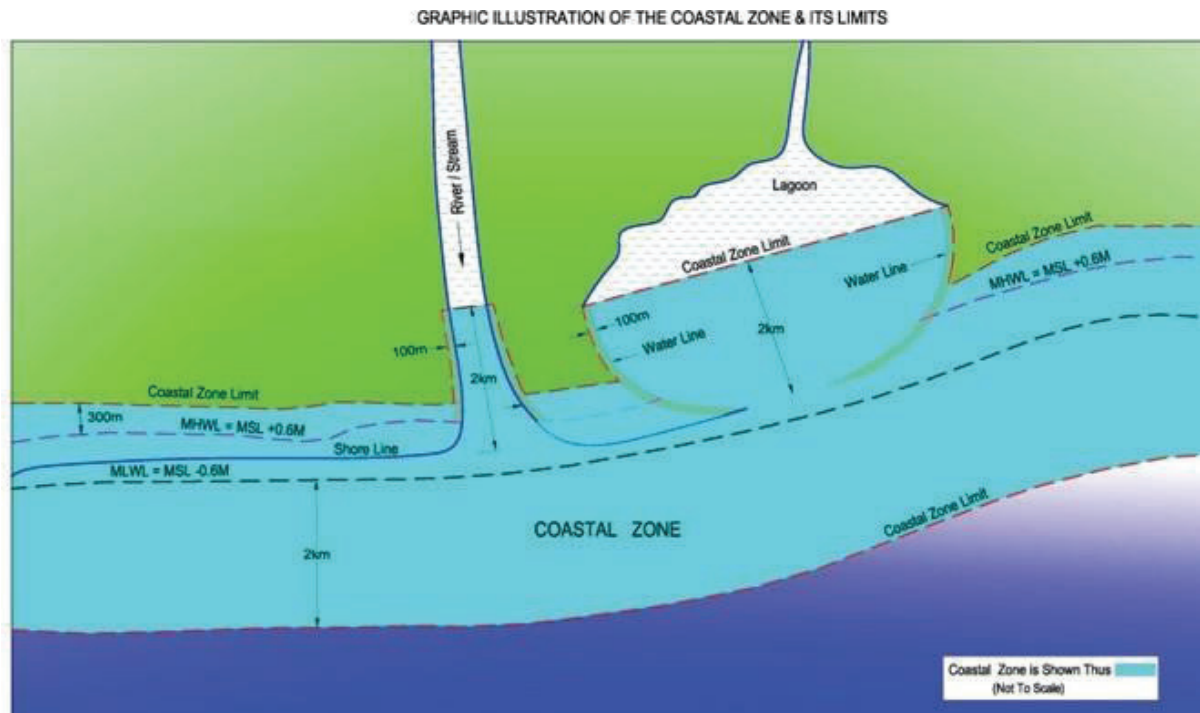


Figure 1- 1: COASTAL ZONE” THE NEW DEFINITION (ILLUSTRATED)

(As per the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981 as amended by the Act, No. 49 of 2011)

1.4.2 The Preparatory Process

The “Coastal Zone and Coastal Resources Management Plan 2024” has been formulated in conformity with the legal provisions of the CC&CRMD Act, No. 57 of 1981, amended by Coast Conservation (Amendment) Act, No. 64 of 1988, and Act, No. 49 of 2011. The revision of CC&RMP 2018 to enable to preparation of CC&RMP 2024 was carried out through a participatory process, field investigations, and primary data and information collected through in-house documents and processes. To ensure the reliability of information and effectiveness of the decision-making process, an adequate level of feedback was obtained from CC&CRMD staff through one-to-one consultation and a group consultation process. The practical issues and ambiguities related to the implementation of management policies, strategies, guidelines, and standards were identified and analyzed through extensive in-house working sessions conducted through the planning process. Moreover, meaningful consultation and informing to the other stakeholder agencies and political authority was conducted through a workshop.

The effectiveness of management policies, strategies, standards, and guidelines of each chapter was systematically assessed, refined, and formulated based on the implementation experience and careful attention to the prevailing context. In addition, feedback also obtained from relevant institution on the management guidelines incorporated into this plan.

1.4.3 Structure and the Content of the Plan

The CC&CRMP 2024 is separated into six chapters. Chapters 2-6 are issue-related and deal with key problems being addressed through integrated coastal zone and coastal resources management. The chapters on Shoreline Management (Chapter 2), Conserving Coastal ecosystems (Chapter 3), Controlling Coastal Pollution (Chapter 4), Special Management Area (Chapter 5) and Regulatory Mechanisms (Chapter 6) are formulated with primary and secondary information gathered through studies, previous CZM Plans (1990, 1997, 2004 and 2018), and other secondary sources. 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. Each of the issue-related chapters contains management objectives, related policies, and proposed actions for management. 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 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.

CHAPTER 2 - SHORELINE MANAGEMENT

2.1 INTRODUCTION

THE problem of coastal erosion and the resulting need for shoreline management could be identified as the major triggering factor leading to the initiation of the Coastal Zone Management Programme of Sri Lanka. The development of the programme can be mainly categorized into three distinct periods in terms of its magnitude, related causes, public perceptions, management measures adopted and policy responses.

In the early stage, the problem of coastal erosion was experienced mainly from the southern part of the island and was viewed as a natural phenomenon and handled on an ad-hoc basis. There was no single state agency vested with the responsibility for coast protection, and a number of government agencies such as Public Works Department (PWD), Colombo Port Commission and Ceylon Government Railway (CGR) carried out coast protection work, mainly focused on a “Hold the Line Approach” that was confined to construction of hard structures such as revetments, seawalls and groynes. However, the problem of erosion aggravated and began to be perceived as major environmental and socio-economic issue overtime.

By the 1970’s, the perception changed as significant cumulative impact in the form of loss of coastal land and properties, infrastructure such as roads and railways and damage to coastal ecosystems became obvious. At this stage, coastal erosion came to be viewed as a significant socio-economic and environmental issue and developed into a public demand for proper management. The required institutional mechanism was setup with the formation of Coast Conservation Division in 1978 under the Ministry of Fisheries and Aquatic Resources. Thereafter, a management programme was initiated at a moderate level. During this period, institutional capacities were also enhanced by formulating a legal framework parallel to the engineering work being implemented.

The third distinct period of the programme development could be identified with the formulation of Master Plan for Coastal Erosion Management in 1986 and its subsequent implementation under the DANIDA Stage 1 and DANIDA Stage 2 projects from 1987 and the ADB funded CRMP from 2001-2007. At this phase, planned coast protection was carried out based on the best available engineering information, simultaneously with the implementation of other management options such as controlling sand and coral mining, conserving coastal ecosystems, curtailing haphazard developments and enhancing public awareness and education.

The above management approach that the Coast Conservation and Coastal Resources Management Department adopted in controlling coastal erosion was able to produce positive outcomes. The overall socio-economic and environmental

benefits gained from the management measures exceeded the cost incurred. These benefits are reflected in the areas of protection of land and properties, infrastructure, tourist establishments, fisheries infrastructure as well as in the livelihoods and employment generated in the coastal region.

2.1.1. Coastal Erosion: Nature of the Problem

Coastal erosion is a significant and continuing problem in varying degree in Sri Lanka, which results in socio-economic and environmental repercussions. Erosion occurs due to both natural causes and anthropogenic interventions and entails public and private cost. These include the loss of beaches, disruption of recreational and tourism activities, damage to public and private properties and infrastructure. It also includes a substantial annual expenditure on coast protection, emergency and disaster relief work. According to current information, a sum of SL Rs. 1520 million has been spent on coastal erosion management during the period 1985 – 1999, SL Rs. 3 billion spent during 2001- 2007 under the ADB funded Coastal Resources Management Project. In addition, a further amount of US\$ 1.4 Million was spent on coastal rehabilitation under the Tsunami Affected Area Rehabilitation Programme (TAARP) and SL Rs.6.3 billion spent from 2014 to 2022. Department has started beach replenishment projects since 2012 with GOSL funds. During the last few decades, majority of the investments for coast protection was done in the south, west, north western and eastern coastal stretches. In contrast, northern, north eastern and north western coastal segments have lesser intervention for coast protection up to now.

Reduction in supply of sand to the beaches is identified as one of the crucial factors underlying the coastal erosion problem. Longshore currents created by the wind and swell waves, mainly transported sand from one location to other location along coast. It is a continuous process and erosion is not significant if the coast comprises of beaches with sufficient continuous supply of sand. If sufficient sand supply is not available in the beaches to accommodate the longshore transport processes if the beach is blocked by coastal structures, then the coastal erosion is inevitable in the adjacent beach.

According to the prevailing information, a high rate of erosion had been reported in Mahaoya- Lansigama coastal area during the period of 2000 - 2005 and protected. Subsequently, erosion continued reporting up to Thoduwawa covering the straight coastal segment up to Maha Oya outlet. The erosion appeared in this segment was successfully mitigated by the CC&CRMD. In spite of that Iranawila coast is being mostly threatened due to coastal erosion in Puttalam district. Similarly, a significant coastal erosion rate has been reported from the coastal stretch lying north of Oluvil Harbour in 2010, consequently a severe impact of coastal erosion spread up to Sainthamarunthu, covering 16 km north of the Oluvil Harbour losing approximately 80m to 100m width of coastal land strip. The barrier beach at Kalido coast in Kalutara had been disturbed due to controlling floods in Kalu ganga in 2017. As a result of flood controlling attempt a severe erosion occurred in the northern coastal stretch spreading more than 3km passing the Tangarine Beach hotel & Royal Palm beach hotel. Moreover, sand bar is developing in a different orientation with keeping the river mouth directly facing to the island, situated close to river mouth. Because of this situation, direct wave attack and river flow influenced the island, and about 100m wide land strip in seaside of the island had been washed away. Galle is one of erosion prone areas in the southern coast in which Hikkaduwa and Habaraduwa are the most vulnerable among the erosion identified in south coast. The emergency coastal erosion incidences reported from 2014-2022 are given in Table 2.1.

In terms of coastal accretion, the reported rates are lower than the coastal erosion rate and occurred only in a few locations. Notable locations of coastal accretion are at south of Oluvil Port happening at the expense of a large-scale erosion to the north of port and in Kandakuliya on the northwestern coast. As indicated in Table 2.1, the emergency coastal erosion incidences reported during the period of 2014 - 2022 demonstrates that despite the management strategies adopted through structural and non-structural solutions, coastal erosion is a continuing problem in the country. In addition to coastal erosion, erosion in water bodies is also evident in the coastal zone. Bank erosion is reported in Maha Oya, Deduru Oya and Malwathu Oya.

Table 2- 1 Reported Locations of Emergency Coastal Erosion 2014- 2022

<i>Erosion Location / Coastal stretch</i>	<i>Status of coast</i>	<i>Problem identified</i>
Puttalam		
Kirimundalama, Uchchamunei	highly dynamic unstable coastal islands	Seasonal changes reshaping islands frequently
Norochohole ,Ilanthadi Alankuda	Strait sandy coast, high longshore transport rate	Moderate erosion
Kappaladi	highly dynamic sandy beach	Moderate erosion
Muthupanthiya – Udappu	Dynamic coast North of Daduru Oya	Moderate erosion
Thoduwawa	Strait coast high sediment transport rate, High residential & fisheries dominant	Severe erosion
Iranawila, Ambakandawila	Strait coast high sediment transport rate, High residential & fisheries dominant	Severe
Barudalpola- Kudamaduwella	Strait coast high sediment transport rate, High residential & fisheries dominant	Severe erosion individual case
Thalwila- north	Strait coast high sediment transport rate, High residential & fisheries dominant,	Moderate erosion
Gampaha		
Kuttiaduwa	highly residential, congested & fisheries domain beach at the north of Negombo Lagoon mouth, seasonal beach observed	Moderate erosion
Aluthkuruwa	partly damaged secondary sand stone reef along the coast has exposed, and sand berm exist at the edge of coastline	Moderate erosion
porutota	Nourished beach	Singular case seasonal erosion
Mora wala Pitipana	highly residential, congested & fisheries domain beach at the north of Negombo Lagoon mouth, seasonal beach observed	Moderate erosion
Uswetakeiyawa Parana ambalama	Disturbed sand berm and exposed damaged sand stone along coast	Moderate erosion
Dungalpitiya	Disturbed sand berm and exposed damaged sand stone along coast	Moderate erosion
Thaldiyawatta	exposed damaged sand stone along coast. no beach	Severe erosion, observe overtopping during the monsoon period
Colombo		
Lunawa Moratuwa	Protected coast	Observe overtopping
Moratuwa – Koralawella	Protected with a groyne series	Erosion observed in 2022 but not repeated

<i>Erosion Location / Coastal stretch</i>	<i>Status of coast</i>	<i>Problem identified</i>
Kalutara		
North of Kalido beach up to Wadduwa	Straight coast North of Kalani River mouth , highly dynamic & high longshore drift	Severe erosion
Beruwala-Maradana	Un planned coastal structures along the coast single case,	minor erosion
Galle		
Ahangama	Ahangama Kanda – laterite cliff, Ahangama Town area -narrow beach, discontinues sand stone reef as secondary barrier congested with buildings	Moderate cliff erosion Severe coastal erosion
Unawatuna, Habaraduwa - Koggala	seasonally change sandy beach, sand stone reef as secondary barrier in Koggala tourism and fishery dominant coast	Severe erosion
Dalawella	Previously protected stretch, mostly laterite cliff be existent	Severe erosion overtopping recorded
Dewata	Highly congested with coastal and building structures at the edge of coast line. Narrow beach in off monsoon.	Moderate erosion
Gintota- Boossa, Ratgama	Majority of coast Previously protected with structures coastline is congested with buildings narrow beach	Moderate erosion overtopping reported
Hikkaduwa,Dodanduwa	Highly congested with coastal and building structures at the edge of coast line, sandy beach seasonal erosion reported	Severe seasonal erosion
Kahawa	Sandy protected beach, adjacent to main road	Over topping recorded
Matara		
Kapparatota, Kalukanda (Devil Face)	Laterite cliff along the coast No beach	reported severe cliff erosion
Mirissa	a bay, sandy beach, laterite cliff at the southern end and Giragala island	Moderate seasonal erosion Severe cliff erosion in south side of bay & Giragala island.
Kamburugamuwa	Sandy beach	Seasonal moderate erosion
Madiha	Part of a narrow sandy beach and a part of protected coast line	single case minor erosion, and overtopping recorded
Kotuwegoda	Pertected coastline, sandy beach in off season	single case minor erosion
Talalla	Sandy beach	Seasonal variation, mild erosion recorded in a year – fairly stable
Dikwella Beliwatta	Sandy beach	Seasonal variation, mild erosion recorded in a year – fairly stable

<i>Erosion Location / Coastal stretch</i>	<i>Status of coast</i>	<i>Problem identified</i>
Madilla	Sandy bay beach road infrastructure along the coast line	Severe erosion high net sediment loss.
Delete this raw		
Hambantota		
Kalamatiya Gurukanda	Bay, sandy wide beach	Moderate erosion
Pallikuda	sandy wide beach partially protected	Moderate erosion
Mawella	Bay sandy beach Fishery anchorage construction is going on	Severe erosion Reshaping the coastline orientation
Delete this raw		
Ampara		
Ninthaur to Sainthamarunthu	About 16km straight coast.	Severe losing a very wide beach permanent erosion
Attapalam	Sandy beach	Severe erosion & affect to paddy cultivation lands due to salt water intrusion
Thirukkivil	Straight coast about 8km sandy beach. lose 15m beach & 5m land	Severe erosion
Visky point – Komari	Sandy beach	Severe erosion
Arugambay	Sandy beach Tourism and fishery activities dominant coast highly congested with buildings and they are at the edge of coast line.	Seasonal variation minor erosion
Batticaloa		
Kaththankudi	Sandy beach, domain fisheries activities	Beach lose 10m , seasonal variation minor erosion
Trincomalee		
Muththur	Sandy beach	Single case, minor erosion
Ralkuli – Kinya(Upparu)	Sandy beach 12km	Minor erosion
Arippu	Delete this raw	
Jaffna		
Mandathivu	Narrow beach, fishery activities dominant	Single case, minor erosion reshaping he beach

Source: CC&CRMD Annual Reports 2014-2022

According to Table 2.1, the majority of cases are attributed to the effects of human activities.

Cross shore transport by waves in rough sea conditions move sediment offshore. Usually most of the sediments are retained within the surf zone and return to the beach by waves during the calm season. Therefore, beach erosion in rough period and accretion during calm season is seasonal and could be considered as natural behavior of the beach.

According to the above phenomena and various anthropogenic effects, only a limited beach area is available to accommodate natural erosion - accretion behaviour; hard coastal structures are relatively made speedy solution to cope with the erosion and to protect coastal lands and properties. Even though, in some instances, such coastal structures may transfer the erosion in to the adjacent beaches.

2.1.2 Past Management Activities and their Effectiveness of Early Initiatives

The early interventions carried out prior to 1970's in controlling coastal erosion could be identified as temporary solutions due to their ad hoc nature. The linkages between anthropogenic activities, especially the resources extraction practices and consequent coastal erosion has not been recognized. At this stage, the engineering solutions mainly focused on a "hold the line" principle. This was due to the loss of flexibility in the coastline associated with urbanization of the particular coastal stretch. In this process, the totality and the dynamic nature of the coastal segment as well as human activities taking place have not been taken into consideration. In the absence of planned infrastructure development in the coastal zone, the erosion incidence occurring during the monsoon period has created negative impacts on those infrastructure facilities disrupting social and economic wellbeing of the coastal communities. Thus, the overall effectiveness of early coast protection interventions could be categorized as being at a lower level, while indirect impacts were kept to a moderate level.

2.1.3 Initiatives carried out in early 1980's

The schemes of planned coast protection were commenced with the inception of Coast Conservation Unit under the Ministry of Fisheries and Aquatic Resources in 1978. Subsequently it was upgraded to the status of a Government Department in January 1984 in recognition of the magnitude of the task it is mandated to perform. The planned coast protection measures adopted in this period were mainly restricted to the construction of revetments, groins, and gabion walls. In addition, other management measures were implemented to control resources extraction practices such as coral and sand mining in the coastal zone. The effectiveness of such planned coast protection measures was higher than the coast protection measures carried out prior to 1970's. However, as a result of hard solution adopted to curb coastal erosion, beach scene operations and some of the recreational activities as well as vertical and lateral public access along the beaches have been disrupted.

2.1.4 Initiatives under Master Plan for Coastal Erosion (MPCEM)

The overall approach adopted in coastal erosion management was turned into a proper path with the formulation of the MPCEM which advocated long term optimal measures in August 1986 under the technical assistance provided by DANIDA. As a result of comprehensive technical, environmental, economic and social analysis carried out by a dedicated team of specialist both from CC&CRMD and the Danish Hydraulic Institute. The problem of erosion in Sri Lanka was defined within the constraints of limited information and the Master Plan recommended the best possible technical approach towards mitigation and also defined the capital investment required for such actions. Since 1986, the coastal erosion management measures have been implemented through DANIDA Stage 1 (1987-1989), DANIDA Stage 2 (1990-1992) GTZ - German Technical Cooperation ((1988-1996), ADB and GOSL funded CRMP (2000-2007), mainly based on MPCEM. The coast protection measures under the MPCEM were spatially formulated and categorized based on coastal segments with key areas and singular cases comprising structural formulations such as offshore breakwaters with sand nourishment, revetments and groins. Coast protection measures have also been carried out through the CRMP project and annual budget of the CC&CRMD. These include the structural measures (hard solutions) implemented in Hambantota, Matara, Galle, Kalutara, Colombo Districts and northwards up to Puttalam.

In addition, other management solutions such as application of setback standards for coastal development, enforcement of regulatory measures to minimize sand and coral mining and enhancement of public education and awareness were also implemented. The effectiveness and outcome of planned coast protection carried out under the MPCEM has demonstrated a higher level of success with moderate indirect impacts.

It is also evident that substantial amount of social, environmental and economic benefits was derived from these measures although it has not been quantified as yet. The benefits gained from the past coast protection measures are mainly perceptible in the areas of protecting highways and railway lines, public and private dwellings, fisheries

infrastructure facilities tourism and recreational facilities. In addition, the need for private investment on coast protection has been drastically reduced after implementation of MPCEM.

2.1.5 Beach Replenishment Projects

Beach nourishment is a process by which sediment, usually sand, lost through longshore drift or erosion is replaced from another sources. Even though, beach replenishment projects are relatively expensive but low environmental impact, Sri Lanka practices this method from 1980s. The first beach replenishment project was implemented in Negombo by the Danish Funds (DANIDA Project) in 1988. Subsequently CRMP project implemented five beach replenishment projects in Maha oya Lansigama, CrowIsland, Moratuwa, Wadduwa and Payagala during the period of 2002 to 2007. Subsequent to the foreign funded projects, the CC&CRMD carried out five beach replenishment projects from 2012 to 2020. The total cost incurred on the beach nourishment is SL Rs. 3084 million. The details of the sand replenishment projects carried out by the department is given in Table 2.2

Table 2- 2 Sand Replenishment Project Carried out by CC&CRMD 2012-2020

<i>Year</i>	<i>Coastal Stretch</i>	<i>Quantity Used for Nourishment (m3)</i>
2012	Uswetakeiyawa	300,000
2015	Unawatuna	200,000
2016	Marawila stage 1	400,000
2017	Marawila stage 2	400,000
2020	Kalutara	300,000
	Angulana	350,000
	Mount Lavinia	150,000

The above projects were successfully completed to protect beaches, minimize coastal erosion and create beach for tourism, fisheries and infrastructure. In spite of the relatively high cost on the basis of cost per year of protection, beach replenishment is highly admired by many beach users.

2.2 ISSUES, THREATS AND CHALLENGES

2.2.1 Natural Processes and Events contributing to Coastal Erosion

Many segments of the coastline are subject to continuing retreat and accretion; some changes occurred seasonally while others are more permanent. The natural processes contributing to coastal erosion are as follows:

- Natural variations in the sand supply to the coast from some rivers
- Loss of sand due to breaching and wash-over of a sand berm
- Offshore sand loss during extreme wave and storm surge conditions
- Loss of sand due to presence of canyons
- Deposition of sand at sand spits and dunes
- Loss of coastal vegetation
- Tsunami, cyclones and other episodic events
- Loss of material from “nodal areas”
- Sea level rise (long term contribution)

Among the other factors, the most important factor contributing to coastal erosion in Sri Lanka is the imbalance of the littoral sediment budget. The littoral transport generates mainly due to action of monsoon generated short crested

wind waves and long crested swell waves on the nearshore sediment. Thus, coastal erosion through the actions of waves, currents and winds results in the loss of sediment in some places. There is a considerable variation in the supply of sediment to the beach and loss of sand from the beaches due to the longshore transport capacity. The erosion taking place in the southwest coast is mainly due to the high capacity of littoral drift than the supply from the rivers to the beaches. The erosion reported from the coastal stretch located north of Maha Oya is compounded by the straightness of the coastline and is particularly severe because of a high deficit in the littoral budget due to sand mining in the Maha Oya and other anthropogenic effects. As per the prevailing information, sand supply along the south coast is also low, but the coastline is relatively stable due to the bay and headland features which offer some sheltering effect. Presently the human intervention make unstable and reshaping the coast.

The global sea level is expected to rise with 30- 40 cm in the 21st century according to the IPCC mid estimates based on the linear melting of the ice sheets of Greenland and Antarctica due to increased emission level of greenhouse. Therefore, the potential increase of coastal erosion due to sea level rise is not insignificant. However, it is quite complicated to quantify the level of erosion when it comes to coastlines in the vicinity of inlets, such as river mouths, lagoons and estuaries. These places are affected by other factors, such as inundation with heavy rainfall, basin filling impacts and impacts due to salt water intrusion etc. Those impacts along the water bodies will be accelerated in the future due to the climate change and the sea level rise.

One of the causes of natural coastal erosion is the increase in sediment transport rate in the direction of the net transport of the shoreline. This can be due to changes in the wave conditions at certain areas, different shape of the coastline, or special bathymetric conditions. The loss of inland sand due to breaching and over-washing of barrier islands and wind transport losses to offshore during extreme wave and storm surge conditions. The high waves cause the sand bars to move seawards and the high storm surges also cause an offshore movement of sand due to non-equilibrium in the profile during the high surge.

The loss of sand to an accumulative beach occurs at the tip of a sand spit and into deep water at the leeward side of the tip of sand spit at the termination point of a littoral cell. Sand lost in this way causes accumulative shore and shoal features in the deposition areas, but the upstream coastline has a sand deficit.

Another cause of natural coastal erosion is oblique wave approach to the coastline. Along such coastlines, there is a tendency for natural formation of spits parallel to the coast. They accumulate sand and shift the supply of sand to offshore. In that case, deficiency of sand supply to downstream coast results taking available sand in downstream to the littoral drift.

2.2.2 Impacts of 2004 Tsunami on Coast Protection and Coastal Erosion

The Asian Tsunami struck Sri Lanka's coastal region as a leading elevation wave on 26th December 2004 two hours after the Indonesian earthquake. One to three waves were reported depending upon the location with a height of 1 m to 15 m. The highest wave height occurred in Koddiyar with 15 m in Ampara District and 12 m each at Kurukulamadam and Hambantota Town. A 10 m height occurred at Mankerni, Pottuvil, Punnaikudah (Batticaloa District) Kirinda and Ratupasgodella, while Kahandamodera and Peraliya recorded 8 m respectively. Tsunami waves first arrived on the eastern coast and to the other parts of Sri Lanka affecting 12 out of 14 coastal administrative districts. Tsunami waves inundated the southwestern part with varying intensity depending upon topography and coastal defense. The sea water inundation varied considerably from few meters to 3.5 km inland. The maximum inundation was recorded at 2 km in Batticaloa and Kuchchaveli in Trincomalee. In Peraliya, inundation was reported about 2 km inland. On the southern coast, the inundation limit was up to about 3.5 km in the lagoon system. (Survey of the December 26th Indian Ocean Tsunami in Sri Lanka, James Goff, International Tsunami Survey Team -TST).

The impacts of the tsunami were severe on the coastal zone where there had been some degree of human induced environmental damage such as removal of sand dunes, coral reefs and coastal vegetation. As per the damage assessment carried out by Coastal Resources Management Project (CRMP) after the tsunami, it was revealed that a number of coast protection structures were damaged in the south west coast while some coastal stretches and sand spits have been severely eroded.

2.2.3 Anthropogenic Activities that Accelerate Erosion

The coastal engineering investigations carried out in Sri Lanka in the past clearly revealed the correlation between accelerating coastal erosion and the human activities taking place within and outside the coastal zone. This was further confirmed through socio- economic surveys and studies conducted with respect to human activities such as sea coral mining, sand mining from the beaches and the rivers and construction of dams across the water ways and construction of coastal structures. A summary of human activities and their impacts which contribute to coastal erosion are presented in **Table 2-3**.

Table 2- 3 Human Activities with an Impact on Coastal Stability in Sri Lanka

<i>Activity</i>	<i>Current Status</i>	<i>Result</i>	<i>Effect on Coast</i>	<i>Example of Sites Affected</i>
Beach sand mining	Moderate	Reduction of beach sand volume available for littoral processes	Induces coast erosion	Panadura, Ahangama , Habaraduwa, Lunawa Angulana
River sand mining	High	Reduction of river sand supply to the beaches Salt intrusion to river upstream	Increases coastal and river bank erosion	Kelani, Nilwala, Maha Oya, Kalu Ganga, Gin ganga
Collecting coral from beaches and shore face	Low	Reduction of volume of beach Material, Reduction of corals to reformation and developments of natural coral reefs	Reduce materials to the beaches, induces coastal erosion	Rekawa, Ahangama, Habaraduwa, Hikkaduwa
Damaging, coral, limestone and sandstone reefs	Low	Damages to the natural barriers, creation of gaps in reefs	Increase wave energy on beaches and increase coast erosion,	Seenigama, Rekawa Uswetakeiyawa , Pitipana
Construction of buildings and other structures too close to the beach and on sand dunes	High	Reduction of coastal stability	Cause damages to the buildings and structures, accelerate coastal and dune erosion	Dewata, Polhena Unawatuna Hikkaduwa Uswetakeiyawa
Maintenance dredging in harbour basins and access channels	High	Removal of sand from the littoral budget	Induce coastal erosion on adjacent beaches	Colombo Port, Fishery harbors and anchorages
Removal and loss of coastal vegetation	Moderate	Reduction of coastal stability, creation of exposed areas for wind and waves	Induce dune and coastal erosion	Erosion to be expected along all sedimentary shores
Construction of unplanned or poorly planned rigid coastal structures	High	Reduction of coastal stability in adjacent coast	Induce of erosion or huge accretion in adjacent coast	Galle, Matara Palliyawatta, Negombo, Oluvil Harbour

<i>Activity</i>	<i>Current Status</i>	<i>Result</i>	<i>Effect on Coast</i>	<i>Example of Sites Affected</i>
Construction of river flow regulating structures	High	Reduction of sediment supply to the beach	Coastal erosion, loss of sand to coast, sand bar formation inside river	Maha Oya, Deduru Oya, Nilwala ganga
Breaching sandbars at river and lagoon outlets	High	Reshaping the outlet	Severe erosion on adjacent coasts and river banks, sand formation inside lagoon, water stagnant inside lagoon due to different orientation of sand bar	Kalutara, Ginthota

Source: CC&CRMD 2023

The impacts of above listed human activities contributed significantly to coastal erosion but in varying degrees depending on the effectiveness of management measures adopted by the CC&CRMD.

Mostly rigid coastal structures such as groynes, detached breakwaters, sea walls, port and inlet jetties at tidal inlets and river mouths, revetments that are interference with the littoral transport and also contribute to coastal erosion. The presence of such structure has a series of effects viz:

- Trapping of the sand on the upstream side of the structure takes sand out of the sediment budget, thus causing shore erosion along adjacent shorelines, mainly on the lee side.
- Changes in the wave reflection and diffraction patterns, hence changes in the wave energy distribution and sediment transport patterns.
- Possible changes of movement of the existing coastal current pattern and tidal movement.
- Loss of sand to offshore.
- Trapping of sand in basins, entrance channels and in adjacent coast of outer ports/harbours.

2.2.4 Development Activities that cause Negative Impacts on the Stability of the Coast

Besides the hard maritime structures, other development activities mainly the buildings and other constructions related to tourism, commercial and dwelling purposes located too close to the beach front restricts coastal process and could accelerate beach erosion. In addition, irrigation schemes, gates, dams and tanks constructed in the river upstream areas negatively affect the stability of the coast by reducing sand supply to the coast. This situation was evident in the absence of development regulatory mechanisms and environmental impact assessment procedures in the past. Prior to implementation of Coast Conservation and Coastal Resource Management Act and the National Environmental Act, there were no legal and institutional mechanisms to direct such developments to avoid negative impacts on the stability of coast.

➤ Sand Mining in Rivers

Removal of sand from the river system directly reduces the supply of sediments to the beaches and is widely identified as the major cause of coastal erosion in Sri Lanka. The national sand requirement has continuously increased parallel

to the growth of the construction industry since late 1970's and reached into a significant level with the economic thrust placed after culmination of the conflict situation in the northern and the eastern parts of the country in 2009. In 2018, sand requirement for the entire country has been estimated at approximately 21 Million cubic meters per year in which major portion is fulfilled from river sand.

Despite many controlling measures, sand mining in river is being taken place increasing at high level in the North Western, Western, and the Southern provinces where much of the construction activity and major coastal erosion problems are concentrated. As per the prevailing information more than 35 of the 103 rivers are subject to illegal river sand mining and that more than 50% of all sand used in the construction sector is sourced from unlawful operations (*Abeyratne H.S.2023*)

However, with the drastic increase of demand and regulatory restrictions imposed on river sand mining, the price of the river sand has been significantly increased while attention on alternative sources such as offshore and land-based deposits also increased. At present, Mahaweli Ganga (Manampitiya and Mahiyangana) is the key extracted source of river sand; in addition to that Kelani Ganga, Deduru Oya, Maha Oya, Kalu Ganga, and Nilwala Ganga are also considered as major sources.

The overall sand mining in rivers at unprecedented rates to meet the current requirement of the construction industry evidently demonstrates the unsustainable status and inevitability in degrading river beds as well as decrease of sand supply to the beaches.

The demand for sand has increased with the growth of the construction industry in the country, especially after the end of the conflict that prevailed in the north and the east in 2009. Based on the annual usage of cement, the annual sand consumption has been estimated and shown in Table 2-4 while the estimated volume of sand mined from the rivers, based on the permits issued by the GSMB is shown in Table 2-5. Nevertheless, the quantity of sand mined illegally from river system is not reflected from these figures.

It should also be noted that the river sand mining is unsustainable and it is a long-standing socio-economic problem. The impacts of river sand mining are irreversible in the short and medium term. Thus, the reactive policy responses will not serve to re-establish the sand supply to the coast from several effected rivers in the short or medium term. In view of the current situation, the policy responses should focus on application of multi management approach that constitute with; (a) regulating river sand mining more effectively to avoid worsening of the current situation and allowing replenishment of the rivers subject to heavy mining in the past (b) curtailing over exploitation in all river system (c) initiating a further national sand study to explore and promote alternatives and to determine sustainable yields more accurately.

The demand for sand has increased with the growth of the construction industry in the country, especially after the end of the conflict that prevailed in the north and the east in 2009. Based on the annual usage of cement, the annual sand consumption has been estimated and shown in Table 2-4. However, the construction activities have drastically decreased from 2020 due to economic and pandemic situation in the country.

➤ Sand Mining on the Beaches and Dunes

Corresponding to the increased demand and the higher prices, sand mining from the beaches and dunes also increased in the recent past, irrespective of suitability or quality standards required for the construction industry. In contrast to the volume of river sand mining in the country, beach sand mining is not significant. Although the quantity of sand extracted annually from the beaches and dunes is less, beach sand mining is much more damaging to the stability of the coast than river sand mining since it has instantaneous impacts on the deficit of the littoral sand budget. However, over the years sand mining from the beaches has been drastically reduced due to the management measures adopted by the CC&CRMD through enforcement of regulations, enhancement of public education, and awareness and coordination with other agencies. In considering the small quantities of beach sand requirement for the coastal communities for religious and other purposes, permission is being granted by the department for removal of sand but

not exceeding 2 cubes from pre-identified locations. However, there are a few locations such as Kirinda, Peraliya, Hikkaduwa, Chilaw and Panadura fishery harbors where the beach sand has been removed as there is an apparent excess of sand. Sand has been accumulating in those locations as the coastal/harbor structures have prevented the littoral drift and resulted in deposition/filling in harbor basins. This deprives the downstream area along the beaches maintaining the sediment budget and causing coastal erosion. Moreover, the removal of deposited sand from the system has negatively impacted to the sand budget and marginal attention has been paid to this problem by some of the authorities as well as the coastal communities. However, those permissions for sand mining in fishery harbours have been temporary suspended due to severe erosion identified in adjacent beaches.

In spite of the management measures effectively implemented by the CC&CRMD, sand removal from the dune systems has been quite high in the northwestern, eastern and the northern provinces in the past. The unauthorized removal of sand from the dune system in the eastern and the northern coastal segments could not be regulated due to conflict situation that prevailed in those areas in the past and some of the valuable dune systems have been significantly damaged. In considering the impacts, conserving the sand dunes was further strengthened through previous CZMPs. Accordingly, an attempt was made to conserve the severely affected dunes.

Table 2- 4 Annual Sand Consumption 2012-2021

<i>Year</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021⁽¹⁾</i>
Cement Consumption (2)(x 000) MT	5,880	6,033	6,247	6,379	7,994	8,495	7,955	8,121	7,189	7,128
Sand Consumption (3)(x 000) m ³	21,168	21,719	22,489	22,964	28,778	30,582	26,638	29,236	25,880	25,661

(1) Provisional, (2) Production+Imports, (3) Based on the formula: 3.6 m³ of Sand = 1 Ton of Cement, Byrne G. et al. 2002, Alternative for river sand, unpublished report CRMP, 2002 (Source: National Output, Expenditure and Income, Central Bank of Sri Lanka, 2022)

Table 2- 5 Annual volume of river sand mining (estimated based on the Permits issued by the GSMB)

<i>Year</i>	<i>Extraction (Million m³)</i>
2015	0.74
2016	0.88
2017	0.77
2018	0.80
2019	0.61
2020	1.30
2021	1.28
2022	0.59

Apart from the rivers, beaches and dunes, sand large quantity of sand extracted from offshore areas (western coast) for the purpose of sea reclamation projects and construction purposes as depicted in Table 2-6. Moreover, it is envisage to extract large quantity of offshore sand for the planned Colombo North Port Development Project and the Marine city Development Project.

Table 2- 6 Quantity of Offshore Sand Pumping for the Requirement of Sea Reclamation and Construction Industry of Sri Lanka from 1994-2022

<i>Period</i>	<i>Volume/Quantity (million m³)</i>
1994-1995	4.55
2005-2007	3
2011-2013	3.8
2018-2019	4
Approx. 2016	40 (for Port City Development) ‡
2022- on going	14.5 (for Colombo West International Terminal) ‡

‡ - Estimations

Source: Sri Lanka Land Reclamation and Development Corporation (SLLRDC) records)

➤ Transformation of Direct Human Impact on Coral

Coral is the principal source of lime for the construction industry in Sri Lanka until recently and supplied approximately 90% of the lime requirement. Sea coral mining from the nearshore areas were reported in the west and the south coast and some parts of the eastern coastal areas causing a significant level of coastal erosion. Although coral has been mined for almost four hundred years in certain parts of the coastline, it was confined to a low level and only from the relic reefs behind beaches. The growth of the construction industry since late 1970's has led to accelerated sea coral mining which involves the destruction of living reefs that act as barriers against wave action. As per the available records, it was revealed that inland and sea coral extraction from the west and south coast has increased from 18,000 tons in 1984 to 30,500 tons in 1998. With the enforcement of stringent regulatory action under the Coast Conservation Amendment Act No. 84 of 1988 banning operating lime kilns, possession, processing and transporting corals within the coastal zone, the amount of sea coral mining has declined from 7,660 tons in 1984 to 2,200 tons in 1994. In this context, coral mining and related socio-economic and environmental impacts were frequent focal themes of discussion in the subject of integrated Coastal Resources Management (ICRM) in Sri Lanka. Thus, to control coral mining, a comprehensive management strategy was adopted by the CC&CRMD in 1978, comprising regulations, introducing and promoting substitutes for coral-based lime, enhancing public education and awareness, and providing alternative employment to people engaged in coral mining. As result of these management measures, the level of sea coral mining was maintained at a lower level up to 2004. However, with the tsunami disaster that struck Sri Lanka's coastal region in 2004, sea coral mining has been drastically reduced or almost halted with the self-realization of its ecological and environmental importance of reefs among the coastal communities, especially in the southern province. No significant level of coral mining is reported in the recent past (Table 2-7).

Table 2- 7 Reflection from the Past - Coral mined in the Coastal Zone of Sri Lanka's Western and Southern Coastal Sector (1992-2022)

<i>Type of coral</i>	<i>Amount 1984 (tons)</i>	<i>% of total</i>	<i>Amount 1992 (tons)</i>	<i>% of total</i>	<i>Amount 1998 (tons)</i>	<i>% of total</i>	<i>Amount 2013-2022 (tons)</i>
Inland coral	10,400	58	15,800	80	28,300	93	Not reported
Sea coral	7,660	42	4,020	20	2,200	7	Not reported
Total	18,060	100	19,820	100	30,500	100	Not reported

Source; CC&CRMD 2023

2.2.5 Future Impacts of Climate Change

The potential climate change effects, especially global warming resulting in sea temperatures and sea level rise, increased frequency and magnitude of tropical storms and other extreme events will have negative impacts on coastal processes, ecosystems and human wellbeing. Although the global mean sea level rise is an important aspect, the relative sea level rise is the main factor determining impacts on the coast. According to the central estimate predicted by the International Panel of Climate Change (IPCC), the global sea level may rise 0.2 cm and 0.5 cm by the years 2010 and 2050 respectively. In consistency with the possible rise of temperature and relative sea level, it is expected to cause shoreline retreat, inundation of low-lying areas and vulnerable areas, increase salt water intrusion into the inland water bodies, geomorphological changes in sediment transport and damage to the coastal habitats such as coral reefs. In addition, sea level rise will create negative impacts on fisheries, tourism and other beach users and coast protection and other structures that have not been designed to withstand such effects.

According to the Climate Change Vulnerability assessment conducted by the Ministry of Environment and Renewable Energy in 2011, sea level rise exposure in important sectors such as urban development, human settlement, economic infrastructure, water, agriculture and forestry, biodiversity and ecosystem services, livestock have been investigated and highly vulnerable areas have been identified. Figure 2.1 depicts the sea level rise exposure map. Based on the IPCC predictions, inundated areas due to predicted sea level rise at the end of 25, 50, 75 and 100 years including the areas covered presently as water bodies are given in Table 2-8

Table 2- 8 Projected Inundated Area in each district including/excluding Water Bodies:

District	Total Inundated Area (ha) Including water bodies				Additional Inundated Area (ha) Excluding water bodies			
	25 year	50 year	75 year	100 year	25 year	50 year	75 years	100 year
Colombo	959	1133	1327	1534	201	375	569	776
Gampaha	3638	4154	4631	5073	459	976	1452	1894
Puttalam	11334	12583	13716	14809	1113	2362	3494	4587
Mannar	8024	8262	8518	8758	248	486	741	981
Jaffna	10321	11164	12014	12891	864	1706	2557	3434
Mulaitivu	912	1004	1092	1180	88	180	268	355
Trincomalee	2315	2529	2791	3033	252	467	729	971
Batticaloa	2325	2443	2568	2702	130	247	372	507
Ampara	1880	2175	2479	2762	293	588	892	1175
Hambantota	4265	5553	6516	7322	885	2173	3136	3942
Matara	1277	1634	1994	2401	384	741	1101	1508
Galle	5622	6462	7249	8014	776	1617	2403	3169
Kalutara	1956	2370	2790	3203	417	830	1251	1664

Source: Shoreline Status Report-2014

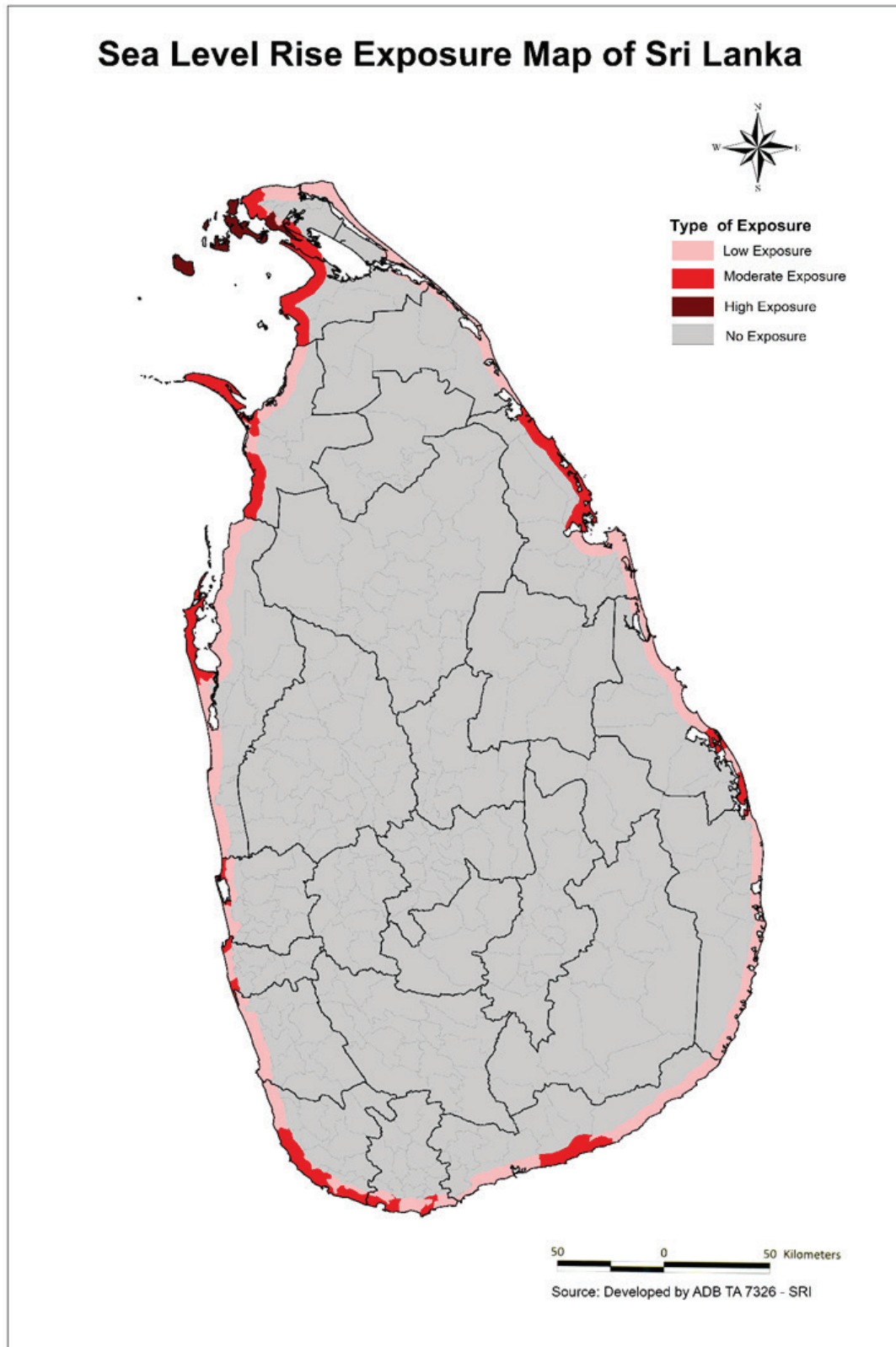


Figure 2- 1: Sea Level Rise Exposure Map of Sri Lanka

Sources: Climate Change vulnerability data Book 2011

In view of the magnitude of the potential issues related to sea level rise, an overall accepted response is the proper adaptation. Thus, it is important to pay careful attention on the following adaptation technologies:

1. Imposition of adequate buffer areas (set-backs) for coastal development.
2. Formulation of design criteria for coastal structures with due consideration of relative sea level rise.
3. Sand dune rehabilitation/stabilization as a soft defense mechanism.
4. Restoration of coral reefs as a soft defense mechanism.
5. Beach nourishment.

In addition to the sea level rise, other natural phenomenon related to climate change repercussion which are important for coastal erosion management are cyclones and strong storms which frequently experienced in the Bay of Bengal.

2.2.6 Coastal Erosion Trends and Shoreline Management Measures Adopted

According to a coastal erosion trend analysis carried out by *Abeykoon L.C.K et al. (2021)* covering the 2005-2019 period focusing on the Western and North-western provinces revealed that average coastal erosion rates of -1.21 ± 0.04 m yr⁻¹ in Kalutara, -0.54 ± 0.63 m yr⁻¹ in Colombo, and -0.7 ± 0.58 m yr⁻¹ in Gampaha district respectively. Puttalam district showed a 0.26 ± 0.07 m yr⁻¹ average accretion rate, while the highest accretion rate (0.95 ± 0.58 m yr⁻¹) was evident in the coastal region of Wilpattu National Park, an area that has few anthropogenic interventions.

The study results also found that the application of hard structures to mitigate the effect of coastal erosion has increased within the past 15 years. Accordingly, at the end of 2019, the country mainly used revetments up to 23,554 m in length (occupying 9.05% of the total study area), consisting of 18,960 m in the Western province (7.29%) and 4,594 m in the North-Western province (1.76%). The Western province has applied more hard structures at a higher rate than the North-Western province due to mega-development projects.

According to the recent investigation records of the CC&CRMD, it was revealed that the coastal erosion at Kalutara coastal stretch adjacent to the river outlet demonstrate a notable leap with approximately 30m from 2017 to 2023.

The district wise coastal erosion incidence reported and the length of shoreline protected by the CC&CRMD from 2000 to 2022, is illustrated in **Table 2-10**

Table 2- 9 Shoreline Management Measures Implemented from 2008 to 2022

<i>District</i>	<i>Protected length from 2008 to 2022 in km</i>
Puttalam	4.1
Gampaha	1.05
Colombo	1.65
Kalutara	3.16
Galle	5.24
Matara	3.81
Hambantota	1.47
Ampara	0.85
Batticaloa	0.1
Trincomalee	1.37
Mulativu	0
Kilinochchi	0
Jaffna	0.75
Mannar	0

Source: CC&CRMD 2023

2.2.7 Data and Information on Coastal Process/Characteristics

The requirement of reliable and updated information on coastal processes as well as socio-economic, ecological and environmental factors related to coastal erosion is a prime necessity for coastal erosion management. Although, the required data and information pertaining to coastal erosion management has been collected through coastal investigations and other research studies for the west, south-west, south and northwest coastal segments during the past few decades, little or no data and information was available for the northern and the eastern provinces and the islands due to the conflict that prevailed in the region over three decades until 2009. Since the northern and eastern coastal provinces are also highly vulnerable to climate change repercussions as well as episodic extreme natural events such as cyclones, storms, and tsunami incidents, the availability of reliable data and information is a vital requirement for coastal erosion management. Moreover, for the attempts being made for economic development in the northern and the eastern provinces by the GOSL, the availability of data and information on coastal processes, and parameters such as wave characteristics, currents, tides, and sediment transportation patterns are vital to determine the environmental impacts. As a part of its attempts to obtain data and information on coastal process/characteristics for the northern and eastern coastal region, modeling studies on longshore sediment transport along the coast in Trincomalee and Batticaloa Districts have been conducted by the CCCRMD in 2018. In addition, the mapping of beach access in Batticaloa District was carried out in 2021 and the mapping of beach access in Mannar, Kilinochchi, Jaffna, and Mullaitivu Districts was initiated in 2022 by the CC&CRMD. Modeling studies on longshore sediment transport at 04 locations in the northern region- Pesalai, Gurunagar, Point Pedro, and Mullaitivu have also been carried out by the ADB for the Northern Province Sustainable Fisheries Development Project, in 2016.

Though the field measurements are limited, there are some global scale wave, wind, and current simulation and forecasting programs and longtime shoreline change estimations which may be used until a proper data acquisition program is in place. However, this information should be compiled into a customized database and verified so that they can be directly used as decision-making tools by the CC&CRMD.

2.2.8 Accommodating New Development Activities within the Coastal Region

With the end of the conflict that prevailed in the country in 2009, the overall economic development has grown to shift the status from low low-income earning country to a middle-income country. However, a significant percentage of the gains made were lost due to the pandemic experienced and the economic crisis, since 2020. However, the economy is expected to recover in the near future. The GOSL's long-term plan of developing tourism, maritime, and energy sectors is mainly concentrated in the coastal region. In addition, mega projects such as the Colombo Port Expansion Project (CPEP) and Port City Development Project are located in the urban coastal waterfront. Several tourism development zones/locations are also planned along the coast. These include the proposed tourism development zone in Kuchchaweli in the Trincomalee District and the locations identified by the master plan on tourism development from Negombo to Mirissa in the western and southern provinces. In addition, many locations along the coast and in the islands in coastal areas suitable for different types of tourism developments have also been identified by a study carried out by the CC&CRMD in 2022. Therefore, minimizing the vulnerability of the coastal region to episodic and chronic coastal hazards is a prime requirement for attracting and accommodating new development interventions related to the above economic sectors while ensuring the sustainability of the coastal resources. To achieve the desired objectives of the economic development thrust placed on the coastal region, scientific and engineering knowledge of the coastal resources, their behavior, and functions should be considered with the social aspects of the coastal region, for a proper development decision-making process.

2.3 POLICIES, PLANS, LAWS AND INSTITUTIONAL ARRANGEMENTS

2.3.1 Plans and Policies

The policies on coastal erosion management are mainly governed by the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981 and its amendment Act, No. 64 of 1988 and No. 49 of 2011 as they provide legal provisions for regulating activities in the coastal zone. In view of the requirement of controlling some influencing activities even outside the coastal zone, the legal regime was strengthened through amendment Act, No. 49 of 2011.

In addition, the first national Coastal Zone Management Plans of 1990, Revised CZM Plans of 1997, 2004, and 2018, “Coastal 2000”; A resources Management Strategy for Sri Lanka’s Coastal Region also addressed the issue of coastal erosion. Based on the policy guidelines provided through CZM Plans and “Coastal 2000”, an overall coastal erosion management strategy was implemented in compliance with the Master Plan for Coastal Erosion Management (MPCEM) prepared in 1986.

In accordance with the legal and institutional provisions, the responsibility and discretion for control of coastal erosion lie with the Director General of the CC&CRMD. Thus, to implement coastal stabilization schemes within the coastal zone, the requirement of an Environmental Impact Assessment has been waived. As a policy, so far priority has been given to the protection of public infrastructure (roads, railway lines, bridges, etc.), followed by public utilities and buildings, dwelling units, state land, and private/commercial buildings respectively, for CC&CRMD funded coast protection schemes. The CC&CRMD permits private and public agencies to implement coast protection schemes if they are consistent with the guidelines and criteria spelled out in the MPCEM. Management actions and regulatory mechanisms are implemented at the national level. In accordance with the CC&CRM Act, an EIA may be required for the development activities including coast protection carried out within the coastal zone by both private and state agencies, at the discretion of the Director General of the CC&CRMD. Development activities that go beyond the coastal zone require adherence to the EIA procedure of the National Environmental Act, No. 47 of 1980 and its amendment Act, No. 56 of 1988, but special concerns of the CC&CRMD will also be taken into consideration. There are many regulatory mechanisms and institutions that are important in controlling activities such as mining, reclamation, and diversions of waterways directly or indirectly create impacts on the stability of the coast.

2.3.2 Nationally Determined Contributions (NDC) Implementation Plan (2021-2030)

Climate change poses a serious threat to the health of the coastal ecosystem, and economic growth and minimizes development gains. Sri Lanka ranks 100th in terms of readiness for climate change adaptation and 60th in terms of climate change vulnerability (NDC Implementation Plan 2021-2030). The Coastal and Marine Sector has been identified as one of the most crucial sectors impacted by these changes among nine sectors. As a result, these nine sectors including the coastal and marine sector have been recognized in NDCs to prioritize adaptation measures by related governmental agencies, specialists, and other stakeholders in each vulnerable sector. Accordingly, the following main activities as depicted in Table 2-11, have been identified for implementation during 2021-2030 by the CC&CRMD and other relevant agencies under the NDC Implementation Plan (2021-2030) for Coastal and Marine Sector.

Table 2- 10: NDCs of Coastal and Marine Sector

• Establish an accurate sea level rise forecasting system for Sri Lanka
• Prepare updated vulnerability and risk maps for the coastal belt of Sri Lanka
• Adopt optimal shoreline management works/measures covering affected length of shoreline using a combination of hard and soft solutions to prevent coastal erosion in the areas most vulnerable to SLR
• Identify and declare coastal and marine natural areas of high priority for building resilience for climate change impacts

Source: Ministry of Environment, NDC Implementation Plan 2021-2030, (2023)

2.3.3 Future Approaches and Trends in Coastal Erosion Management Practices

Coastal erosion and accretion are natural processes. However, this natural phenomenon may become a problem when disturbed by human activities and natural disasters or changes. In addition, the spreading of poverty, coupled with the growing population in the coastal region and the increasing economic growth has created major challenges in managing coastal erosion along the coast, in the future. Thus, careful attention has to be paid to the following in managing coastal erosion in the country.

1. Maintaining a basal shoreline position at the most important areas where the shoreline retreat cannot be allowed. Through a comprehensive study, the shoreline sections where maintaining a basal shoreline position is required should be identified. Seasonal shoreline variation may be allowed but continuous retreat should be managed through sand nourishment or by other means.
2. Prevailing information revealed that the existing coast protection measures provide significant protection.
3. Scientific findings revealed that presence of vegetation in coastal areas will improve slope stability, consolidate sediment and diminish the amount of wave energy moving onshore and protecting the shoreline from erosion.
4. Increased interest in soft options for coast protection is becoming predominant and is in line with the advanced knowledge on coastal processes.
5. A combination of soft and hard solutions is sometimes necessary to improve the efficiency of the option and to provide environmentally and economically acceptable coast protection measures.
6. Requirement of adopting climate compatible technologies and designs for fisheries, tourism and other economic activities located in the coastal zone.
7. As per the legal provisions introduced through Coast Conservation and Coastal Resource Management Amendment Act, No. 49 of 2011, the declaration of affected areas and conservation areas should be implemented as appropriate, for controlling coastal erosion.
8. Use of new technologies (such as Geo bags) is sometimes necessary to improve the efficiency of the option and to provide environmentally and economically acceptable coast protection measures.
9. Pay due attention on fulfilling commitment of NDCs under Coastal and Marine Sector as specified in NDC Implementation Plan 2021-2030

2.4 MANAGEMENT OBJECTIVES, POLICIES, STRATEGIES AND ACTIONS

Objective 1

Coastal erosion prevention is ensured through optimal shoreline management works/measures consisting of soft solutions, combination of soft and hard solutions or hard solutions

Policy 1.1

Maintain the coastline at a predefined position (Basal Shoreline Position-BSP).

Strategy 1.1.1

Shoreline retreat should be minimized.

Proposed Actions

1. Establishing coastal cell boundaries through a scientific study.
2. Establishing coastline positions within each cell through a study on how the shoreline has been changing over the time. This may be initially done for the shoreline sections where the erosion impacts are severe and may extend to the other areas when funds and resources are available.
3. Establishing the BSP for sections of the beach which was there on a predetermined date to be defended against erosion through appropriate measures such as periodic sand nourishment etc.

4. Taking appropriate measures to maintain the BSB established.
5. Updating the status of the coastline periodically which will help taking quick corrective measures to control erosion. Seasonal shoreline variation may be allowed through a tolerance range in the BSP.

Strategy 1.1.2

Re-establishment of a shoreline that has been changed due to a development activity is a responsibility of the developer.

Proposed Actions

1. Take appropriate action to ensure that the development activities do not change the sand budget at the adjoining shorelines.
2. At places where the proposed development activity has a potential to disturb the natural movement of sand, take appropriate action to ensure that the development plan has a sand bypass or other suitable mechanism so that the downstream sand budget remains unchanged.
3. The permit system that allows development activities in the coastal zone should cover an extended period beyond the construction/implementation completion to see whether there are any subsequent changes in the shoreline. It may be a period of about two years after the completion of the marine structure construction which covers two sets of different weather seasons.

Measures that are required to mitigate shoreline changes due to a development activity will be carried out by the CC&CRMD with the funds made available by the developer.

Strategy 1.1.3

Ensure the beach is properly restored to the satisfaction of CC&CRMD subsequent to any retrieval of coastal resources.

Proposed Actions

1. Monitor and regulate the removal of mineral sand and other beach material.
2. Monitor the beach restoration process after the extraction of mineral and other resources.

Policy 1.2

Coastal stabilization will be carried out in a planned manner by the identification of by analyzing the coastal erosion trends.

Strategy 1.2.1

Identify coastal erosion trends; prioritize areas for protection based on high levels of erosion and threats to public and private properties, economic activities and utilities as well as critical habitats; adopting proper monitoring procedures and formulating site-specific management interventions.

Proposed Actions

1. Study and identify coastal erosion trends and areas with specific attention on North and Eastern coastal segment subject to, or liable to, high levels of erosion.

2. Conduct monitoring programmes based on priority areas to enable the preparation of a Status report on coastal conditions, and to update it periodically.
3. develop a guidelines on how to prepare and implement Shoreline Management Planning where appropriate.
4. Initiate the process of Shoreline Management Planning for priority locations on a pilot basis.
5. Permit public or private entities to prepare and implement coast protection works which comply with the shoreline management plans.
6. 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.
7. Consider applying the general/specific guidelines introduced through shoreline management plans at appropriate locations during project approval procedures in the Coastal Zone.

Policy 1.3

Coastal erosion control/shoreline management will be based on sound scientific/engineering assessment.

Strategy 1.3.1

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

Proposed Actions

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. Prepare a list of activities, locations, timing, and other information relevant to each institute who will carry out regular erosion monitoring. Assure fund availability through inclusion in the annual budgets and ensure proper implementation through periodic monitoring.
3. Establish and maintain a comprehensive database -through institutional monitoring on hydrographic conditions, land use, critical coastal habitats ecosystems and socio-economic characteristics in the Coastal Zone.
4. Establish (a) an inter-institutional database relevant for coastal erosion management and (b) a survey of coastal erosion and protection status. Prepare a list of 'who does what' to ensure proper implementation.
5. Formulate appropriate mechanisms to provide access to the metadata base (above) as well as an institutional database for public and private agencies and researchers.

Policy 1.4

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 1.4.1

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 Actions

1. develop guidelines for reclaiming coastal frontages for development possibilities and providing additional buffers.
2. Provide guidance on the preparation of reclamation plans to ensure that reclamation is confined to sites where the consequent shoreline readjustments are limited and protection costs can be recovered through development consistent with this objective.

Policy 1.5

Dune stability will be enhanced by prohibiting sand removal and promoting the growth of environmentally suitable/endemic vegetation on sand dunes to minimize coastal erosion.

Strategy 1.5.1

Control activities that have adverse impacts on dunes and dune vegetation and replant environmentally suitable/endemic vegetation on sand dunes where the native vegetation is damaged.

Proposed Actions

1. Prohibit sand removal from dunes, control activities that cause damage to dune vegetation.
2. Replanting appropriate vegetation on sand dunes where the vegetation has been destroyed

Policy 1.6

Stability of natural coastal features will be enhanced in the process of shoreline management.

Strategy 1.6.1

Formulate and implement shoreline management plans/coast protection schemes to minimize impacts of coastal erosion while enhancing stability of the coastal natural features.

Proposed Actions

1. Identify priority areas suitable for adopting shoreline management plans with special emphasis on coastal natural features.

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 coordinated and regulated to ensure that natural coastal processes are unhindered.

Strategy 2.1.1

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

Proposed Actions

1. Develop a “Compliance Monitoring Plan”, and enforce adherence to coastal setback standards by conducting permit compliance monitoring surveys as required.
2. Identify areas that are prone to coastal erosion and flooding and formulate appropriate guidelines.
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 at local, divisional and provincial level. Implement a programme to show the setback details in a zoomable map through CC&CRMD Web.
5. Prepare a developers guide book comprising new setback standards, regulations and guidelines.

Policy 2.2

Adverse impacts on the Coastal Zone from construction of coastal and marine structures will be minimized.

Strategy 2.2.1

Implement mitigation measures according to EIA/IEE studies to minimise adverse impacts due to construction of coastal and marine structures (except for shoreline management structures in accordance with shoreline management plans).

Proposed Actions

1. Implement mitigatory measures recommended through EIA/IEE to minimize adverse impacts in the Coastal Zone from coastal structures and other schemes.

Policy 2.3

The impacts of development activities carried out beyond the coastal zone will be investigated and areas suitable for designation as “affected areas” determined.

Strategy 2.3.1

Formulate appropriate criteria to identify affected areas and prepare list of potential areas to be declared as affected areas within or adjacent to the coastal zone, through in-depth field investigations and public consultation. declare affected areas as required through *Gazette* notification.

Proposed Actions

1. Prepare appropriate criteria and list of candidate sites to be declared as affected areas.
2. Formulate regulations for administration and management of the affected areas.

Policy 2.4

Creation of additional buffers, reclamation and creation of artificial islands will be recognized as mechanisms to cope with coastal erosion and to minimize development pressures within the coastal zone.

Strategy 2.4.1

Formulate criteria based on technical, ecological, social, economic and political factors to determine suitable areas to create additional buffers, islands and reclamation.

1. Based on the finalized criteria, prepare a list of candidate locations suitable for creation of additional buffers, reclamation and islands.
2. Carry out EIA SEA to identify potential environmental, social and economic impacts and mitigatory measures.
3. Formulate technical guidelines for creating islands and additional buffers.

Policy 2.5

Maintain the natural dynamic behaviour of the islands as they are very fragile geological formations.

Strategy 2.5.1

Ensure that the development activities do not disturb the natural dynamic behaviour at the islands.

Proposed Actions

1. Permit only the developments that do not disturb the sand movement at the islands.
2. Permit/Promote structures that allow sand bypassing through them when planning marine structures.
3. Carry out a comprehensive assessment on the stability the islands that are developing or evolving.
4. Prepare a suitable shoreline management strategy to minimize the impacts on the developing or evolving islands.

Objective 3

Beach stability is ensured by maintaining the sediment budget in the coastal zone.

Policy 3.1

Activities that disturb sand supply to the beach through rivers, streams, dunes etc. will be regulated.

Strategy 3.1.1

Regulation of sand mining in rivers and estuaries by means of guidelines specifying quotas, time and area limits and imposition of monitoring schemes.

Proposed Actions

1. Prepare a strategy for enforcement of the Guidelines for Sand Mining in the Coastal Zone; as well as landward and seaward of the Coastal Zone (including rivers upstream), in collaboration with relevant state organizations/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 Secretariate's officers according to the above strategy.
3. Adhere to guidelines by licensed mining operators.
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 organizations.

Policy 3.2

River sand mining will be alleviated by the promoting 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 Actions

1. CC&CRMD to promote research in collaboration with institutions and relevant administrative bodies to:
 - Identify new technologies that minimize 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 Actions

1. Explore appropriate sources of offshore sand deposits through investigations.
2. 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 organizations, Universities and National organizations funding research, and form a Central database.
3. Carry out a cost benefit study of the use of offshore sand in the construction industry.
4. 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 organizations, media and NGOs, based on available data and results of impact assessments.
5. Liaise with the relevant organizations involved with offshore sand mining and storage to ensure availability of sand to the public.
6. Coordinate inter-agency efforts to provide alternative employment for displaced river sand miners.
7. Encourage Government entities for the usage of offshore sand for public sector constructions.

Policy 3.3.

Beach stability will be enhanced by eradicating sea coral mining.

Strategy 3.3.1

While recognizing the low level of sea coral mining, enforce the ban on sea coral mining more stringently to ensure a total halt.

Proposed Actions

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.

Policy 3.4

Promote conduct of national sand study to determine availability of sources and quantity of sand including off shore sources for construction and other purposes in compliance with the future demand.

Strategy 3.4.1

Launch a programme on the importance of conducting a national sand study in the face of massive economic development taking place in the country and the envisaged economic development targets for next ten years.

Proposed Actions

1. Prepare concept paper highlighting the requirement of conducting a national sand study or any other relevant studies.
2. Launch a national sand study and disseminate findings for policy considerations.
3. Monitor the status of the offshore sites where large-scale sand mining has been carried out in the past to understand the physical and ecological impacts.

Objective 4

Ensure the resilience against impacts of climate change on coastal features, infrastructure and coastal communities.

Policy 4.1

Availability and timely implementation of contingency measures to mitigate impacts of climate change on coastal geography, infrastructure, livelihoods, and coastal communities.

Strategy 4.1.1

Formulate contingency measures through quantifying and monitoring impacts of climate change on sea level rise, coastal erosion, flooding, coastal structures and other coastal developments.

Proposed Actions

1. Collate data from all relevant authorities on climate change parameters such as wind and wave patterns, rainfall, , sea level rise, etc. to predict coastal impacts of sea climate change.
2. Establish a database on climate change features relevant to coastal zone management in collaboration with relevant state organizations.
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.

Policy 4.2

Promote climate change adaptation measures to minimize issues related to possible sea level rise and other repercussions related to climate change impacts on the coastal zone.

Strategy 4.2.1

Implement climate change adaptation strategy as spelt out under the Coastal and Marine Sector of the NDC implementation Plan 2021-2030.

Proposed Actions

1. Attempt to establish a most realistic level of sea level rise.
2. Establish the mid-century and end-century shorelines.
3. Formulate climate change compatible guidelines for coastal development including coastal fisheries and aquaculture in collaboration with relevant agencies.
4. Make the people aware of coastal flooding due to sea level rise through flood risk maps, which would discourage them moving into vulnerable areas.

Objective 5

Coastal community resilience will be adopted as a long term measure to minimize impacts and vulnerability of coastal erosion that may increase due extreme coastal hazards.

Policy 5.1

Make sure the community is aware of the coastal hazard-prone areas which will ensure preparedness and expedite the disaster recovery process.

Strategy 5.1.1

Formulate criteria for identifying hazard-prone areas in the coastal region based on previous events and predictions made through the coastal vulnerability index.

Proposed Actions

1. Identify areas to be designated as coastal hazard prone areas based on the criteria formulated.
2. Make the community aware of the risk
3. Initiate coastal community resilience programme in such areas with the collaboration of relevant state agencies to minimize and bounce back from shocks.
4. Discourage development activities in places such as collapsible coastal cliffs, moving landforms, etc, where the vulnerability is very high and post-disaster recovery is difficult.

REFERENCES

1. Abeyratne S.H.(2023), Unregulated river sand mining in Sri Lanka, A way forward for sustainable river sand mining
2. Byrne G. et al. 2002, Alternative for river sand, Unpublished report CRMP, 2002
3. Byrne, G and Nanayakkara, A. 2002, Alternatives for River Sands, Final Report, unpublished, Coastal Resources Management Project
4. Coast Conservation and Coastal Resources Management Department, 1986, Master Plan for Coastal Erosion Management
5. Coast Conservation and Coastal Resources Management Department, 2004, Revised Coastal Zone Management Plan 2004
6. Coast Conservation and Coastal Resources Management Department, 2014, Preparation of a Shoreline Status Report Covering Effectiveness of Structural and Non-structural Solutions Adopted by Coast Conservation Department since 2004
7. Ministry of Environment (2021), Nationally Determined Contributions (2021-2030)
8. Ministry of Environment Sri Lanka, 2011, Climate Change Vulnerability Data Book
9. Olsen et.al, 1992 “Coastal 2000”; A Resources Management Strategy for Sri Lanka’s Coastal Region.
10. Oppenheimer, M., B.C. Glavovic , J. Hinkel, R. van de Wal, A.K. Magnan, A. Abd- Elgawad, R. Cai, M. Cifuentes-Jara, R.M. DeConto, T. Ghosh, J. Hay, F. Isla, B. Marzeion, B. Meyssignac, and Z. Sebesvari, 2019: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York,
11. Sri Lanka Land Reclamation & Development Corporation, 2013, Quantity of offshore sand pumping for the requirement of construction industry of Sri Lanka from 2004 – 2013 (Internal Records)

CHAPTER 3 - CONSERVATION AND SUSTAINABLE MANAGEMENT OF COASTAL ECOSYSTEMS

3.1 Environmental, Social, and Economic Significance of Coastal Ecosystems

Sri Lanka has a diverse range of coastal ecosystems that include estuaries and lagoons (214,522 ha), mangroves (11,656 ha), seagrass beds (37,137 ha), salt marshes (27,520 ha), coral reefs (not determined) and large extents of beaches including barrier beaches, spits (5,731 ha) and sand dunes (10,363 ha) (Table 3.1 gives the extents of these ecosystems by Districts based on GIS data analysis). Each of these coastal ecosystems possesses a significant number of species and provides an array of ecosystem services vital to humans. In addition to the environmental services, these ecosystems support the livelihoods of the coastal communities in a significant manner to enhance their economic status and maintain social integrity. Many coastal and inshore resources associated with the coastal ecosystems support a developing export industry based on the export of Prawns, Lobsters, Crabs, Beach de mer (Sea Cucumber), Chunks and Shells, and other fishery products which earned over Rupees 24,716 million in 2015 (MFAR 2016).

Coastal ecosystems comprise a rich component of the country's coastal and marine biodiversity. As per the prevailing information, the identified species in marine and coastal waters are over 1,800 pelagic species of fish, 05 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. 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 ecosystems is also believed to be high and of possible economic value. In addition, 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 mollusks, many of which are of commercial value.

The non-extractive value of coastal ecosystems such as coral reefs, mangroves, estuaries/lagoons, and beaches are very high and has considerable economic and aesthetic value. The water bodies of lagoons and estuaries function like buffer zones, protecting coastal communities from the full force of weather-related events, such as storm surges, floods, and cyclones by damping wave action, dissipating river discharge, and temporarily storing water. The ecosystems such as mangroves, sea grass beds, and salt marshes function as large filters to extract pollutants, excess nutrients, and sediment carried out from municipal and industrial wastewater inland and stormwater runoff. (Miththapala, Sriyanie 2013) They are also used for mooring small fishing crafts and 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 communities traditionally use coastal vegetation such as mangroves for various purposes, such as providing food and beverages, timber for house building and boat construction, firewood, material for the preparation of fishing accessories, etc. Many coastal ecosystems, 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 monsoons.

Table 3- 1: Extent of Coastal Ecosystems by District (ha)*

<i>District</i>	<i>Mangroves</i>	<i>Salt Marshes</i>	<i>Dunes</i>	<i>Beaches, Barrier Beaches and Spits</i>	<i>Lagoons and Estuaries</i>	<i>Other Water Bodies</i>	<i>Sea Grasses</i>
Colombo		-	-	-	-	400	-
Kalutara	175	-	-	45	172	105	-
Galle	768	224	-	112	1,259	486	-
Matara	66	-	-	338	-	101	-
Hambantota	793	1,270	1,623	325	1,346	2,213	-

District	Mangroves	Salt Marshes	Dunes	Beaches, Barrier Beaches and Spits	Lagoons and Estuaries	Other Water Bodies	Sea Grasses
Ampara	677	294	607	816	-	-	-
Batticaloa	2071	2781	-	1,093	44,132	2,273	-
Trincomalee	3369	1,365	-	337	18,100	1,192	-
Mullaitivu	824	722	-	717	5,377	352	2,054
Jaffna	2638	4,970	4,590	800	43,872	2,100	21,225
Kilinochchi	2226	5,943	-	872	8,123	76	509
Mannar	1944	5,602	899	215.5	5,144	1,661	13,349
Puttalam	2784	1,557	2,644	328.6	83,581	3,003	-
Gampaha	713	1,274	-	36.7	3,416	-	-
Total Extent	19758	27,520	10,363	5,731.6	214,522	13,062	37,137

Source: 1. Synthesis report on coastal habitats (2014): 2. Premakantha K.T et al., *The Sri Lanka Forester*, Vol.41, 2022, 01-12

3.1.1 Coastal Ecosystems

Coral reefs are among the most diverse ecosystems on Earth, hosting a wide variety of marine life, including fish, invertebrates, and algae. They provide habitat and breeding grounds for numerous species, many of which are commercially valuable for fishing and tourism. Protecting these reefs helps maintain biodiversity and the overall health of the marine ecosystem.

Conserving coral reefs in the country is vital for the well-being of the environment, economy, and local communities. Conservation efforts are essential to ensure the sustainability of these ecosystems and the benefits they provide to current and future generations.

* Coral Reefs

Coral reefs in Sri Lanka are categorized into three habitat types. They are (a) true coral reefs consisting of live corals as well as calcareous substances, (b) sandstone reefs, and (c) rocky reefs. The latter two reef types may also be covered by corals to varying degrees. All three ecosystems are distinctly different but may be found mixed together (*Rajasooriya and White 1995*). More than 200 species of stony corals and 900 species of reef-associated fish have been documented in Sri Lanka. In addition, nine main habitual reef-building coral families were also reported. It is also found that around 70% of total marine fish production comes from coastal waters and reef habitats (*Perera N, 2019*)

The condition of the reef, mainly combined with substrate cover, diversity, and abundance of reef organisms, indicates that the best reefs are associated with the barrier-type reefs located offshore. These reefs are found mainly in North Western, South Eastern, and Eastern waters. The most extensive coral reefs in Sri Lanka are the patchy coral reefs in the North Western 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 South Western, Eastern, and Northern coasts also contain fringing coral reefs adjacent to the shore, growing from the sea floor usually on a nucleus of rock. It has been estimated that about 2 % of the coastline contains fringing coral reefs. *Hikkaduwa*, *Unawatuna* and *Rumassala* are some of the main fringing reefs along the South Western coast and *Passikudah* is one of the known fringing reefs on the Eastern coast. Coral reefs also occur around the Jaffna Peninsula - mainly around the small coastal islets, but they are not extensively developed. 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*. 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 on the West Coast to the Southern areas of the Trincomalee District in the North East.

The coral cover in the reefs located in the Southern part of the island is extremely low when compared to the reefs located in the Eastern and the Northern part mainly due to the external impacts. Destructive fishing practices including, bottom set netting, stepping, dynamiting, coir industry, glass bottom boat maneuvering, destructive fisheries activities, and excess sediment and freshwater influx are the major causes responsible for the degraded situation on the Southern coast (*Synthesis Report on Coastal Habitat 2014*). However, current information revealed that the live coral cover at *Hikkaduwa* National Park had increased from 12 % in 2005 to 26 % in 2007 mainly due to rapid settlement and growth of *Pocillopora damicornis*, which had risen from 6 % of the total live coral cover in 2004 to 35 % in 2007. It is also reported that the present cover of *Acropora* was only 0.6 % due to a high level of sedimentation (Rajasooriya 2008). The live coral cover at *Kapparatota* also decreased from 52 % in 2004 to 22 % in 2006. As per the current information it was reported that live coral cover at *Polhena* is confined to 21.2 % while 6.45 % at *Madiha* due to anthropogenic activities such as coconut retting, ornamental fish collection and reef walking (*Synthesis Report on Coastal Habitat 2014*).

The Synthesis Report on Coastal Habitats 2014 indicates that the coral reefs located in the Northern and Eastern parts of the country are in better condition compared to the Southern part of the country. It was reported that live coral cover at Punkudativu and Mandativu Island in the Jaffna Peninsula was 45 % with 29 % of limestone substrate (*Synthesis Report on Coastal Habitats 2014*). The condition of the coral reef in Dutch Bay in Trincomalee is reported as relatively in good condition and constitutes of branching *Acropora* spp., foliose *Monitipora*, and *Echinopora lamellose*. According to the previous monitoring reports, the live coral cover of this reef was 52 % and 20 % coral rubble. As a result of the 2004 tsunami, the reef sustained extensive damages and currently supports 38.8 % live hard corals with 40.23 % rubble cover. The shallow coral reef at Pigeon Island in Trincomalee is dominated by branching and tabulated *Acropora* spp and no damages were reported due to the 2004 tsunami. Thus, the live coral cover of 54.38 % in 2003 has been increased to 74.25 % by 2005. According to the monitoring studies carried out by NARA, the live hard coral cover has increased from 40 % in 2004 to 70 % in early 2007 in the Bar Reef Marine Sanctuary at *Kalpitiya*. This increase is mainly due to the rapid growth of *Acropora Cytherea*, which constitutes more than 75 % of the live hard corals.

* Sea Grass Beds

Sea grass are flowering plants that thrive in shallow oceanic and estuarine waters and are descendants of terrestrial plants that re-entered the ocean between 100 and 65 million years ago. They have leaves, stems, rhizomes and roots. Sea grass beds often occur in sheltered waters combined with coral reef ecosystems or estuaries and lagoons.

Sri Lanka's coastal waters have extensive seagrass beds, often occurring in association with coral reef ecosystems or estuaries and lagoons. They are particularly found in the basin estuaries and lagoons of Puttalam, Mundal, Negombo, Mawella, Rekawa, Koggala, Kokilai, Jaffna and Batticaloa. A total of 16 seagrass species belonging to 10 genera have been reported from Puttalam Negombo, Mundal and Rekawa lagoons. Extensive sea grass beds have been reported from the Dutch Bay (in Kalpitiya) to the Western end of the Jaffna Peninsula and from Mannar to the North West across the Palk Bay and to Rameswaram Island on the Indian coast (Samarakoon and Pinto 1988). However, the distribution of sea grasses along the coast from North East to South East is limited and no records are available. Thus, it is difficult to get a clear picture of the total composition and distribution of sea grasses in the coastal zone of Sri Lanka. However, the extent of seagrass beds in Sri Lanka has been reported as 23,819 ha (Gunathilleke et al in 2008).

Seagrass, the marine angiosperms, are considered to be among the most productive submerged ecosystems. They serve as a source of energy for a complex food web, provide ecosystems for endangered dugong (Dugong dugong)

and other aquatic organisms including epiphytes to consolidate sediment, produce detritus, and are a source of dissolved and particulate organic carbon for the aquatic food webs. In addition, they also serve as nursery functions for a large number of fish, crustaceans and bivalves that use these ecosystems as a refuge, particularly in the larval stage of their life cycles that are vulnerable to sudden environmental changes and susceptibility to predation (Silva EIL et. al 2013). In Sri Lanka, Bristle worms (Polychaetes) are harvested from seagrass beds as brood stock for feed aquaculture. In addition to temperature, light, and nutrients, sheltered zone with substrates constituted of sand mud, and dead, are corals ideal for the dense growth of seagrasses that are rich in species diversity. Seagrass also acts as a filter for coastal waters and stabilizes the floor of the coastal seas. In addition, seagrass absorbs carbon dioxide from the ocean when they photosynthesize (Miththapala, S, 2008).

Sea grass beds are subjected to various threats due to anthropogenic activities such as destructive fishing practices, collection of invertebrates or shellfish harvesting, construction of physical structures, altering tidal influx, intrusion of agrochemicals, the emergence of macro-algal stands, regulation of water inflows, effluent discharges from shrimp farms and solid waste disposal. **Table 3-2** shows sea grass species from different coastal sectors in Sri Lanka.

Table 3- 2: Sea Grass Species from Different Coastal Sectors in Sri Lanka

<i>Species</i>	<i>North</i>	<i>South</i>	<i>West</i>	<i>North West</i>
<i>Cymodocea rotundata</i>	x			x
<i>Cymodocea serrulata</i>	x			x
<i>Enhalus acoroides</i>	x			x
<i>Halodule pinifolia</i>	x			
<i>Halodule uninervis</i>	x			x
<i>Halophila beccarii</i>			x	
<i>Halophila decipien</i>		x		x
<i>Halophila minor</i>			x	
<i>Halophila ovalis</i>		x	x	x
<i>Halophila ovata</i>	x	x		
<i>Potamogeton pectinatus</i>		x	x	
<i>Naja marina</i>		x		
<i>Ruppia maritima</i>	x	x	x	
<i>Siringodium isoetifolium</i>	x		x	x
<i>Thalassia hemprichii</i>			x	x
<i>Sostrea sp</i>		x		
Total	8	7	7	8

*** Estuaries and Lagoons**

A coastal lagoon is a shallow coastal body of water, separated from the ocean by a barrier; this barrier can be formed by a coral reef, a barrier island, a sand bar or a spit, shingle or less frequently rocks. An estuary is a point at which a river and the sea meet. Estuaries are therefore a dynamic ecosystem where seawater is brought in by the tides but is diluted by freshwater flowing in from rivers and streams

Sri Lanka's coastline is characterized by a series of estuaries and lagoons, which are transitional ecosystems of diverse tropic statuses, scenic beauties, rich rare and endemic species, aquatic biodiversity, and ecosystem productivity. They are complex socio-ecological systems containing a diversity of species and a variety of coastal ecosystems including mangroves, salt marshes, sea grass beds and mud flats. The heterogeneous nature and complexities of lagoons and estuaries are primarily determined by geomorphology, climate and weather, tidal fluxes and fluvial inputs and cohesive interactions with land-based activities (Silva E.I.L et. al 2013). By and large, the range of ecosystem services provided by the lagoons and estuaries are undervalued and their multiple use and benefits have not been adequately taken into consideration policy formulation and decision-making process. Besides the primary features, the knowledge of the ecological significance of the lagoon and estuaries are negligible. A total of 82 lagoons with a shoreline (perimeter) of 2,791 km are located in the coastal region and are considered to be highly productive and contain economic value associated with the biological production of aquatic and semi aquatic habitat and mangrove vegetation. A meaningful approach to the management of barrier-built estuaries and lagoons must combine bio-physical, socio-economic and political considerations. Therefore, estuaries and lagoons are regarded as Socio-Ecological Systems (SES), (Samarakoon et al. (2012).

Table 3- 3: Number of Lagoons located in each Coastal Region

<i>Coastal Region</i>	<i>Lagoon Area (sq.km)</i>	<i>Lagoon Perimeter (km)</i>	<i>Number of Lagoons</i>
North	804	1,221	17
Northeast	182	411	04
East	44	174	14
Southeast	29	149	16
South	23	109	10
Southwest	20	166	09
West	46	151	03
Northwest	372	410	09
Total	1,520	2,791	82

Source: Silva E.I.L et. al 2013

There are two different types of estuaries; riverine estuaries where the rivers or streams discharge directly into the sea through relatively narrow channels (e.g. the Kelani Ganga, Maha Oya, Kalu Ganga and Nilwala Ganga estuaries) and barrier built 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 in to a bay that opens to the sea (e.g. the Kala Oya riverine estuary opens to Dutch Bay, the Mahaweli estuary opens to Koddigar and Thambalagam Bays, and the Polatu Modara estuary to Weligama 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. There are around 89 lagoons ranging from 03 ha to 7,589 ha in extent, of which 08 cover more than 1,000 ha each. Total extent of lagoons amounts to about 36,000 ha. Lagoons are more abundant along the North, South, South Eastern 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.

* Salt Marshes

Salt marshes are found close to the landward margin of the inter-tidal zone where the soil salinity is relatively high due to insufficient fresh water supply to flush out the accumulated salts. Salt marshes consist of herbaceous, salt resistant plants growing in sandy or mud tidal flats in arid areas and are periodically inundated by the sea.

The existing information revealed that there are around 27,520 ha of salt marshes in the country (Synthesis Report on Coastal Habitats 2014). 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.

* Mangroves

Mangroves are woody, seed-bearing, highly specialized plants ranging in size from shrubs to tall trees. These shrubs and trees are adapted to grow in intertidal zones of lagoons, estuaries and sheltered bays in tropical and some sub-tropical regions in the world. Mangrove ecosystems consist of intertidal zones of muddy shores in bays, lagoons and estuaries dominated by highly adapted woody halophytes associated with continuous watercourses, swamps and backwaters, together with their population of plants and animals.

Mangroves are highly productive but extremely vulnerable ecosystems confined to intertidal zones of coastal environments including lagoons. According to Premakantha K.T et.al (2022) Sri Lanka's mangrove areas amounted to about 19,758 ha and largest tract of mangroves are found in Puttalam Lagoon, the Kala Oya basin and Trincomalee (Sri Lanka Forester 2022). 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 01 km landwards from the Mean Low Water Tidal Level, they may spread up-river 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). In addition to the tacit value and environmental services rendered by mangroves, it supports the depending communities by providing fish resources, fuel wood, building materials and dyes for coloration of fishnets. (Silva, E.I.L at el 2013). Mangroves serve to reduce the effects of floods while functioning as filters to sift out pollutants that reach the coastal area from inland and trap sediments. It is also important in carbon sequestration.

The major mangrove areas in Sri Lanka are located around Jaffna, Vadamarachchi (Thondamanar) Lagoons, Kokilai, Nayar, Nanthikadal Lagoons, Trincomalee, Kathiraveli, Upparu Lagoon, Valachchenai, Batticaloa Lagoon, Pothuvil (Eastern Coast), Weligama, Gintota, Balapitiya, Bentota (Southern Coast), Panadura Estuary, Negombo and Chilaw Lagoons, Mundal Lake, Puttalam Lagoon, Dutch Bay, Portugal Bay and Mannar (Western and North Western Coast). Although the records of true mangrove species are inconsistent 22 mangrove species have been identified. This amount reflects, one third of the world's mangrove species. Among identified species, most dominant are *Avicennia marina*, *Lumnitzera racemosa*, *Rhizophora mucronata* and *Excoecaria agallocha*. (Sri Lanka Forester 2022).

* Barrier Beaches, Spits and Dunes

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. Spits are incipient barrier beaches that projects from the shore in the direction of the dominant drift and are free at one end. Sand Dunes are wind-blown accumulation of sand, which are distinctive from adjacent landforms such as beaches and tidal flats mainly due to the fact that dunes do not get the effects of tides.

Sri Lanka's wide and sandy beaches along much of the 1,620 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.

* Barrier Beaches

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 South Western Coast. Along the Southern Coast, there is a barrier beach at Weligam Ba, and several between Dondra and Ambalantota. Thambalagam Bay, a westward embankment of Koddigar Bay, is almost entirely cut off as a barrier beach, which is partially breached during the North East Monsoon. Some barrier beaches are free at both ends and form islands (e.g. at Karaitivu).

* Spits

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 05 km to the South. 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).

* Dunes

Coastal dunes are unique terrestrial ecosystems located in the transition zone between the ocean and the continent. These habitats ecosystems are naturally dynamic and, therefore, highly fragile and vulnerable to the impacts of human-induced activities.

There are three types of dunes that have been identified in the country. They are:

- * Low, flat to slightly undulating, isolated platforms of sand less than 01 m in height (e.g. incipient dunes found at Koggala, Matara, Akuralla and Uswetakeiyawa)
- * Transverse primary dunes, consisting of single fore-dune ridges of undulating sand masses associated with stable beaches, exceeding 05 m in height (e.g. dunes at Mannar, Pooneryn, Kalpitiya and along the South Eastern Coast)
- * Secondary transgressive dunes, usually exceeding 03 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 North Eastern, North Western and South Eastern Coasts of Sri Lanka. These extend from Mullaitivu and Point Pedro, Elephant Pass and Chavakachcheri across Mannar Island towards Kalpitiya and Ambakandawila. On the South East, 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.

Sand dunes in Sri Lanka are essential components of the coastal vistas and bio-diversity. The materials in sand dunes protect the land behind them from storm erosion and potential sea level rise. Dune vegetation also traps sand and prevent it from being blown further inland. When there are storm surges and waves, sand dunes prevent flooding inland. According to prevailing information, intact sand dunes were the most effective barrier against tsunami waves that affected the coastal region of Sri Lanka in 2004 (Bambaradeniya et al. 2006).

3.2 PRESENT STATUS OF COASTAL ECOSYSTEMS

Despite the management measures adopted by government, non-government and civil organizations in the country, a significant amount of coastal ecosystems in Sri Lanka have undergone degradation in different degrees in different

locations in the past resulting in the decline of their resources as well as extents at an unprecedented rate. Underlying the apparent degradation of coastal ecosystems 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. These factors could be categorized into three types. Firstly, the quality and quantity of coastal ecosystems have been degraded due to over-exploitation parallel to population growth in the coastal region, for the purpose of economic benefits. Secondly, natural chronic and episodic disasters such as coastal erosion, cyclones (1978) tsunami (2004) and “ElNino” Southern Oscillation effect (1998) directly created a negative impact on most of the coastal ecosystems located within the coastal region. Thirdly, the thirty-year conflict situation that prevailed in the country until 2009 caused much damage to some of the coastal ecosystems, especially in the North and the Eastern Coastal Region.

3.2.1 Issues and Threats

• Damage and Destruction of Coral Reefs

The value of environmental services of coral reefs in providing benefits to society is very significant and identified as the most valuable shallow water marine ecosystems in Sri Lanka. However, these reefs are now degraded at many sites, due to both natural causes and human impacts. The degraded reef ecosystem can be seen especially in the near-shore areas of Western and Southern coastal segments. Prior to the tsunami event experienced in 2004, the principal cause for coral reef destruction was the large-scale mining of corals for the lime industry. This is despite the ban imposed in 1988 on mining, collecting, transporting and processing of sea coral. The available data show a perceptible decline of sea coral mining between 1984 and 1998. After the tsunami event, the mining of sea corals for the lime industry in the South and South Western coastal regions tremendously decreased to a negligible level. Apart from the regulatory measures, public awareness and monitoring procedures implemented by the Coast Conservation and Coastal Resources Management Department as well as self-realization of the importance of coral reefs among the coastal communities led to this situation.

The nature and main causes of coral reef degradation has been changed overtime and other factors have been appeared as main factors contributing to damage coral reefs at present. Among these factors, the use of destructive fishing methods such as the use of dynamite, the use of Moxys nets to catch ornamental fish, and bottom set nets on coral reefs to catch lobsters have been reported. Similarly, the use of unregulated fishing gear such as “surukku” and “lyila” nets also reduced valuable and rare fish species inhabiting the reefs. Moreover, coral reefs are damaged due to sedimentation, pollution and tourism related activities.

The growth of the coastal tourist industry has also, directly and indirectly, caused damage to the coral reefs, particularly those in the Southern, North Western and Eastern coastal areas. Direct habitat loss or damage was evident in these areas due to stepping on the reef, placing anchors on coral reef areas, 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 sewage disposal systems related to tourist facilities, inadequate or poorly designed infrastructure are quite evident in these areas.

Beside human interventions, coral destruction in most shallow areas was evident in 1998 due to mass bleaching caused by high water temperature associated with ‘El Nino’ Southern Oscillation (ENSO) effect in many areas. In recent years, El Nino events have become more frequent, with the interval reducing from 12 years to 07 years although the time frame is too short to confirm this trend. As per the prevailing records, there were somewhat significant bleaching events that occurred in 2000, 2002, 2003 and 2005 in various parts of the country but not on the scale of 1998. However, the magnitude of the bleaching event that occurred in 2002 in the Southern part of the island was similar to the 1998 bleaching event (Synthesis Report 2014). In addition, proliferation in plagues of coral predators such as crown of thorns starfish (*Acanthaster planci*) also damaged the coral reefs significantly. Such plagues are increasingly reported close to large human populations, where there is evidence of over fishing and/or increases in nutrient runoff from the land. There are more reports of damage to coral reefs from the predatory gastropod mollusk, *Drupella*. Beside predators, some of the major reefs were observed with massive algal growth (*halimeda* Sp) especially in Pigeon Island and Polhena Reefs. The spreading of invasive species is now being recognized as a major potential threat to the ecological balance of the coral reef. The invasive species, which have damaged reefs in the Western part of the country, are suspected of being introduced *via* the ballast water or hulls of

cargo ships or from the ill-informed release of aquarium specimens (Synthesis Report on Coastal Habitats 2014).
The local drivers of reef degradation and spatial distribution of live coral cover is depicted in Table 3-4 and 3-5

Table 3- 4: The Local drivers of Coral reef degradation

<i>Region</i>	<i>Local Drivers</i>	<i>Magnitude of destruction</i>
North Western		
Silavaturai, Arippu, Vankalai and Bar Reef	Destructive fishing	High/Very high
	Netting on reefs	High
	Sedimentation	Low
	Over fishing	Very high
	Sea cucumber and chank collection	Very high
	Tourism/recretaion	Low
	Pollution	Moderate
Eastern Region		
Passikudah, Kalkudah, Punnaikudah, Kayankerni, Pigeon Island, Kuchchaveli	Destructive fishing	Moderate
	Netting on reefs	Moderate
	Sedimentation	Moderate
	fishing	Moderate
	Sea Cucumber/chank collection	High
	Tourism/recreational	High
	Pollution	High
Northern Region		
Point Pedro, Inbarsitty Thondamanaru, Valithoondal, Karainagar Pungudativu ,Kayts, Delft	Destructive fishing	High
	Netting on reefs	Moderate
	Sedimentation	Low
	fishing	
	Sea Cucumber/chank collection	High
	Tourism/recreational	Low
	Pollution	Low
Southern Region		
Hikkaduwa, Rumassala Weligama, Mirissa Polhena	Destructive fishing	High
	Netting on reefs	Moderate
	Sedimentation	High
	fishing	
	Sea Cucumber/chank collection	Low
	Tourism/recreational	High
	Pollution	High

Source: Concept Note, Based on 1). Global Fund for Coral Reefs IUCN 2023 2) Arulanathan et.al 2021 3) Perera N 2019

Table 3- 5: The Spatial distribution of Live Coral Cover in the Coastal Regions

<i>Coastal Region</i>	<i>Location</i>	<i>Live Coral Cover%</i>
Southern Region (2014)	Hikkaduwa	19.6
	Rumassala	
	Weligama	64%
	Mirissa	50%
	Polhena	21.5
Eastern Region (2020)	Kayankerni,	38%
	Passikudah,	21%
	Pigeon island,	59%
	Adukkuparu,	12%
	Parrot rock reefs	70%
Northern Region (2021)	Point Pedro	55%
	Inbarsitty	45%
	Thondamanaru	46%
	Valithoondal	43%
	Karainagar	25%
	Pungudativu	40%
	Kayts	25%
	Delft	15%

Source: 1. Ramawickrama N W et al. (2020) 2. Arulananthan A et al. (2021)

• Degradation of Lagoon and Estuarine Ecosystems

The Lagoons and estuaries are valuable coastal ecosystems in Sri Lanka that act as economic drivers by providing sources of income for the fisher communities, contained rich bio-diversity and provided anchoring facilities for the fishing crafts. For example, the yearly earnings from fisheries in three most productive barriers-built estuaries, Negombo, Puttalam and Batticaloa alone exceed two billion Rupees (Samarakoon J, at el 2012). However, the lagoons and estuaries and the biodiversity they contained are under heavy stress and confronted profound changes due to population growth in the coastal region, pollution due to the inflow of sewage, untreated industrial effluents, urban wastes and waste oil, spreading of invasive plant species and climate change repercussions. In the North Western coastal belt, lagoons and estuaries are polluted due to discharges from shrimp farms. Some of the lagoons/estuaries are degraded by coconut husk retting (e.g. Madu Ganga Estuary, Bolgoda Estuary), sand mining and anchoring of fishing crafts. 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 *Salviniamolesta*. These ecosystems are also affected by indiscriminate harvesting of commercially important species.

Other issues connected with these ecosystems are the loss of functional lagoon/estuarine water areas due to unauthorized encroachment and land reclamation (e.g. Bolgoda and Negombo Estuaries and Mawella and Lunawa Lagoons). There has also been a 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 the 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.

In general, the resources in the majority of the lagoons in Sri Lanka remain either satisfactory, somewhat good or very good status. Lagoon resources in the Mannar District are reported to be in a better condition than the lagoons in other coastal districts. However, lagoon resources in the Hambantota, Colombo and Galle Districts have been categorized as “bad” or very bad” (Silva E.I.L. at el 2013).

- **Damage to Sea Grass Beds and Seaweeds**

The current information on the status of sea grass beds in Sri Lanka has not been updated in the recent past. However, as per the existing information, the sea grass beds in lagoons and around the coral reefs are often damaged due to destructive fish harvesting techniques. Trampling or using fishing gear that rakes up sea grass are also damaging. Push nets and drag nets cause immense damage to sea grass meadows in coastal wetlands (Miththapala. S, 2008). In Sri Lanka, large-scale commercial trawling and drift netting over the sea grass beds that occur between Puttalam and Jaffna and beach seining in certain sections of the coastline also affect sea grass beds. The reported mass-scale poaching in the form of trawling operations by Indian fishermen in the Northern coastal waters also created severe damage to the sea grass beds. In certain areas, commercial polychaete harvesting as brood stock feed for shrimp hatcheries also causes severe damage to sea grass beds (e.g. Negombo and Chilaw Estuaries). Other adverse impacts are from siltation resulting from offshore sand mining, 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 sea grass beds. Damage to sea grass beds in Sri Lanka due to 2004 tsunami has been reported as a minor incident (FAO 2007). In addition, higher water temperatures related to climate change also will directly effect on the growth, reproduction and general metabolism of sea grasses (Miththapala. S, 2008).

- **Damage and Destruction of Mangrove Areas**

The mangrove ecosystems are currently gradually threatened by numerous anthropogenic activities. These include deforestation, encroachment, conversion of mangrove ecosystems to human settlements, aquaculture projects, land reclamation and tourism related projects.

In the recent past, a substantial damage to the mangrove swamps, especially those located in the Northern and Western Provinces in the country has been caused by the conversion of large extent of mangrove areas to shrimp farms and salterns. In addition, lowland agriculture, housing construction and expansion of human settlements also contributed in a significant manner to damage the mangrove areas. The mangroves associated with Negombo Lagoon environment diminished to 253 ha in 2010 indicating loss of nearly 100 ha over a period of 20 years, due to man induced causes (Kasige at el 2012, EML). In the North Western Province, loss of mangroves occurred primarily because of the expansion of shrimp farms, but smaller-scale losses have also taken place due to the expansion of human settlements and industries. By and large, there has been a significant reduction in the mangrove cover between 1986 and 2009, largely due to human interventions. There is also an overuse of mangrove resources. For example, the extraction of poles and wood for domestic use and twigs for brush pile fishery is beyond sustainable levels. Mangrove ecosystems are also degraded by water pollution and siltation. In addition to man-induced causes, natural causes such as tsunamis and the spreading of invasive species also damaged the mangroves in the recent past. As a result of the 2004 tsunami event, large patches of mangroves have been destroyed in Valachenai, Akkaraipattu, Sallitivu, Vaharai and Panama coastal segments. Invasive alien species such as *Annona glabera*, *Typha angustifolia*, *Salvinia molesta*, *Pistia stratiotis* and *Naja marina* also created a negative impact on the mangrove ecosystems (Synthesis Report on Coastal Habitats, 2014).

A several government and non-government organizations including, Department of Forest, Coast Conservation and Coastal Resource Management Department are involved in rehabilitation and restoration programmes for a long period, majority of the planting attempts have been failed and urge to protect existing mangrove forests (Sri Lanka Forester 2022). Accordingly, by 2019, seventeen mangrove forests had been declared by the DFC while twelve declared by the DWC.

- **Destruction of Salt Marshes**

Salt marshes mainly occur in regions where the dry season is prolonged as in the North, North West, North East and South East of the country. Salt marshes provide many vital ecological functions including resting and feeding

areas for migrant and resident wildlife (Synthesis Report on Coastal Habitats 2014). The salt marshes have been reduced quite considerably in the Puttalam District where they have been converted for establishing shrimp farms and salterns. It is reported that the extent converted was nearly 2,960 ha between 1986 and 2002. Dayaratna et al 1997 reported that about 50 % of the salt marshes around the Puttalam Lagoon area have been lost within a - 10 year period (1981-1992) largely on account of shrimp farms. The salt marshes located in the Eastern Province have been subjected to pollution from wastewater, chemicals from agriculture and industrial activities, sewage and solid waste (Synthesis Report on Coastal Habitats 2014).

The salt marshes located in the Northern Region, especially in the Mannar District were unaffected during the last three decades due to the conflict situation that prevailed in the areas. Unlike the other coastal ecosystems, the absence of proper environmental valuation of the salt marshes has created an ambiguous status about the usage.

• **Degradation of Sand Dunes, Barrier Beaches and Sand Spits**

The degradation of sand dunes, barrier beaches and sand spits in Sri Lanka is mainly due to encroachments for the construction of dwellings, expansion of human settlements, siting of hotels and related infrastructure and transformation to agricultural lands for cultivation of coconut, chili, onion and other crops. Consequently, the littoral woodland zone, which typically 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 impacts of floods, tsunami (2004) cyclones and 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 for 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. (This may also adversely affect other coastal ecosystems such as coral reefs and sea grasses). In some coastal areas (e.g. Batticaloa and Hambantota Districts), exotic plant species have been introduced for beach and dune stabilization and concerns have been expressed of their adverse effects. The main beaches along the Southern Coast from Kosgoda to Palatupana, Palaitivu Islands on the Northern Coast and Arugam Bay on the Eastern Coast provide nesting sites for five turtle species that come ashore for nesting. These ecosystems are getting degraded at a rapid rate due to indiscriminate allocation of land for the construction of hotels, the proliferation of slums and shanties, incorrect siting of tourist facilities and ribbon development.

3.2.2 Climate Change Repercussions and Importance of conserving coastal ecosystems

The coastal environment and its ecosystems are changing more rapidly and more broadly in the country than ever before due to both human-induced and natural causes. Climate change-related factors have been identified as major potential factors leading to changes in the composition, biodiversity and quality of coastal ecosystems. The climate change repercussions could be clearly seen from the nature and extent of the sensitive and fragile coastal ecosystems such as coral reefs and Sea grass beds exist today.

Despite potential stress due to climate change, conserving coral reefs, sea grass beds, mangroves and other coastal ecosystems is of paramount importance in confronting climate change challenges for several reasons;

- **Carbon Sequestration:** Coastal ecosystems such as mangroves and seagrass beds are highly effective at sequestering carbon dioxide from the atmosphere. They store large amounts of carbon in their biomass and sediment, helping to mitigate climate change by reducing greenhouse gas concentrations.
- **Coastal Protection:** Coral reefs, mangroves, and seagrass beds serve as natural barriers against coastal erosion and storm surges. They help protect coastal communities from the increasing frequency and intensity of extreme weather events associated with climate change.
- **Biodiversity Hotspots:** These ecosystems are home to a diverse range of plant and animal species. Preserving their biodiversity is crucial for maintaining the resilience of ecosystems and ensuring the survival of numerous species, some of which may be essential to human food security and livelihoods.

- **Fisheries and Livelihoods:** Coastal ecosystems support fisheries by providing breeding grounds and habitat for fish and other marine species. Many coastal communities rely on these ecosystems for their livelihoods and sustenance. The decline of these habitats can lead to reduced fish stocks and economic hardships for coastal populations.
- **Tourism and Recreation:** Coral reefs, in particular, attract tourists from around the world. They contribute significantly to the tourism industry, which is vital for the economy. As these ecosystems degrade, so does their attractiveness to tourists, impacting local economies.
- **Water Quality and Nutrient Cycling:** Mangroves and seagrass beds help improve water quality by filtering pollutants and trapping sediments. They also play a role in nutrient cycling, which is essential for maintaining the health of coastal waters.
- **Adaptation to Sea-Level Rise:** Coastal ecosystems can adapt to rising sea levels by building up their own elevation through sedimentation and root growth. They provide a natural means of adapting to the impacts of sea-level rise, helping to protect coastal communities and infrastructure.
- **Resilience to Ocean Acidification:** Coral reefs, although vulnerable to ocean acidification, can benefit from improved water quality and reduced stressors when other coastal ecosystems are conserved. This can enhance their resilience to changing ocean conditions.
- **Scientific Research:** These ecosystems are valuable sites for scientific research, providing insights into the impacts of climate change on marine ecosystems and potential mitigation strategies.
- **Cultural and Spiritual Significance:** Many coastal communities have deep cultural and spiritual connections to these ecosystems. Preserving them is essential for maintaining cultural heritage and the well-being of these communities.

3.2.3 Undervalued Coastal Ecosystems

The actual economic values of the coastal ecosystems are not comprehensively estimated yet. Thus, there is a tendency to underestimate the total economic value of the coastal ecosystems when siting development activities within the Coastal Zone. Given the rapid development taking place in the coastal region in the areas of road development, commercial and fisheries harbour development, reclamation and island development, and coastal tourism, it is important to incorporate environmental valuation in the decision-making process. In this respect, attention has to be carefully paid on potential ecosystem services, including carbon sequestration, coastal protection, fisheries support, tourism revenue, and cultural significance.

3.2.4 Conservation and Sustainable Development

The aftermath of the 2004 tsunami and the thirty years of the conflict situation that prevailed in the country, the requirement of rapid economic development, the enhancement of the per capita income level was considered the most priority condition. Hence, the GOSL has planned development of five economic hubs, where two hubs namely maritime and tourism are located in the coastal region. With the major development thrust directed on coastal region, negative impacts on the coastal habitats are inevitable. Thus, the balancing of conservation needs with the economic development requirements have to be carried out in a more realistic manner emphasizing total economic value of the coastal ecosystems. In compliance with the current economic attempt being applied by the GOSL on skipping from the middle-income trap, much emphasis has to be placed on conservation needs and mitigatory measures, when using the coastal areas.

3.3 ADDRESSING ECOSYSTEM CONSERVATION

3.3.1 Policies, Plans, Laws and Institutional Arrangements

Current rate of depletion and degradation of coastal ecosystems in the country highlights the requirement of conservation and adaptive management. The management of coastal ecosystems in a comprehensive and holistic

manner was initiated by the CC&CRMD through the formulation and implementation of Coastal Zone Management Plans of 1990, 1997, 2004 and 2018. The policy arena with respect to ecosystem management initiatives was further strengthened through “Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka’s Coastal Region” produced in 1992. These initiatives led to the formulation and adoption of several management strategies covering regulation, education and awareness creation, planning and policy development, monitoring, research and coordination. Conservation of coastal and marine ecosystems and their biodiversity are also addressed in the National Biodiversity Conservation Action Plan implemented by the Ministry of Environment and Natural Resources. The legal provisions in the Coast Conservation Act No 57 of 1981 and its subsequent amendments No: 64 of 1988 and No.49 of 2011 also promote the conservation of coastal ecosystems through regulatory measures. The expansion of the legally defined Coastal Zone through the 2011 amendments to the Act covering the riparian land of the coastal water bodies has placed more emphasis on conserving the coastal ecosystems through the regulatory process.

The National Strategy and Action Plan published by the IUCN, Sri Lanka Office for the National Steering Committee of the “Mangrove for the Future” Programme, Sri Lanka, proposes an eco-system based on integrated Coastal Management in Sri Lanka. This is based on an evaluation of the 30-year record of coastal management in Sri Lanka, and postulates, “a more systematic approach is perceived to be imperative”. Whilst some of the recommendations that can be accommodated within the current legal mandate of the CC&CRMD have been included in this plan, a shift to ecosystem-based integrated coastal management would require a major reorientation of the CC&CRM Act which would in turn depend on the official acceptance of the proposed strategy and action plan at the highest levels of policy-making.

Table 3- 6: Key Management Strategies of CC&CRMD for Coastal Ecosystem Conservation

Regulatory	<ul style="list-style-type: none"> • Banning of all activities pertaining to sea coralmining • Permits from CC&CRMD made mandatory for all development activities in the Coastal Zone • Expansion of Coastal Zone covering riparian land of the coastal water bodies • Legal provisions introduced to declare “Conservation Areas” And “Affected Areas”
Education and Awareness	<ul style="list-style-type: none"> • Dissemination of knowledge through printed materials on the value of coastal ecosystems and issues pertaining to them • Inclusion of facts about problems affecting coastal ecosystems into the secondary school curriculum • Conducting awareness programmes on different coastal ecosystems for school children, teachers and key stakeholders.
Planning and Policy Development	<ul style="list-style-type: none"> • Conservation of coastal ecosystems through Special Management Area (SMA) Plans in selected sites • Institutionalization of SMA process
Monitoring	<ul style="list-style-type: none"> • Implementing a monitoring programme on coral and sand mining
Research	<ul style="list-style-type: none"> • Supporting research on coral reefs and mangroves
Co-ordination	<ul style="list-style-type: none"> • At the national level: Coast Conservation Advisory Council • At the local level: The Coast Conservation and Coastal Resource Management Coordinating Committee, Steering Committees and SMA Community Coordinating Committees (CCCs) • Supported through other organizations.

Source: CC&CRMD 2023

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 ecosystems. The CC&CRMD, Ministry of Fisheries and Aquatic Resources, Ministry of Environment, Department of Wildlife Conservation (DWLC), Forest Department, National Aquatic Resources Research and Development Agency (NARA), Central Environmental Authority (CEA), Marine Environment Protection Agency (MEPA) and the Urban Development Authority (UDA) are among such agencies. Each has a specific role to play in the conservation and management of various coastal ecosystems. In addition, the coastal Provincial Councils also should play a key role in managing coastal ecosystems in their respective provinces. The activities of the Irrigation and Agriculture Departments also have major impacts on coastal ecosystems, as do the activities of the respective Provincial Councils, Pradeshiya Sabhas and Divisional Secretariat Offices.

3.3.3 Future Trends in Management Practices

Attempts at adopting an integrated approach to management of coastal ecosystems in the past indicated a need for closer co-ordination among institutions that have jurisdiction over various coastal resources. Future strategies for conservation and rational management of coastal ecosystems should take due cognizance of the constraints encountered in the past. The management measures adopted by the CC&CRMD in respect of coastal ecosystems 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 SMA initiatives should be adopted as a tool where possible to promote community participation in dealing with specific coastal ecosystems 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 ecosystems (e.g. the Biodiversity Conservation Action Plan prepared by the ministry dealing with the environment). There should also be adequate institutional coordination and cooperation in the preparation of all Coastal Resources Management Plans. For instance, integrated coastal ecosystem 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 creation is also considered an effective tool for ecosystem conservation. Therefore, adequate emphasis has to be given in this respect in future management practices.

Future approaches for coastal ecosystem 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 with respect to coastal ecosystems in the future should be to ensure the sustainable management of coastal ecosystems and for the preservation and enrichment of their natural features. Achieving this requires addressing the issues pertaining to each ecosystem separately in view of their specific characteristics and requirements. Care has to be taken to ensure that all policies and actions for the conservation of coastal ecosystems comply with the National Physical Development Plan, the National Environmental Action Plan and the National Biodiversity Conservation Action Plan and other national planning initiatives. It is important to implement coastal ecosystem management on a prioritized basis as some ecosystems are faced with severe threats that require immediate attention. While no attempt has, however, been made to prioritize coastal ecosystems for management action in this document, this could be an important aspect to be addressed in implementing the CZMP. In the preparation of plans, especially for the SMAs, care should be taken so that the linkage between the individual habitat and the ecosystem unit in which they are nested is considered.

3.3.4 Climate Change Adaptation – Conservation of Bio-diversity

As per the Updated NDC implementation Plan 2021-2030, biodiversity sector has been identified as one of the major sectors for climate change adaptation. In this respect, it has identified both terrestrial and coastal habitat loss, fragmentation, and degradation; overexploitation of biological resources; extinction of traditional crop and livestock varieties, and breeds; pollution; conflicts between people and wildlife; the rapid spread of

alien invasive species; and rising human population density as major threats. Further, leading contributing factors for habitat losses have been recognized as land use changes in forests, ad hoc wetlands reclamation, uncontrolled use of coastal areas, landfills in wetlands, and deforestation. Accordingly, the following main activities have been identified for implementation during 2021-2030 by the key agency and other relevant agencies including CC&CRMD under the NDC Implementation Plan (2021-2030) for biodiversity Sector.

Table 3- 7 NDCs of Biodiversity Sector

<ul style="list-style-type: none"> • Management of climate-sensitive areas and restoration of degraded areas inside and outside the Protected Areas (PAs) network to conserve habitats that are highly vulnerable to climate change
<ul style="list-style-type: none"> • Increase connectivity in the zones that will be subjected to climate-driven changes according to current predictions through landscape approaches
<ul style="list-style-type: none"> • Expansion of PA extent to enhance the ability of the PA network to function as a buffer for climate change
<ul style="list-style-type: none"> • Strengthen ex-situ conservation programmes covering climate-vulnerable taxa and regions
<ul style="list-style-type: none"> • Effective management of the spread of Invasive Alien Species (IAS) triggered by favorable climate conditions

Source: Ministry of Environment, NDC Implementation Plan 2021-2030, (2023)

In order to address the future requirements for coastal ecosystem 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 ecosystem and the policies, strategies and actions required to remedy these situations are provided accordingly in view of their present status and associated uses.

3.4 NON-LIVING COASTAL RESOURCES

A variety of environmentally and economically significant non-living coastal resources are existence within the coastal region in the country. These non-living coastal resources constitute sand, gravel, rocks, minerals, and other materials found along the coastal zone are of significant extent and economically significant.

The country's coastline is abundant with sandy beaches, making sand and gravel some of the most common non-living coastal resources. Beside near shore and offshore areas, physically and spatially, the sand resources are existed in the form of beaches, spits, dunes and several other features in the coastal zone. The volume of sand available within the coastline determines the stability of the beaches and provide habitat for turtle and other marine life. In addition, sand extracting from the coastal zone being used as a material for creation of additional buffers, coastal reclamation, filling, infrastructure development, and the manufacturing of concrete and other building materials despite restrictions imposed by the CC&CRMD.

Apart from sand, other non-living coastal resources contain various types of rocks and minerals, including limestone, granite, and mineral sands. The rich deposits of mineral sands located within the coastal region include ilmenite, rutile, zircon, monazite and garnet. These minerals have industrial applications, especially in the production of ceramics, paints, and alloys.

In terms of spatial distribution, heavy-mineral-rich beach sands extend along the shore about 8 km south from Kokkilai Lagoon and they extend about 370 m. landward. The 72-km-long stretch of beach in Northeastern Sri Lanka may represent the richest deposit of heavy-mineral sands in the world. According to the mineral composition, ilmenite (FeTiO₂) and rutile (TiO₂) are found in large concentrations in the Pulmoddai beach sand deposit area. Moreover, several other beach mineral-sand deposits of monazite, zircon, garnet and ilmenite are also found in various parts of the island.

As per the literature, beach deposits on the northeastern coast of Sri Lanka have some of the highest concentrations of heavy minerals in the world. Currently, ilmenite, rutile, and zircon are extracted mainly from the beach sand along the north east coast. In addition, the beach sand also comprised of commercially valuable sillimanite, monazite and garnet. Monazite composes 0.3 percent of the heavy mineral fraction. In some locations, contain of the heavy minerals has been reported as much as 90 percent of the sand deposits, Similarly, ilmenite forms 65 percent of the composition while rutile forms 10 percent and zircon forms 10 percent respectively (Lanka Minerals Sands Limited, 2013).

It is reported that Monazite-bearing alluvium exist in southwestern Sri Lanka. The stream sediments of the Bentota River, have been described as “one of the world’s most thorium-rich sediments” (Rupasinghe and others, 1983). Although there are no commercial operations reported, considerable amount of monazite moves with other heavy minerals through Bentota River and deposited in seasonal beach sand deposits extending from Beruwala south to Kikawala beach, covering 12 km beach stretch along the coast, Deposits of ilmenite-rich sands are also known to exist along the northwestern coast of Sri Lanka (Murphy and Frick, 2006). However, published descriptions of these deposits are lacking.

3.4.1 Management of Non-Living Coastal Resources

The management of non-living coastal resources, such as minerals, sand, and infrastructure, is essential for sustainable coastal development and the conservation of coastal ecosystems. In view of the dynamic nature of coastal zone and the requirement of economic needs of the country, management strategies focused on non-living resources must be carefully design to ensure sustainable use while conserving the health of the coastal ecosystems.

3.4.2 Sustainable Development Opportunities in the Coastal Resources

Sustainable development of coastal resources is crucial to ensure the long-term well-being of both the environment and the people who depend on these resources for their livelihoods. The coastal areas of the country are rich in biodiversity and provide essential ecosystem services, such as fisheries, tourism, and protection from coastal erosion. However, they are also vulnerable to various natural and man induced threats, including overexploitation, pollution, and climate change.

To ensure sustainable development of coastal resources in the country, requires a holistic and long-term approach that balances economic development with ecological preservation. It also demands the active participation of government agencies, local communities, NGOs, and other stakeholders to ensure the protection and responsible use of these invaluable natural resources.

The key management strategies and vital consideration for sustainable development of coastal resources must mainly rely on adoption of Integrated Coastal Management approach for balancing economic development with conservation of coastal environment. This approach needs to focus on coordinated planning and management of land and water resources in the coastal zone to achieve social, economic and environmental objectives.

In addition, sustainable fisheries management should be ensured by curtailing overfishing and destructive fishing practices, implementing quotas, size limits, and seasonal closures to ensure the long-term viability of fish stocks. Moreover, Special Management Area (SMAs) and or Marine Protected Areas (MPAs) has to be established to ensure effectively management and to safeguard biodiversity, enhance fisheries, and promote sustainable tourism. MPAs can serve as living laboratories for studying and preserving marine ecosystems.

Implementation of strict regulations to control pollution from industrial, agricultural, and urban sources is vital for conserving coastal ecosystems. Development and implementation of strategies to adapt to the impacts of climate change, including rising sea levels, increased storm intensity, and ocean acidification is necessary to ensure sustainable management of ecosystems. This may involve building resilient infrastructure, relocating vulnerable communities, and implementing sustainable coastal engineering solutions.

3.5 MANAGEMENT AND COORDINATION OF COASTAL RESOURCES

The pertinent line agencies (NARA, DWC, GS&MB, LAs, etc.) working in connection with coastal resources must take into account the rules and regulations of the Coast Conservation and Coastal Resource Management Act, management guidelines, management objectives, policies, strategies, and actions included in the Coast Conservation and Coastal Resource Management Plan when they are creating and updating their own rules, regulations, management and conservation guidelines, recommendations, and documents relevant to coastal resources. If it is not protected by the CC&CRM Act, it must be updated with the required measures. In order to determine whether the aforementioned requirements have been incorporated into the management plans and conservation policies of these line agencies, the Coast Conservation and Coastal Resource Management Department will undertake follow-up investigations to ensure effective institutional coordination for management.

Moreover, some coastal resources are being managed by various line agencies, including, National Water Supply and Drainage Board (NWSDB), DOI, Forest Department and others. If certain activities extend beyond the coastal zone, special consideration should be given by the respective agencies to how they will affect coastal resources (for example, the estuary at the river's mouth).

3.6 MANAGEMENT OBJECTIVES, POLICIES, STRATEGIES AND ACTIONS

Objective 1

Coral reefs are conserved to enhance biodiversity, non-extractive values, provide barrier against coastal hazards such as erosion, tsunami, and storm surges, permit sustainable use of bio-resources, and sustain fisheries and other economic activities.

Policy 1.1

The degradation and depletion of coral reefs quantitatively and qualitatively due to human-induced activities within and outside the Coastal Zone will be minimized.

Strategy 1.1.1

Enforce existing legislations and regulations effectively to minimize/eradicate damage to and destruction of coral reefs through human-induced activities.

Proposed Actions

1. Continue to enforce existing laws/regulations to prevent the degradation of coral ecosystems.
2. Continue implementation of the provisions of the Coast Conservation and Coastal Resource Management Act against sea coral mining to improve current conditions more effectively.
3. Assist relevant authorities in controlling the mining of inland corals and to minimize negative impacts.
4. Continue awareness creation programmes for identified target groups such as coral-based lime users, coastal dwellers, ornamental fish collectors, fishermen, tour guides, and glass-bottom boat 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 Actions

1. Provide appropriate publicity for the uses of alternative substitutes and construction technology for coral-based lime to enable to conservation of coral reefs.
2. Encourage and advocate for introducing market instruments to promote the use of substitutes for coral-based lime among different user groups.
3. Continue implementation of the policy on the restriction of the use of coral-based lime in state construction works.

Policy 1.2

Mainstream concerns regarding climate change and other natural events into management of coral reefs where possible.

Strategy 1.2.1

Implement. recommended policy guidelines under climate change adaptation for coral reefs.

Proposed Actions

1. Facilitate and support monitoring activities conducted on the status and trends of the health of the Coral Reefs by NARA.
2. Assist implementation of related identified activities under NDC Implementation Plan 2021-2030.
3. Carry out appropriate action to improve the post-event coastal environment to facilitate fast recovery of coral reef ecosystems.
4. Develop and implement strategies to help coral reefs adapt to changing conditions, such as assisted evolution and the cultivation of more heat-tolerant coral strains

Policy 1.3

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

Strategy 1.3.1

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

Proposed Actions

1. Encourage and facilitate continuation of implementation of the recommendation related to fish stock assessment conducted by DFAR/NARA on lobsters, chanks, ornamental fish and sea cucumber.
2. Monitor effectiveness of implementation of guidelines and regulations enforced by DFAR on fish stocks.
3. Support implementation of actions proposed in the Biodiversity Conservation Action Plan as relevant for conservation of coral reef associated biodiversity.

Policy 1.4

Management initiatives including scientific research relevant to coral reef restoration/rehabilitation and conservation will be promoted.

Strategy 1.4.1

Promote and support coral reef surveys and restoration through collaborative research on these ecosystems and their resources and promote measures for sharing/effective dissemination of information.

Proposed Actions

1. Conduct survey to determine actual extent, status and value of coral reef ecosystems associated with the coastal waters of Sri Lanka.
2. Identify and disseminate information regarding priority sites for coral restoration, and the methods and the technology for reef restoration.
3. Initiate a programme in collaboration with local /foreign funding organisations and research institutions/universities to replant with community participation, corals in areas where heavy destruction of corals is evident with community participation.
4. Initiate a mechanism to enhance capacity and promote collaborative research on coral reef organisms that could enhance quality of life (e.g. organisms of medicinal value).
5. Promote investigations on development of starfish population on spatial basis and carry out a 'Crown of Thorns' starfish (*Acanthaster planci*) eradication programme.
6. Assist NARA to regularly update the meta-data base developed 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 1.5

Management of tourism, recreational and other development activities associated with coral reefs shall ensure the health of the coral reefs.

Strategy 1.5.1

Manage tourism and other development activities to minimize negative impacts on coral reefs and the resources they contain through collaborative measures.

Proposed Actions

1. Promote sustainable and responsible tourism practices to minimize physical damage to coral reefs and educate visitors about their importance
2. Promote participation of private entrepreneurs in managing coral reefs located in the respective tourism development areas with required community participation.
3. Control discharges and sedimentation from development activities through regulatory measures (permits, EPL, EIA/ IEE) in collaboration with relevant agencies.
4. Enhance livelihoods of the coastal communities through non-extractive uses of the coral reefs in tourism areas in collaboration with the private sector involvement.

5. Initiate community surveillance programmes with DWC to minimize negative impacts on coral reefs related to tourism, recreation and fisheries activities.
6. 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.
7. Promote awareness among tourists and tour guides on the conservation status of reefs and reef organisms through collaborative programmes with the Tourist Board, hotels and tour operators, Customs and Airport authorities.
8. Coordinate and support customized training programmes and reference material to assist with identifying coral reef organisms prohibited for export for relevant state officials.
9. Promote and conduct coral reef transplantation programme in coral reef degraded areas with the assistance of NARA, universities, and associated communities.

Objective 2

Lagoons and estuaries are conserved to sustain and enhance ecological functions, and promote socio-economic activities and non-extractive values while maintaining resource sustainability.

Policy 2.1

The degradation of estuaries and lagoons due to man-induced causes and development activities within and outside the Coastal Zone will be minimized/eradicated.

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 Actions

1. Expand the existing coastal water quality monitoring programme of the CC&CRMD covering lagoons and estuaries 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 from dwellings into lagoons and estuaries.
3. Formulate a compliance monitoring programme to ensure that all industries within the Coastal Zone adhere to the conditions/guidelines imposed through Development Permits, EPL and EIA/IEE.
4. Implement existing provisions of the relevant legal enactment to curtail, pollutant discharges into lagoons effectively.

Policy 2.2

Lagoons and estuary mouths/outlets and adjacent banks will be managed based on sound scientific information.

Strategy 2.1.2

Minimize reduction of functional area of lagoons and estuaries due to encroachments, reclamation, removal of vegetation and other development activities.

Proposed Actions

1. Survey and demarcate the boundaries of the lagoons and estuaries with the assistance of relevant agencies.
2. Implement development permit procedures to control development activities covering riparian land and the water area lying within the coastal zone.
3. Adopt legal provisions of the CC&CRMA on SMA to control development activities associated with the lagoons and estuaries.
4. Enforce prevailing regulatory measures against encroachments and reclamation.

Policy 2.3

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

Strategy 2.3.1

Promote sustainable management of resources in estuaries and lagoons through eco-system service valuation and with community participation.

Proposed Actions

1. Prepare ecosystem service valuation model for selected politically, economically significant barrier built estuaries (Negombo and Puttalam).
2. Ensure that the fishery in estuaries/lagoons is at sustainable levels by regulating gear, methods and effort.
3. Formulate programme to promote the use of the ecological, aesthetic and recreational value of estuaries/lagoons and their natural environs with the relevant stakeholders while maintaining the sustainability of the resources.
4. Encourage and assist to implement the relevant recommendations of the National Biodiversity Conservation Action Plan implemented by the Ministry of Environment.
5. Study the impacts of sand bar formation/removal on selected estuaries/lagoons and identify measures to mitigate adverse effects.

Strategy 2.3.2

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

Proposed Actions

1. Develop a mechanism to integrate lagoon and estuary management with watershed management to minimize 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.

Objective 3

Sea grass beds are conserved to sustain ecological functions and socio-economic values.

Policy 3.1

Direct and indirect damage to sea grass beds from activities will be minimized.

Strategy 3.1.1

Minimise negative impacts of activities that damage sea grass beds through existing regulatory measures with relevant agencies.

Proposed Actions

1. Enforce existing regulatory measures to prevent pollution, sand mining, destructive fishing methods and other activities that damage Sea grass beds.
2. Implement EIA/IEE procedures to avert potential negative impacts of dredging and mining in the coastal waters.

Policy 3.2

Research and community awareness on sea grass beds in Sri Lankan waters will be promoted.

Strategy 3.2.1

Initiate inter agency collaborative research and monitoring and awareness programmes that will help enhance management of sea grass beds.

Proposed Actions

1. Initiate programme to carry out systematic mapping of critically threatened sea grass beds in Sri Lankan waters.
2. Declare vulnerable/threatened sea grass beds as conservation areas under the provisions of the CC&CRMA.
3. Initiate a programme to study the adverse effects of catchment hydrology and sand bar formation on sea grass beds and propose management measures.
4. Carry out public outreach programme on conservation of sea grass beds and associated habitats ecosystems among target groups.
5. Address, the conservation of seagrass meadows in the lagoons through the SMA process.

Objective 4

Mangrove ecosystems are conserved and managed to maintain biodiversity, and sustain ecosystem services and socio-economic activities.

Policy 4.1

Depletion and degradation of mangroves due to unplanned development activities will be prevented /minimized.

Strategy 4.1.1

Formulate and implement programme to prevent or minimize damage to mangrove systems.

Proposed Actions

1. Identify vulnerable mangrove areas where management is urgently needed, and prioritize for conservation.
2. Declare conservation areas based on the priority list with the assistance of Forest Department.
3. Implement activities identified under the NDC implementation Plan related to Mangroves
4. Formulate guidelines for mangrove replanting schemes to rehabilitate identified degraded mangrove areas.
5. Regulate new development activities in mangrove areas through EIA/IEE procedures and permits.
6. Introduce a monitoring mechanism to identify the adverse impacts of present and future development activities within mangrove ecosystems and formulate suitable mitigatory measures.
7. 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 Actions

1. Promote private entrepreneurs to establish ecotourism projects in suitable areas with community participation.
2. Identify non-destructive uses of mangrove resources at community level and disseminate such information to stakeholders.
3. Establish a suitable mechanism to ensure inter-agency coordination and participation to promote sustainable use of mangrove resources.
4. Formulate and implement programmes through SMA process to ensure sustainable use of mangroves.

Policy 4.3

Protect mangroves within the Coastal Zone in compliance with the existing legal provisions.

Strategy 4.3.1

Encourage and promote enforcement of legal provisions to protect mangroves within the Coastal Zone.

Proposed Actions

1. Formulate and implement education and awareness programmes on the prevailing legal provisions among stakeholder groups.
2. Encourage community participation in obtaining information on contraventions of the legal provisions.

Policy 4.4

Promote conservation and enhancement of mangrove ecosystems to enable an increase in blue carbon sequestration ensuring sustainable livelihoods and protecting coastal ecosystems

Strategy 4.4.1:

Formulate and implement the multifaceted program with stakeholder participation constituting research, monitoring, and effective coordination mechanism

Proposed Actions:

1. Establish a research program to study blue carbon ecosystems, focusing on carbon sequestration rates, biodiversity benefits, and ecosystem services to minimize climate change repercussions and ensure sustainable coastal livelihoods
2. Promote technological innovation, including remote sensing and GIS, for effective ecosystem monitoring and management

Strategy 4.4.2:

Develop and implement a mangrove restoration/ enhancement programme while ensuring community engagement, and establishing a sustainable financial mechanism.

Proposed Actions:

1. Launch large and medium-scale restoration projects targeting degraded mangrove areas and replanting new areas
2. Develop public education and awareness programs to highlight the importance of blue carbon ecosystems and engage local communities in conservation efforts.
3. Promote the implementation of blue carbon initiatives targeting mangroves through Special Management Areas
4. Establish sustainable financial mechanisms to support conservation and restoration projects, in collaboration with public, private, and international sources
5. Foster strong international partnerships and collaborative projects targeting blue carbon ecosystems

Objective 5

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

Policy 5.1

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

Strategy 5.1.1

Minimize adverse impacts of development activities on barrier beaches, spits and dunes through regulatory measures and the establishment of Dune Protection Lines (DPLs).

Proposed Actions

1. Declare barrier beaches, spits and sand dunes located in front of low-lying areas as Critical Zones and control 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 or 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 or 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 survey considering the setback standards stipulated in this document Plan.
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 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 5.2

Sand dunes will be protected to minimize the impacts of episodic coastal hazards such as tsunamis and cyclones.

Policy 5.3

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

Strategy 5.3.1

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

Proposed Actions

1. Assist and encourage 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, and ensure that the guidelines are adhered to.

Policy 5.4

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

Strategy 5.4.1

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

Proposed Actions

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.
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*.

Objective 6

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

Policy 6.1

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

Strategy 6.1.1

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

Proposed Actions

1. Identify critical and importance salt marsh areas in terms of their ecological and socio-economic importance and formulate guidelines for planning and development activities in them.
2. Determine carrying capacity/potential and prepare appropriate 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.

Policy 6.2

CC&CRMD shall coordinate with other agencies to conserve salt marshes within and outside the Coastal Zone.

Strategy 6.1.2

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

Proposed Actions

1. Formulate and implement customized programmes for communicating about salt marshes and their values to key stakeholders to enhance commitment for conservation.

2. Supply information about pollution control and technology suppliers of pure industries to the industries make negative impacts in the coastal zone.

Objective 7

Non-living coastal resources sustainably manage to enhance economic vitality while conserving the coastal ecosystems

Policy 7.1

Environmentally sound extractive uses of non-living coastal resources including mineral sands will be promoted to enhance economic benefits while maintaining ecological integrity of the ecosystems

Strategy 7.1.1

Adopt a multi-faceted approach involving government agencies, local communities, businesses, and environmental organizations to ensure ecological integrity, and the long-term well-being of coastal ecosystems and communities.

Proposed Actions

1. Set sustainable limits on extraction rates and quantities to prevent overexploitation.
2. Promote innovative technologies and practices for resource extraction and conservation.
3. Promote use of responsible mining practices, best practices for resource restoration including habitat restoration techniques.
4. Implement penalties for non-compliance to deter illegal resource extraction or damage to coastal ecosystems.
5. Strengthen enforcement mechanisms to ensure that regulations and guidelines are followed.

Objective 7

Unintentional damage to the ecological function or value coastal ecosystems caused by the development activities will be compensated through habitat creation, restoration, enhancement, or preservation, which lead to improved overall ecological quality.

Policy 7.1

Ecological compensation will be adopted in restoring and enhancing damaged ecosystems to maintain balance between economic development and conservation needs

Strategy 7.1.1

Introduce ecological compensation through the development permit procedure

Proposed Actions

1. Introduce ecological compensation requirements through permit conditioning for development activities in the coastal zone.
2. Identify affected ecosystem through permit compliance monitoring programme on development activities.

3. Formulate and implement ecological compensation plan through coastal developers

Objective 8

Coastal ecosystems sustainably manage through establishment of beach parks and recreational areas while maintain ecological status and public safety through effective shared responsibility between private sector entities and CC&CRMD

Policy 8.1

Recognized and promote the involvement and undertaking shared responsibility for ecosystem management by private sector entities and CC&CRMD through establishment of beach park and recreational areas in suitable locations

Strategy 8.1.1

Beach parks and selected recreational areas sustainably manage through effective financial mechanism

Proposed Actions

1. Launch awareness programme among private sector entities to inform available opportunities
2. Formulate sustainable financial mechanism to generate income
3. Develop operational guidelines for vesting shared responsibility
4. Identify suitable locations to establish beach parks and recreational areas

Objective 9

Conservation and planned development within the coastal zone will be harmonized by directing investment through the provision of Information

Policy 9.1

Investment in development activities dependent on coastal environment and resources shall facilitate through the provision of updated bio-physical information on suitable locations.

Strategy 9.1.1

Information on focal areas/ locations for tourism, renewable energy, aquatic farming, and mineral extraction (Except sand) is disseminated through information compendium

Proposed Actions

1. Prepare information compendium consistent with the updated NPP, tourism plan on focal locations for;
 - Tourism; over water structures, water bungalows, establishment of land based recreation, water based recreational activities
 - Aquatic/Sea Farming; Seaweed, sea cucumber, crab fattening, sea farming
 - Renewable energy; Solar power, wind power, ocean thermal power
 - Beach parks and recreational area;

REFERENCES:

1. Coast Conservation and Coastal Resource Management Department, (2014); Updating and preparation of a synthesis report on Coastal Coral Reefs, Sea grass Beds, Salt Marshes, Lagoons and Estuaries and Barrier Beaches within the coastal region of Sri Lanka.
2. Coast Conservation and Coastal Resource Management Department (2004), Revised Coastal Zone Management Plan 2004.
3. Government of Sri Lanka, Coast Conservation and Coastal Resources Management Act, No. 57 of 1981.
4. Ministry of environment and Natural resources, 2009, National action Plan for Haritha Lanka Programme
5. Miththapala, S. (2008) Mangroves, Coastal ecosystem Series Volume 2 P1-28 + iii, Colombo Sri Lanka; ecosystem and Livelihood Group Asia, IUCN.
6. Miththapala, S. (2008) Sea grasses and Sand dunes, Coastal ecosystem Series Volume 3, Colombo Sri Lanka; ecosystem and Livelihood Group Asia, IUCN
7. Miththapala, S. (2013). Lagoons and estuaries. Coastal ecosystems Series (Vol 4). vi + 73 pp. IUCN Sri Lanka Country Office, Colombo.
8. N Perera (2019) A Preliminary Report on the Status of Kayankerni Coral Reef, Sri Lanka
9. Silva, E.I.L; Katupotha, J.; Amarasinghe, O.; Manthirithilake, H.; Ariyaratne, R. 2013. Lagoons of Sri Lanka: from the origins to the present. Colombo, Sri Lanka; International Water Management Institute (IWMI).
10. Ramawickrama N.W et al (2020) Diversity and the Current Status of Coral Reefs in Eastern Coast of Sri Lanka, Proceedings of the International Research Conference of Uva Wellassa University.
11. Samarakoon, Jayampthy; Saman Samarawickrama (2012) An appraisal of challenges in the sustainable management of the Micro tidal Barrier built estuaries and lagoons in Sri Lanka, IUCN, Sri Lanka Country Office, Colombo.
12. Van Gosen, B.S., Fey, D.L., Shah, A.K., Verplanck, P.L., and Hoefen, T.M., 2014, Deposit model for heavy-mineral sands in coastal environments: U.S. Geological Survey Scientific Investigations Report 2010-5070-L, 51p <http://dx.doi.org/10.3133/sir20105070L>.
13. Arulanathan, A.; et al (2021) The Status of the Coral Reefs of the Jaffna Peninsula (Northern Sri Lanka), with 36 Coral Species New to Sri Lanka Confirmed by DNA Bar-Coding. Oceans 2021, 2, 509-529. <https://doi.org/10.3390/oceans2030029>
14. Department of Forest Conservation (2022) The Sri Lanka Forester Volume 41 (New Series) Special Issue on Mangroves

Web sites used: <http://www.fao.org/docrep/010/ai000e/AI000E07.htm>

<https://nexttravelsrilanka.com/corals-sri>

CHAPTER 4 - CONTROLLING COASTAL POLLUTION

4.1 INTRODUCTION

Coastal pollution could emerge due to contamination of coastal waters, shores, and adjacent ecosystems by various pollutants originating from human activities. These pollutants can have detrimental effects on marine life, human health, and the overall health of coastal environments.

To overcome coastal pollution, a combination of regulatory measures, sustainable practices, public education and awareness efforts are essential. Some strategies to address coastal pollution include implementing stricter environmental regulations, improving wastewater treatment, promoting sustainable agriculture and fishing practices, halting dumping of waste, reducing plastic consumption and promoting recycling, and enhancing coastal zone management and protection.

With increasing trends in coastal zone developments and the use of coastal waters, beaches, and adjacent areas for various purposes such as recreation/tourism, fishing, and mariculture pollution in coastal waters has become a significant issue.

The details on the significance of the issue, nature of coastal pollution, type of pollutants and sources, current status of water quality in coastal waters, beach areas, and also plans, policies, and implementation strategies to address the related issues are presented in this chapter.

4.1.1 Significance of the Problem

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 findings of the recent monitoring studies carried out by CC&CRMD show deterioration of coastal water quality in economically sensitive coastal areas. In addition, it is also evident that a significant part of the focal beach areas has been severely polluted due to solid waste.

In view of the remarkable attraction on development of coastal tourism and other important economic activities including within the coastal region, the degree of pollution should be closely monitored and effectively managed.

As a result of growing population pressures, urbanization and development activities taking place in the coastal region, the problem of coastal pollution has been increasing over the past few decades. In 2019, population in the coastal districts was estimated as 12,319,000. Colombo Metropolitan Area has the highest rate of urbanization growing from 3.9 million in 1981 to 5.648 million in 2012. Ocean waters, coastal surface waters comprising rivers, streams, estuaries and lagoons and ground water in coastal areas receive significant level of pollution loads from un-regulated industries, development activities and human settlements located in and outside the Coastal Zone. Out of all industries in the country (small, medium, large scale) 61.6 % of industrial units are located in the coastal region and significant amount of units' discharge effluents with little or no treatment. By and large, the sustainability of fisheries, tourism and other industries and livelihoods of local communities depend considerably on the productivity of the diverse ecosystems and resources within this area. The nearshore waters in particular are used extensively

for fishing, mariculture and recreation etc., for which different levels of water quality and aesthetically pleasing environments are required.

The impacts of pollution on the coastal and marine ecosystems and their resultant biological as well as socio-economic implications are many and varied. The existing information revealed that the cost of coastal water pollution in Sri Lanka is on the increasing side. For example, the cost to human health from coastal water pollution in the Colombo Metropolitan Area is estimated to have increased from LKR. 2 million in 1992, to LKR. 4 million in 1997 and LKR. 14 million in 2002 respectively (CZMP – 2018). There are also losses associated with decreased biological diversity, reduced aesthetic, recreational, cultural and archaeological values, declining land prices and reduced revenue from tourism, fisheries and other development activities. There are also some strong 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 prior to rehabilitation due to pollution is approximately LKR 1,963 million and the total annual land value decline in the area is estimated to be LKR 712 million. In addition, the total direct cost incurred on rehabilitation of Lunawa Lagoon during the period between 2004- 2007 under the ADB funded CRMP and Lunawa Environmental Improvement Project was approximately US\$ 95 million. Thus, the benefits expected from coastal pollution management are substantial and reducing pollution in the coastal region is of paramount importance

Pollution of ground water

Although an accurate assessment of coastal 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, characterized 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/l) and a chloride concentration ranging from 50-200 mg/l. In contrast, domestic wells located outside these areas have nitrate levels less than 2 mg/l and chloride concentrations less than 100 mg/l. There is widespread ground water contamination in the Jaffna Peninsula attributed to agricultural run-off and the extensive use of pit latrines. 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 (CC&CRMP 2018)

COASTAL WATERS AS THE CONDUIT OF POLLUTION

Coastal nearshore waters in some coastal areas receive considerable pollutants by way of sewage, industrial, agricultural, and domestic wastewater, sediment 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 nearshore waters are dependent 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 health of the important ecosystems associated with them and the diverse and economically important fauna and flora 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.

Ground water 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. 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. Over the 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 groundwater of coastal areas are leachate of fertilizers causing nitrate pollution; seepage from faecal matter and pollution with heavy metals in industrial zones. Treatment of groundwater is very costly so 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. (CC&CRMP 2018)

4.2 Nature of Coastal Pollution

4.2.1 Key Factors Influencing Coastal Water Pollution

The main factors influencing water pollution in the coastal region are the increasing population pressures, particularly in the areas where industrial, agricultural, fisheries, and tourism-related activities are predominant. Accordingly, the coastal zone is under threat from unmanaged human activities that cause coastal water pollution because of sewage and solid waste; industrial effluents; pollution from tourism; power, fisheries, and aquaculture; oil spills; heavy metals, and plastics.

The coastal districts of Colombo, Gampaha, Kalutara, Galle, Matara and Jaffna respectively recorded the highest population densities. 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, if not properly managed. In this respect, specific attention has to be placed on five metro regions proposed in Northern, North Central, Eastern, Southern and Western coastal regions under the Sri Lanka 2030 National Physical Plan. In addition, coastal areas in Mannar, Jaffna, Kuchchiveli and Kalpitiya coastal segments are to be developed as new tourism development areas.

A master plan has been developed for tourism developments along the coast from Negombo to Mirissa by the CC&CRMD. In addition, a study carried out by the CC&CRMD in 2022 has identified suitable locations for different types of tourism developments along the coast. Thus, a higher tendency towards occurring coastal pollution has to be expected in the future.

4.2.2 Types of Pollutants and their Sources

Although the level of coastal water pollution has not been fully studied yet, the current information revealed that 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 in urban areas 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

<i>Type of pollution</i>	<i>Key sources</i>	<i>Adverse impacts</i>
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

<i>Type of pollution</i>	<i>Key sources</i>	<i>Adverse impacts</i>
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 algae growth Causes change or decline of biodiversity Changes water quality
Organic (non- toxic and toxic) and heavy metal pollution	Industries Tourism 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 Affects benthic fauna with the formation of oil slicks and tar balls.
Thermal pollution	Power sector, Industries	Affects migration patterns of fauna Affects the growth of marine flora and fauna Causes changes in ecosystems Stimulates algae growth

Source: CC&CRMP 2018

4.2.3 Spatial characteristics of coastal water pollution in Selected Coastal Segments

The findings of the study carried out by CC&CRMD in 2020 in eight coastal segments with different locations in different environment types from Negombo to Mirissa demonstrate the alarming situation related to coastal pollution control and the requirement of effective management measures to avoid the social and economic cost of coastal pollution (CC&CRMD 2020)

The results of the study carried out in eight coastal segments from Maha Oya to Mirissa are summarized below

Segment 1 - Maha Oya to Kutti Duwa

Except for Porutota beach, all the sampling locations were contaminated with total and faecal coliform and COD values exceeded the given standards.

Segment 2 - Talahena to Kelani River mouth

It is reported that all sampling locations exceeded the standard level of COD where the highest faecal coliform bacteria and COD levels were detected in Kelani River mouth.

Segment 3 - Wellawatta canal to Mt. Lavinia.

All the sampling locations were contaminated with total and faecal coliform except Mt. Lavinia beach. High oil concentration was recorded in water collected near Dehiwala fish market (14.32 mg/L) and the highest COD was recorded in Mt. Lavinia beach

Segment 4 - Talpitiya canal mouth to Kalutara Kalido beach

The results show that all the sampling locations were contaminated with total coliform and COD values, which exceeded the given standards

Segment 5 - Kechhimale Mosque to Kaluwamodera (Bentota river mouth).

The results show that except Benthota beach, all the sampling locations were contaminated with total and faecal coliform. The highest COD (4622.64 mg/L) and oil (19.87 mg/L) was found in Beruwal harbour.

Segment 6 - Hikkaduwa (Thuduwegoda canal outlet up to Kumarakanda)

The results show that except two sampling locations, all other sampling locations were contaminated with total coliform, and faecal coliform counts remained below the standard. COD values exceeded the given standards and the highest was recorded at Hikkaduwa lagoon mouth (3475.31 mg/L).

Segment 7 - Unawatuna (Yakdehimulla to Koggala Lagoon mouth)

Except Unawatuna beach and Koggala river, all the other sampling locations were contaminated with faecal coliform and the highest COD was recorded (4800.45 mg/L) in Devol Devalaya canal where the second highest was noted in Koggala river mouth (4622.64 mg/L).

Segment 8 - Mirissa (Kapparatota to Bandaramulla)

The results show that the almost all sampling locations were contaminated with total coliform, and high faecal counts were recorded at Kapparithota, Bandaramulla coast and Mirissa harbour sampling locations. COD values exceeded the given standards and the highest was recorded at Polwathumodara sampling location (5770 mg/L).

Apart from the above, a study conducted in 2022 within the same coastal area from Negombo to Mirissa covering 11 coastal segments and 65 sampling locations and results also revealed similar situation with respect to coastal water pollution. The findings of the study have indicated the prevailing levels of Temperature and pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), Nitrate, Ammonia, Total Phosphorus (TP), Chemical Oxygen Demand (COD). it was also reported that the fecal coliform in all of the coastal waterways, indicating fecal contamination, and the discovery of Salmonella sp. pathogenic bacteria from the Dehiwala canal and Rathmalana sampling locations highlighting the requirement of additional attention. The findings also concluded that the study area has begun to decline due to anthropogenic activities and that there is less care for environmental friendliness as development is in progress. (Manage P et. al 2022).

4.3 ISSUES AND THREATS

4.3.1 Inadequate Municipal Sewage Disposal Facilities

As described in the previous section, faecal pollution is a major problem in some coastal waters due to the direct discharge of untreated municipal sewage into the land, waterways and the sea. Colombo is one of the few cities in Sri Lanka with an installed sewerage system. A part of the sewer connections 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 more

than 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.

As per the current estimates, the generated wastewater in the coastal area was approximately 1,822,864 m³ per day and a significant amount of domestically generated wastewater is discharged into the Coastal Zone through canals, drains, and pipes. According to a study carried out by MOFE in 2001, out of a total 370, 000 m³ of daily wastewater generated in the greater Colombo area, only 90,000 m³ is discharged through ocean outfalls. The balance amounts of 280,000 m³ re-enters the environment as wastewater. The wastewater discharge through marine outfalls contained high organic content, high nutrient content, and high content of coliforms

Sewage disposal facilities in the Greater Colombo Area

Wellawatta and Mutwal sea outfalls belonging to Colombo Municipality Council discharge wastewater to sea using high density Polyethylene (HDPE) pipes. Long sea outfalls use grit removal methods to remove larger materials and but further treatment process is not applied. During the past few years, water skin diseases were recorded in Wellawatta coastal area and it might have resulted due to the discharge from sea outfalls (Compendium on Coastal Pollution, 2014).

4.3.2 Inadequate Facilities for Waste Disposal in Underserved Settlements

Many highly populated coastal low-lying areas have a shallow water table and a high vulnerability for flooding. Inadequate drainage facilities and ad hoc developments 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 nearshore 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% of the city's population. These settlements are under-served in respect of sanitation, safe water and waste disposal facilities. Pollution from these sources causes a reduction of dissolved oxygen in the canals and streams, resulting in an anoxic environment and a foul odor that is harmful to human health and aquatic organisms.

4.3.3 Industrial Effluents

There are nine Export Processing Zones (EPZ), three Industrial Parks (IP) and one Export Processing Park (EPP) 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 (CC&CRMP 2018)

- Sri Lanka-China Logistics and Industrial Zone, in the Hambantota region, is being developed primarily by Chinese investors and is expected to involve \$5bn in funding
- Industrial park at Horana
- Millaniya, in the Kalutara
- Trincomalee and Kilinochchi have been identified as suitable places for the -manufacturing of consumer goods, while Kandy, Galle and Jaffna have been earmarked for a range of IT goods.

Industrial effluents that have undergone little or no treatment are frequently received by nearshore waters, lagoons, and estuaries through run-off, leakage, and seepage. Most of the industries located in the coastal areas belong to either the medium or low polluting category. In 2016, Sri Lanka had 5253 industries with a high or medium pollution potential in the Coastal Zone (CEA 2016). 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 and COD values.

The majority of the 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 the central treatment of wastewater prior to discharge. During the past few years, many water quality issues occurred due to discharge of untreated industrial wastewater. Industrial wastewater contains POP (Persistent Organic Pollutants) and heavy metals which are not decaying with time. Due to high cost involved in treatment methods, many factories don't do not use treatment to remove POP and heavy metals. In this respect, tanning factories could be considered as one of the significant main pollution sources.

Table 4-2 shows the number of High/Medium polluting industries located in coastal Divisional Secretariat Divisions. These include those set up under the Board of Investment (BOI). **Table 4.3** depicts the tolerance limits stipulated by CEA through *Gazette*-No. 2264/17 – Thursday, January 27, 2022 for industrial and domestic discharged into marine waters while **Table 4.4** depicts tolerance limits for coastal waters.

Table 4- 2 Spatial Distribution of High Medium Polluting Industries including BOI approved

<i>DSDs in Coastal Districts</i>	<i>Category A</i>	<i>Category B</i>	<i>BOI</i>	<i>Total</i>
Colombo	122	70	14	206
Gampaha	638	358	138	1134
Kalutara	272	183	53	508
Galle	182	319	17	518
Matara	176	246	13	435
Hambantota	150	95	17	262
Trincomalee	148	163	17	328
Ampara	99	149	7	255
Batticaloa	116	240	5	361
Mullaitivu	23	47	0	70
Jaffna	301	284	3	588
Mannar	88	115	3	206
Puttalam	128	240	14	382
Total	2443	2509	301	5253

Source: Central Environmental Authority (2016)

Table 4- 3: Tolerance limits for the discharge of wastewater or effluent into Marine Waters

No.	Parameter	Unit, type of limit	Tolerance limit values for an outfall leading up to near- shore water	Tolerance limit values for a short sea outfall	Tolerance limit values for a long sea outfall
1.	Total suspended solids	mg/l, max.	30	50	250
2.	Total dissolved solids	mg/l, max.	2100	-	-
3.	pH value at ambient temperature	-	6.0 – 8.5	5.5 – 9.0	5.5 – 9.0
4.	Biochemical Oxygen demand (BOD ₅ in 5 days at 20°C)	mg/l,max.	15	75	400
5.	Temperature at the point of discharge	°C, max	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser	Ambient water temperature +/- 5 or 35 whichever is lesser
6.	Oils and greases	mg/l,max.	5	12	15
7.	Phenols (as C ₆ H ₅ OH)	mg/l,max.	1	1	5
8.	Chemical oxygen demand (COD)	mg/l,max.	50	400	800
9.	Dissolved phosphates (as P)	mg/l,max.	1	5	10
10.	Ammoniacal nitrogen (as N)	mg/l,max.	15	50	150
11.	Cyanides (as CN)	mg/l,max.	0.1	0.2	0.4
12.	Total residual chlorine(as Cl ₂)	mg/l,max.	0.5	0.5	1.0
13.	Fluorides (as F)	mg/l,max.	2	2	5
14.	Sulphides (as S)	mg/l,max.	2	2	5
15.	Arsenic, total (as As)	mg/l,max.	0.08	0.1	0.2
16.	Cadmium, total (as Cd)	mg/l,max.	0.02	0.05	0.10
17.	Chromium, total (as Cr)	mg/l,max.	0.05	0.05	0.10
18.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.01	0.01	0.05
19.	Copper, total (as Cu)	mg/l,max.	1.0	1.0	1.0
20.	Lead, total (as Pb)	mg/l,max.	0.05	0.10	0.10
21.	Mercury, total (as Hg)	mg/l,max.	0.001	0.002	0.01
22.	Nickel, total (as Ni)	mg/l,max.	0.1	0.2	1.0
23.	Selenium, total (as Se)	mg/l,max.	0.01	0.05	0.10
24.	Zinc, total (as Zn)	mg/l,max.	3	3	5
25.	Silver, total (as Ag)	mg/l,max.	0.005	0.035	0.35
26.	Pesticides (Total)	mg/l,max.	0.005	0.005	0.05
27.	Surfactants (Total)	mg/l, max.	1	5	10
28.	Faecal Coliform	MPN/100ml,max	150	1500	10 ⁷
29.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5	0.5	0.5
30.	Radioactivity Gross beta activity +	Bq/l maximum	1.0	1.0	1.0

(LIST I B) Colour Parameters

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
1.	Colour		Maximum spectral absorption coefficient
2.	400-499 nm- (Yellow range)	m ⁻¹	7 max
3.	500-599 nm- (Red range)	m ⁻¹	5 max
4.	600-750 nm- (Blue range)	m ⁻¹	3 max

Source: GOSL Gazette-No. 2264/17 – Thursday, January 27, 2022

Table 4- 4 Tolerance limits for the discharge of wastewater or effluents into Coastal Waters

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
1.	Total suspended solids	mg/l, max.	50
2.	Total dissolved solids	mg/l, max.	1000
3.	pH at ambient temperature	-	6.0 – 8.5
4.	Biochemical oxygen demand (BOD ₅ in 5 days at 20°C)	mg/l,max.	30
5.	Temperature at the point of discharge	°C, max	Ambient water temperature ± 5 or 40 whichever is lesser
6.	Oils and greases	mg/l,max.	10
7.	Phenols (as C ₆ H ₅ OH)	mg/l,max.	1
8.	Chemical oxygen demand (COD)	mg/l,max.	250
9.	Dissolved phosphates (as P)	mg/l,max.	5
10.	Total Kjeldhal nitrogen (as N)	mg/l,max.	150
11.	Ammoniacal nitrogen (as N)	mg/l,max.	50
12.	Cyanide (as CN)	mg/l,max.	0.05
13.	Total residual chlorine (as Cl ₂)	mg/l,max.	0.5
14.	Chlorides (as Cl)	mg/l, max.	Shall not change 20% from the ambient level at any point of the tidal cycle.
15.	Fluorides (as F)	mg/l,max.	2.0
16.	Sulphides (as S)	mg/l,max.	2.0
17.	Arsenic, total (as As)	mg/l,max.	0.05
18.	Cadmium, total (as Cd)	mg/l,max.	0.05
19.	Chromium, total (as Cr)	mg/l,max.	0.05
20.	Chromium, hexavalent (as Cr ⁶⁺)	mg/l,max.	0.01
21.	Copper, total (as Cu)	mg/l,max.	0.05
22.	Lead, total (as Pb)	mg/l,max.	0.05
23.	Mercury, total (as Hg)	mg/l,max.	0.001
24.	Nickel, total (as Ni)	mg/l,max.	0.2
25.	Selenium, total (as Se)	mg/l,max.	0.05

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
26.	Zinc, total (as Zn)	mg/l,max.	1.0
27.	Silver, total (as Ag)	mg/l,max.	0.035
28.	Pesticides (Total)	mg/l,max.	0.005
29.	Surfactants (Total)	mg/l, max.	5.0
30.	Sulphates (as S)	mg/l, max.	250
31.	Faecal coliform	MPN/100ml, max.	150
32.	Radioactivity Gross alpha activity +	Bq/l maximum	0.5
33.	Radioactivity Gross beta activity +	Bq/l maximum	1.0

LIST IIB

Colour Parameters

No.	Parameter	Unit, type of limit	Tolerance limit values for coastal waters
1.	Colour		Maximum spectral absorption coefficient
2.	400-499 nm- (Yellow range)	m ⁻¹	7 max
3.	500-599 nm- (Red range)	m ⁻¹	5 max
4.	600-750 nm- (Blue range)	m ⁻¹	3 max

Note 1: All efforts shall be made to remove unpleasant odor as practicable as possible.

Note 2: These limit values are based on the premise that for coastal water the dilution factor may be at least 1:8. In an event where the dilution factor is found to be less, the limit values given in the Lists shall be adjusted on a proportional basis so as to give rise to more stringent limit values.

Note 3: In case of the tolerance limits of radioactive materials exceeds, the standards stipulated by the Sri Lanka Atomic Energy Regulatory Council shall apply.

4.3.4 Pollution from Tourist Establishments

At present 74.4% (or the majority) of Sri Lanka's tourist arrivals are for pleasure. This type of tourism depends highly 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.

Current information revealed that a high percentage of tourist hotels registered with the Sri Lanka Tourism Development Authority (SLTDA) are located in the coastal region. In year 2013, tourist arrivals to Sri Lanka were approximately 100,000 per month and the generated monthly wastewater volume has been estimated as 19,000 m³. A study conducted among 276 hotels, revealed that 92 % of large hotels had wastewater treatment plants while only 17 % of the small and medium hotels had such plants. A significant growth in tourist arrivals has taken place from 2013 until 2018 after which it was significantly affected by Easter bombings in April, 2019 and the Covid pandemic conditions. A Strategic Plan for Sri Lanka Tourism 2022-2025 has been prepared by the SLTDA for the recovery and expansion of the tourist sector in the country. However, the negative aspects of the uncontrolled expansion of tourism at

the start of the tourist boom have become apparent in many coastal resorts, where there are clusters of restaurants and guesthouses, as well as at other major tourist centers. The nearshore 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, southwestern and eastern coasts. Tourism expansion in Hikkaduwa, Beruwala, Unawatuna and Arugam Bay areas has led to water quality degradation as well as visual pollution of beaches and nearshore waters. As per the ongoing coastal water quality monitoring studies carried out by the CC&CRMD, it is clearly evident that the qualities of the nearshore coastal waters in the vicinity of tourism centers have been significantly degraded due to the discharge of effluents. The problem of sullage is particularly perceived as a problem associated with larger hotels. Squatter settlements connected with tourism is also a concern as they contribute to faecal pollution, which is a severe threat to recreational activities. Such as swimming and water sports in coastal waters.

4.3.5. Pollution from the Power Sector

Sri Lanka's energy requirements are met from six different types of resources. Recent statistics indicate that in 2019, thermal power plants (oil) contributed 30.2 %, and thermal power (coal) contributed 35.3 %, both surpassing the main hydropower contribution of 22.7 % of gross power generation. (Sri Lanka Energy Balance 2019, An Analysis of Energy Sector Performance, Sri Lanka Sustainable Energy Authority) The thermal power plants are mainly located in the coastal regions. These plants are located in Kerawalapitiya, Norachchola and Puttalam. Kerawalapitiya and Puttalam plants use furnace oil as the energy source while coal is used by the Norachchola plant. Although hydropower contributed a major share to the total installed capacity, its inputs towards annual power generation are steadily decreasing. The shortfall between power demand and the present hydropower output is being fulfilled by thermal power generation using petroleum, coal, and natural gas. The establishment of these plants in the coastal regions can result in the thermal pollution of coastal waters. The discharge of hot water and desalinized water are the main threat for the coastal water quality from the thermal power plants.

4.3.6. Pollution from the Fisheries Sector

A total of 21 functioning fishery harbors, 42 anchorages, and 883 landing sites located in the Coastal Zone contribute to the pollution of coastal waters due to improper disposal of burned oil and bilge water from fishing vessels to the harbour waters. In addition, the production of a substantial amount of organic waste from fish degutting, market floor runoff, cleaning, and garbage dumping also causes higher COD levels in the affected coastal waters. Although the Ceylon Fishery Harbor Corporation (CFHC) has provided burned oil reception facilities at the harbors, the discharge of waste oil into the harbor basins is being continued, posing environmental threats. Feasibility studies have been carried out recently for the rehabilitation of up to 4 harbours- Beruwala, Galle, Puranawella, and Kudawella- located in the south/southwest coast of the country in which improved waste management methods are to be adopted.

4.3.7. Unsanitary Disposal of Solid Waste

A study conducted on 192 countries which include residents that border the Atlantic Ocean, Pacific Ocean, Indian ocean, Black Sea, and Mediterranean Sea identified Sri Lanka as 5th out of the top twenty countries polluting the ocean due to marine debris. According to a study conducted on 22 beach stretches along the coast revealed that 4.1 large (>25mm) and 158 small (5mm-25mm) debris per square meter of the beach. By usage classification, packaging material (55%) dominated the consumer products (25%) and fishing gear (20%). Plastic was the highest contributing (93%) material. Beaches close to a river mouth, city or with a barrier had greater debris accumulation (Yong Chang Jang et al. (2018))

Solid waste is one of the major sources of coastal pollution. Environmental and health hazards related to solid waste have been growing in Sri Lanka during the last few decades, and continue to be a problem. Solid wastes in the coastal environments were comprised of domestic wastes, solid wastes from recreational activities, tourism and other industry-based wastes, smoking-related wastes, and medical waste, etc. The sources of solid wastes in the coastal environment are mainly from land-based, coastal based and sea-based sources. Solid wastes accumulated in

the coastal zone especially on the beaches are from the inland of the country, reaching via rivers, streams, and other waterways. In addition, haphazardly dumping of solid waste by the coastal residents, beach users, tourism related establishments and fishing vessels and. infrastructure facilities contribute to aggravate the problem.

According to Yong Chang Jang (2018) there were 4.1 large (>25mm) and 158 small (5mm-25mm) debris per square meter of the beach. By usage classification, packaging material (55%) dominated the consumer products (25%) and fishing gear (20%). Plastic was the highest contributing (93%) material. Beaches close to a river mouth, city or with a barrier had greater debris accumulation.

In a study conducted in 2021 (Hitige and Samarkoon, 2021) to evaluate the status of solid wastes and waste management in the coastal environments of Sri Lanka 15 coastal environments of Sri Lanka were selected as the sampling locations. The methodology comprised analyzing the types of solid wastes and the composition of each type of solid wastes in a unit area. The sources of solid wastes governing marine litter were identified. The study revealed that there was an average of 4.2 kg and 50 pieces of debris per a square meter of beach. The results of the study presented that tourist beaches away from the town limits show the highest density of solid wastes and coastal environments in river mouths show the next highest. Plastic was identified as the dominant material governing marine litter in coastal environments. The study indicated that the lack of infrastructure facilities in the country, inappropriate and illegal waste dumping, absence of proper waste management systems, and less awareness on this issue governs the accumulation of solid wastes in the coastal environments and end up as marine litter. The study concludes that there is a need for utilizing proper waste management in the coastal environments with the effective use of available infrastructure facilities. At the same time, the need of promoting plastic recycling and acknowledging the community regarding the impact of solid wastes on marine litter is much needed. The study introduced a mobile application as a communication application to enhance the effective waste management of solid wastes with the available facilities and to motivate the community to save the coastal ecosystems of Sri Lanka

According to the above study it was revealed that the main types of solid wastes on the beaches comprised of plastic, glass, metal, wood, paper, polythene, and other floating materials.. **Table 4.5** depicts the nature and composition of solid waste on the beaches.

Table 4- 5: Overall percentage of each type of solid wastes collected in sampling locations in a unit area

<i>Material</i>	<i>Weight</i>	<i>Number</i>
Plastic	48%	41%
Glass	39%	8%
Metals	9%	10%
Woods	1%	3%
Paper and Polythene	1%	19%
Others	2%	20%

Source: LY Hitige et al. (2021) *International Journal of Environment, Agriculture and Biotechnology* Vol-6, Issue-5; Sep-Oct, 2021

Jambeck et al. (2015) estimate that, on average, 0.2 kg per person per day (ppd) of plastics is consumed worldwide. Sri Lanka is the worst country (5.0 kg/ppd), followed by the U.S. (2.59 kg/ppd) and South Africa (2.0 kg/ppd)

As per the current estimates, the amount of waste generated in the coastal provinces are approximately 7145 tons per day in which only 2769 tons per day (39%) being collected and disposed into final 213 disposal sites (Mervin Lal et al. 2020). The rate of waste collection by the Local authorities' island-wide is estimated to be about 2769(Tons/day) today but the problem is essentially urban and a major percentage of the waste is generated in the Western Province.

According to the study carried out by CEA, 46 major dumping sites have been identified, out of which, more than 80 % of dumpingsites are located in the northern and eastern provinces. Approximately 95 % of these dumping sites are being operated without environmental approval. Most of the dumping sites are open dumps and 04 % of dumping sites have used bare land and other sites are located in wetlands and marshy land directly or indirectly connected to the Coastal Zone. There is also the problem of garbage littering beaches near squatter settlements and tourist resorts and indiscriminate solid waste dumping within the shore area. Accumulation of solid waste on beaches results in degradation of water and floatable visual pollutants along the shoreline. The main constraint faced by many local authorities is inadequate facilities for safe disposal of solid waste due to the lack of environmentally safe dumping sites. **Table 4.6** depicts the amount of daily solid waste collected by municipalities in coastal provinces.

Table 4- 6 Amount of Solid Waste collected in Municipalities in Coastal Provinces

<i>Coastal Province</i>	<i>Generation Amount per day/Ton</i>	<i>Collection Amount per day/Ton</i>	<i>Collection Percentage</i>	<i>Number of final disposal sites</i>
Western	3502	1793	52%	52
Southern	1158	264	8%	60
North Western	1134	187	5%	45
Eastern	785	347	10%	40
Northern	566	178	5%	16
Total	7145	2769	38%	214

Source: Mervin Lal et al. (2020) Sri Lanka Journal of Social Sciences 09(01):72-85

4.3.8 Pollution from Agriculture and Aquaculture

Agriculture

The current information revealed that the use of chemical pesticides, herbicides, and fungicides in agriculture is at a significant level some of which are persistent. These substances degrade the soil as it absorbs contaminants in the leachate, culminating in the pollution of groundwater. Polluted groundwater used for agriculture and the resultant runoff from agricultural lands contaminates coastal surface waters. In addition, the excessive use of fertilizers causes nitrate pollution in coastal areas. As per the current estimates 396,888.8 MT of Urea, 144776 MT of MOP (Muriate of Potash), and 109,708 MT of TSP (Triple Super Phosphate), have been imported for agricultural purposes in 2012. As per the National Output, Expenditure, and Income (2021), in 2018, the (wholesale) fertilizer issues for the major crops of Tea, Rubber, Coconut and Paddy were 166,000 MT, 8,582,000 MT, 53,076,000 MT and 111,000 MT respectively. Most of the pollutants from the agriculture sector come to the coastal areas through radial river network in the country. In this respect, Kelani River has been identified as the largest transporter of the fertilizer and pesticide runoff to the coastal areas from the tea estates. It is also reported that Mahaveli River Estuary has been polluted with agrochemicals discharged by Mahaveli “H” Region.

The impact of agriculture on water pollution

On The SMA programme will be formulated in compliance with legal provisions and the new regulations as pee 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. Consequently, the artificial fertilizer importation and use in Sri Lanka has increased significantly. According to the 2012 figures, 396888 MT of urea, 144776 MT of MOP and 109708 MT of STP have been imported for agricultural purposes. As per the National Output, Expenditure and Income (2021), in 2018, the (wholesale) fertilizer issues for the major crops of Tea, Rubber, Coconut and Paddy were 166,000 MT, 8,582,000 MT, 53,076,000 MT and 111,000 MT respectively. These figures demonstrate the magnitude of the. chemical fertilizer usage in the country and possibility of coastal water pollution

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.

Much of the coastal pollution in the north-western 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 caused considerable pollution in the Dutch Canal and the surrounding coastal areas. Discharge of effluents into the Dutch Canal also led to spreading of diseases and collapse of the shrimp industry in the North-western province. High levels of nitrates and phosphates released from shrimp farms into the coastal waters have caused eutrophication of nearby water courses in the region and pollution of ground water. In considering the importance of eradicating the pollution level of the Dutch Canal, government had to spend approximately Rs. 130 million on rehabilitation measures. **Table 4.7** depicts the status of water quality during the final part of the pond harvesting.

Many aquaculture developments are planned in the northern and eastern provinces, both overland and in nearshore or lagoon water bodies and a possibility exists for significant coastal water pollution, if proper waste management measures are not adopted.

Table 4- 7: Water Quality in Farm Effluents during the Final Part of Pond Harvesting

	<i>Small scale farms</i>	<i>Medium scale farms</i>
Salinity	07- 45	08-43
pH	8.1-9.6	7.9- 9.5
Total ammonia (ppm)	0.628 - > 3.5	0.52- > 3.5
Nitrite (ppm)	0.624 - 4.92	0.65- 5.78
Nitrate (ppm)	2.6 - 5.2	2.5 - 4.8
Phosphate (ppm)	2.9 -3.3	2.5 - 3.6
Sulphide (ppm)	5.6- 7.2	4.4 - 6.8
Dissolved oxygen (ppm)	1.6 - 2.6	1.8 - 2.4
Total suspended solids (ppm)	522 - 1380	496- 1240

Source: COREA – ASLE 2009 *Pollution from Oil Spills and Other Discharges*

Six major commercial ports located around the island contribute topollution of coastal waters due to accidental release of oil. Poor receptionfacilities for waste oil, ballast and bilge waters cause the port waters to bepolluted. Such facilities, as well as pollution abatement plans, are a vital requirement to ensure pollution free Ports

4.3.9 Pollution from oil spills, other discharges and fishery harbours

Sri Lanka has six commercial ports around the island and oil pollution is a commonpollution identified. 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 fisheries harbours cause minor oil discharges and slicks. According to few studies carried out on water quality in Galle and Colombo harbor areas, it was revealed that the levels of BOD, COD, N and faecal coliform are higher than the proposed standard values for nature

conservation (Compendium on Coastal Pollution, 2014). Although the minor oil discharges and slicks may not cause serious impacts, they result in visual pollution leading to depreciation of the aesthetic quality of the beaches for recreation. There have also been four moderate spills of crude oil reported in Sri Lanka's marine waters and intrusion 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 end up in coastal waters, underlining the need for service stations to intercept the oil with interceptors. 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 Environment Protection Authority (MEPA) to collect the oil waste, which is pumped into bowsters directly from the ships. **Table 4.8** depicts the waste oil collected by the operators over the past six years at the Colombo Port. Even so the final disposal of this oil is not monitored by any regulating authority.

Table 4- 8: Amounts of Waste Collected or Removed by Collectors in the Colombo Port

<i>Year</i>	<i>Quantity</i>
2016	22871m ³
2017	26382m ³
2018	23835m ³
2019	27145m ³
2020	29598m ³
2021	29889m ³

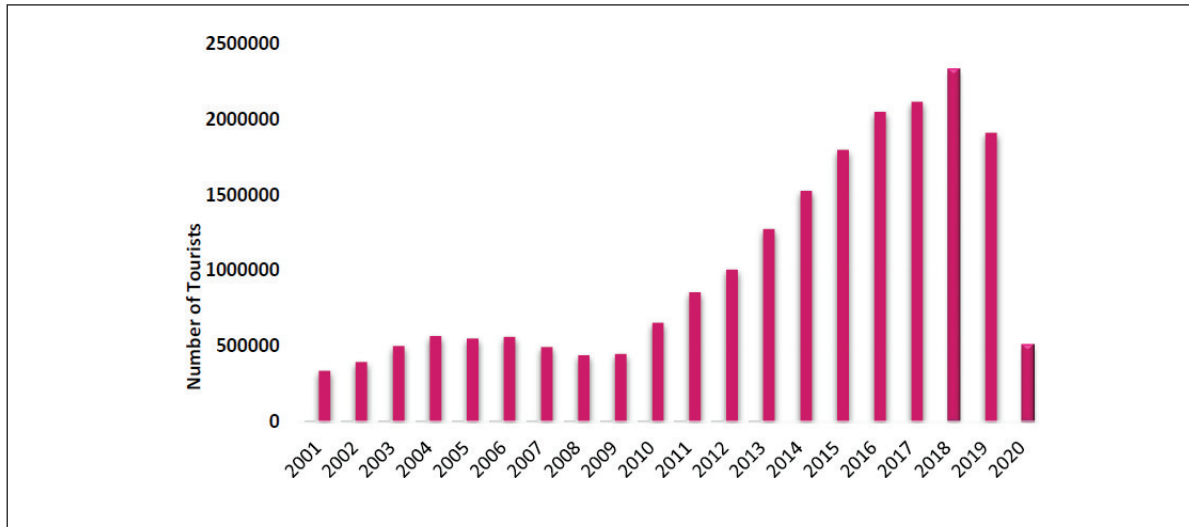
Source: Based on MEPA WRS Permits 2022

Despite green harbor concept advocated by CFHC, water quality in the majority of the fisheries harbours have been degraded and exposed to severe oil pollution, organic pollution and faecal contamination. Further it was reported that discharge of burnt oil, bilge water from fishing vessels, discharge of fish waste from fish degutting, accidental oil spillage during refueling and solid waste discharge from boat repairing as main sources and activities that led to increased pollution (Nirosha et al. 2013)

4.3.10 The Development of Maritime, Energy and Tourism Hubs and Potential Threat of Pollution

As per the government policy framework, three main economic hubs vis. Tourism, Maritime, and Energy hubs to be mainly located in the coastal region. A significant growth in the tourism sector has taken place in recent years with increasing tourist arrivals until 2018 after which the tourism sector after which it was significantly affected due to Easter bombings in April 2019 and the Covid pandemic conditions (**Figure 4.1**). A Strategic Plan for Sri Lanka Tourism 2022-2025 has been prepared by the SLTDA for recovery and expansion of the tourist sector in the country. The activities related to the development of maritime hub mainly deal with development of commercial harbours and related facilities on mass scale. In this respect the existing commercial harbours such as Colombo, Hambantota, Trincomalee and Galle will be developed. Plans have been developed by the SLPA to develop the Galle Port as a regional recreational and commercial port. The potential pollution threat from these developments cannot be ignored. Thus, it is essential to incorporate proper pollution mitigation measures at the planning stage and related issues should be addressed comprehensively.

Figure 4- 1: Tourist Arrivals in Sri Lanka (2001-2020)



Source: Annual Statistical Report 2020, SLTDA

4.3.11 Current Status of Coastal Water Quality in selected Coastal Segments

Although the continuous and spatially specific data on coastal water quality parameters were not available, an attempt was made to determine the conditions of water quality in 25 sampling locations from Norachcholai to Nilaveli using data gathered from different sources by Lanka Hydraulic Institute (LHI) under the study commissioned in 2014 by the CC & CRMD. A description of the sampling locations is given in **Table 4.9**.

Table 4- 9: Description of Sampling Locations

<i>Location</i>	<i>Description</i>
Norachcholai	Close to coal fired thermal power plant
Chilaw Beach	Famous bathing site
Ambakandawila	Water intakes located near shrimp hatcheries
Marawila	Bathing site, tourism, industries, hatcheries
Negombo Beach	Bathing site, tourism activities
Kelani River Mouth	River outfall
Mutwal	Waste water sea outfall
Colombo	Commercial harbor
Wellawatta	Waste water sea outfall
Mount Lavinia	Bathing site, tourism activities
Wadduwa	Bathing site, tourism activities
Kalutara - Moragalla	Bathing site, tourism activities
Beruwala	Bathing site, tourism activities
Bentota	Bathing site, tourism activities
Hikkaduwa	Bathing site, tourism activities
Galle	Commercial harbor

<i>Location</i>	<i>Description</i>
Unawatuna	Bathing site, tourism activities
Koggala	Industry, Tourism
Weligama	Tourism, fishing activities
Polhena	Bathing site, Tourism activities
Bata-Atha	Industry
Tangalle	Bathing site, tourism activities
Mirijjawila	Industry, tourism
Arugam Bay	Bathing site, tourism activities
Nilaveli	Bathing site tourism activities

Source: CC&CRMD 2014

During the water quality data analysis, attention was paid by the study team on analyzing parameters such as pH, Dissolve Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen (TN), Total Coliform (TC), Faecal Coliform (FC) and Oil and Grease. Accordingly, it was revealed that pH levels in sampling locations stayed within natural coastal water quality conditions reflecting a pH level of 7.8 and 8.4. The DO levels in the sample locations except Colombo do not indicate depletion below the standards. In terms of BOD levels, the analysis revealed that Mutwal, Wellawatta and Galle satisfy only the CEA non-consumption use standards while all other sampling locations do not satisfy both bathing and non-consumption use standards. As per the CEA standards for bathing, the recommended COD value must be lower than 20/mg^l. However, Mutwal and Kelani River Mouth have satisfied CEA bathing standards and the COD values of all other locations do not satisfy both standards. Although the CEA has not specified a standard, acceptable range is 2 mg/l to 6 mg/l. According to the analysis, it was indicated that TN values measured in Kelani River Mouth, Mutwal, Colombo, and Wellawatta were not in an acceptable range. This situation may be due to discharge of untreated sewage and contamination by fertilizer. In accordance with CEA standard for bathing, TC value has to be lower than 1000 MPN/100 ml while the recommended value for non-consumption uses, value has to be lower than 2000 MPN/100 ml. The analysis revealed that TC concentration values for non-consumption uses in all sampling locations are well within the non-consumption use standard. However, famous bathing sites such as Mount Lavinia, Kalutara, Unawatuna, Bentota and Polhena are not safe for direct contact activities. Concerning faecal coliform (FC), the acceptable bathing standard has to be lower than 50 MPN/100ml and for non-consumption uses has to be lower than 600MPN/100ml. The analysis shows higher FC concentration than the acceptable levels for bathing in all sampling locations except in Beruwala, Galle and Mirijjawila sampling locations. Further, FC values in Norachchola, Chilaw, Marawila, Wadduwa, Bentota, Koggala, Unawatuna, Weligama, Tangalle and Bata-atha satisfy the non-consumption use standards. The oil and grease content of all sampling locations shows higher concentration in monsoon periods. However, it has to be lower than 200 mg/l.

4.4 PLANS, POLICIES AND IMPLEMENTATION STRATEGIES

Although the coastal pollution is one of the major environmental issues in the Coastal Zone, it was not addressed in the first-generation Coastal Zone Management Plan of 1990. However, in considering the importance and priority, it had been brought in to the revised CZMPs of 1997, 2004 and the CC&CRMP of 2018. Besides policies, strategies and actions introduced through CZMPs and the CC&CRMP, there are many policies, laws and programmes in place that have a bearing on controlling pollution including coastal water pollution. For instance, major development projects taking place in the Coastal Zone (except fishing) are subject to Environmental Impact Assessment (EIA) procedures. These include the prescribed projects listed in the National Environmental Act, No. 56 of 1988, with the CC&CRMD functioning as the Project Approving Agency and other projects in the Coastal Zone identified by the DG of the CC&CRMD as those require undergoing EIA procedure.

In 2020, the Ministry of Environment introduce National Waste Management Policy to make all the citizens and institutions legally responsible to engage in waste management, sensitize citizens, institutions, waste managers and

service providers continuously on the need to be accountable and responsible to manage wastes, ensure availability of facilities and infrastructure for treatment and final disposal, minimize final disposal of waste by retaining its resource utilization value throughout the life cycle, enhance effectiveness and efficiencies of existing waste management systems/practices and promote new systems for avoidance, prevention and/or minimization of waste with appropriate technology and practices, improve efficiencies and effectiveness of existing appropriate markets, promote new markets with appropriate innovative technologies and partnerships, reduce risks to public health, environment, and ecosystems and improve occupational health & safety of waste handlers; and enhance effective partnerships to meet international obligations in waste management moving beyond compliance.

The vital regulatory tools in place that could curtail industrial pollution up to some extent in coastal waters are the 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.

Despite the pollution control activities being carried out by other institutions such as CEA, MC, NWSDB, and MEPA, the CC&CRMD is also currently engaged in various corrective and preventive activities to either control or minimize water pollution in the Coastal Zone. Many of these activities require mechanisms for effective coordination and collaboration with other institutions and agencies. For instance, the 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 underserved settlements in Colombo is also being addressed by many agencies.

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 nearshore waters, lagoons and estuaries, and inland in the Coastal Zone. The MEPA is mandated to control the pollution of marine waters, but only when it involves offshore sources. Several agencies such as the BOI, CEA and CC&CRMD, however, have the authority to monitor water quality in the Coastal Zone and to regulate discharges from development activities. Additionally, some line agencies such as NARA, NWSDB, SLRDC and ITI and the 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. However, it is required to review the changes in water quality due to seasonal effects in detail and have to be addressed more adequately before finalization. Ambient water quality standards for inland surface water (i.e. any standing or flowing water on the surface of the land extending up to the boundary of the coastal water) have been *gazetted* in 2019 (No. 2148/20 - TUESDAY, NOVEMBER 05, 2019). 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 the control of collection, storage, transport, and disposal of hazardous waste were gazetted in 1996, and the Ministry of Environment has introduced a hazardous waste management system through the licensing scheme as per the regulations stipulated under Part 11 of the National Environmental (Protection and Quality) Regulations No. 1 of 2008. 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.

4.5 FUTURE DIRECTIONS FOR MANAGING COASTAL POLLUTION

To ensure the sustainability of the economic development thrust put in place on the coastal region, it is essential to manage coastal pollution by formulating and implementing adequate strategies. In addition to the regulatory measures focusing on compliance, it is necessary to adopt comprehensive and effective programmes targeting awareness creation, infrastructure development, research, monitoring of point and non-point sources and water use zonation schemes.

Although the problem of coastal pollution including water area, beach and the coastal land is a major issue to be addressed in the management of coastal resources, the CC&CRMD 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 the Provincial Agencies and the Local Authorities to play an effective role in monitoring coastal water bodies and compliance checking within their jurisdiction. A budgetary allocation to monitor coastal pollution by each Provincial agency/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 appropriate interventions are required to rectify conditions in coastal water bodies that are of poor quality.

Laws and regulations as well as awareness creation 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. Additionally, careful attention should be placed on formulation and introduction of a coastal water zoning scheme in compliance with the sensitive economic activities which are expanding in the coastal region.

4.5.1. Requirement of Coastal Water Usage Zoning Scheme and Specified Criteria

To minimize issues pertaining to coastal water pollution and to ensure sustainability of economic activities in the coastal region, water usage zoning should be introduced based on sound socio-economic and ecological information. Zoning is commonly employed as a land and water use planning and regulatory tool to guide and direct the type of development most favorable or advantageous to the growth and development of an area considering the ecological constraints and the socio-economic objectives. Water zoning scheme can ensure that different development activities take place at the sustainable level that maximizes the benefits and limits negative impacts on the environment. In addition, zoning can be used to separate different incompatible uses and to minimize user conflicts while conserving the coastal ecosystems.

Requirements for successful implementation of water zoning scheme

- (i) Presence of legal mandate and adequate legal provisions
- (ii) Sound ecological and socio-economic information on the target environment
- (iii) Local participation in enforcement
- (iv) Shared governance and partnership
- (v) Ensuring sustainable financing
- (vi) Involving all stakeholders in zonal planning process
- (vii) Acknowledging multiple uses of marine and coastal zones early in the planning process
- (viii) Law enforcement agencies need to be made aware of the zones.

To prevent pollution in sensitive areas of coastal waters, it is necessary to classify it into different zones as indicated in the **Table 4.10**.

In view of the current economic development pressures and the rapid population growth taking place in the coastal region, it is necessary to pay careful attention to adopting coastal water zoning scheme in the near future. Thus, an attempt has to be made to fulfill the important pre-requisites to formulate coastal water zoning scheme through this plan. Until water zoning is adopted, the new legal provisions introduced on “Affected Areas” and “Conservation Areas” through Coast Conservation Amendment Act, No. 49 of 2011 could be used to achieve similar objectives at least up to some extent.

Table 4- 10: Proposed Classifications for Coastal Water Usage Zoning

<i>Description</i>	<i>Usage</i>
Recreation	Water contact recreation non-water contact recreation
Nature Conservation	Ecosystem conservation, Science and education, Aesthetic enjoyment
Fishery of Shellfish	Fishery of shellfish (Mollusca) Aquaculture of shellfish (Mollusca) Salt pans Ornamental production
Fishery of Finfish	Fishery of finfish Aquaculture of finfish Fishery of non-mollusk invertebrates Aquaculture of non-mollusk invertebrates
Non-consumptive uses	Non-water contact recreation Navigation Harbour Sand mining Mineral extraction
Consumptive uses	Drinking (After desalination) Domestic purposes

4.6 MANAGEMENT OBJECTIVES, POLICIES, STRATEGIES AND ACTIONS

Objective 1

Acceptable water quality for different beneficial designated uses is maintained by adhering to regulations/guidelines stipulated on the discharge of untreated or/and partially treated effluents from development activities to coastal and marine waters.

Policy 1.1

All existing development activities will be managed in terms of water quality by CEA emissions standards or National Environmental (Protection and Quality) Regulations

Strategy 1.1.1

Ensure that all existing development activities in the coastal region (comply with CEA standards for effluents discharge through regular monitoring of coastal water quality.

Proposed Actions

1. Expand, strengthen, and continue the ongoing water quality monitoring programme of CC & CRMD to check ambient water quality in the coastal waters to capture high incidences of pollution and help identify polluting development activities in the area.
2. Direct findings of the monitoring studies to the relevant institutions for necessary actions.
3. Identify low and high-polluting development activities in the coastal region and prepare a database in collaboration with the CEA.
4. 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.

5. Promote the formulation of effluent standards for those development activities that do not have disposal standards (e.g., for aquaculture, reject water from desalination plants), in collaboration with the relevant authorities.

Policy 1.2

High-polluting industries will be scrutinized to ensure that the ambient water quality in the Coastal Zone is not impaired.

Strategy 1.2.1

Identify high-polluting industries and facilitate their access to technology for controlling the emission of effluents degrading ambient water quality of the Coastal Zone; encourage and assist relevant authorities responsible for scrutinizing such industries regularly.

Proposed Actions

1. Co-ordinate with the relevant authorities and stakeholders by providing necessary information on high-polluting industries through regular monitoring in the Coastal Zone.
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 in providing possible financial incentives to industries to enable them to obtain better pollution abatement technologies.
4. Conduct outreach programmes to create awareness among high-polluting industries located in the on the importance of maintaining a pollution-free Coastal Zone.

Policy 1.3

Development activities resulting in the emission of effluent/wastewater to be discharged into designated environmentally sensitive areas/conservation areas will be managed strictly adhering to special conditions on ambient water quality.

Strategy 1.3.1

Carry out periodic monitoring in the Coastal Zone at selected sites to check whether new developments can be permitted in them without exceeding the maximum permissible levels of ambient coastal water quality standards/parameters stipulated in the guidelines prepared by CC&CRMD/CEA for various designated uses.

Proposed Actions

1. Select sites of critical economic/ecological importance in the Coastal Zone and establish ambient water quality for each site with spatial and temporal water quality monitoring. Identify potential designated use/s within Conservation Areas and Affected Areas to be declared under the provisions of the Coast Conservation Amendment Act, No. 49 of 2011 in consultation with other relevant authorities/ stakeholders and make regulations to control other uses/development activities.
2. Identify sites where new developments can be permitted, based on designated use/s and ambient water quality of the site.
3. Carry out a study to identify likely sources of pollution at 'Critical Sites'/Conservation Areas where ambient water quality in the Coastal Zone does not match designated use/s, and propose appropriate interventions for pollution abatement to enable further development.

Objective 2

Coastal and Marine Water Quality in the Coastal Zone is enhanced by management of pollution sources.

Policy 2.1

Any type of waste or foreign matter either disposed of in the Coastal Zone directly or disposed of elsewhere but the impact is felt within the Coastal Zone will be managed so as not to affect water quality in the Coastal Zone adversely.

Strategy 2.1.1

Encourage and mobilize relevant authorities to prepare waste management plans to reduce adverse impacts on water pollution in the Coastal Zone.

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 authorities.
2. Identify urban centres, industries, coastal tourist centers, fishing harbours and other areas emitting solid waste for which solid waste plans are urgently needed.
3. Assisting Local Authorities to identify alternate dump sites in environmentally less vulnerable locations for relocation of dump sites in the Coastal Zone.
4. Monitor the environmental degradation of sites located within the Coastal Zone affected by the dumping of solid waste.
5. Encourage and assist 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. Frame regulations to curtail dumping of solid waste into designated “Conservation Areas”, “Affected Areas” and declared “Special Management Areas”.

Policy 2.2

Faecal pollution of coastal and marine waters in the Coastal Zone will be managed with collaborative action with Local Authorities and other relevant agencies.

Strategy 2.2.1

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

Proposed Actions

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.
3. Make the Local Authorities aware of the problem and the sites and assist them in reducing faecal contamination.
4. Provide findings of the monitoring studies carried out on water quality in the Coastal Zone at respective sites to the, SLTDA, hoteliers and relevant civil societies as appropriate, so that they can assist in taking corrective action.

Policy 2.3

Oil spills in the Coastal Zone will be managed to minimize the degradation of coastal resources.

Strategy 2.3.1

Identify the major sources of oil discharge in the Coastal Zone and formulate curative/remedial action in collaboration with relevant authorities.

Proposed Actions

Coordinate with MEPA to identify sources of oil discharges into the Coastal Zone.

Formulate and implement programmes with relevant authorities to reduce or capture oil discharge into the Coastal Zone, particularly in harbours and SMA sites.

Promote and assist CFHC in implementing the green harbor concept.

Conduct awareness programmes together with MEPA, CFHC, DFAR, and PA (?) to make stakeholders aware of the need to minimize oil pollution.

Policy 2.4

Salinization of the coastal and marine waters will be managed within the Coastal Zone in a manner that will not create adverse impacts on ambient water quality.

Strategy 2.4.1

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

Proposed Actions

1. Identify likely areas with high nitrate pollution and salinization, based on objective criteria.
2. Monitor sites affected and collaborate with relevant authorities to reduce the pollution mentioned above.
3. Make the Local Authorities aware of the problem and assist them in reducing faecal contamination at sites that are known to be highly polluted, sites of high economic value, critical ecosystems, places of scenic beauty or archaeological and cultural value.

Objective 3

Pollutants entering coastal and marine waters in the Coastal Zone are estimated through regular monitoring and research and development.

Policy 3.1

Identify pollution loads in major surface waters entering the Coastal Zone, and enable improving water quality in collaboration with relevant agencies.

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 and marine 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 the pollution of coastal groundwater.

Strategy 3.2.1

Collaborative activities on surveillance of groundwater quality and quantity will be undertaken in the Coastal Zone to ascertain the likely changes.

Proposed Action

1. Select critical sites of high economic value in the Coastal Zone, and monitor water quality of such sites with designated water uses.
2. Assist relevant authorities in abating incidences of coastal groundwater pollution.

Objective 4

Coastal and marine water pollution in the Coastal Zone is managed through education and the dissemination and sharing of information using strategic communication.

Policy 4.1

Collaborative programmes will be undertaken with relevant agencies/NGOs to educate stakeholders on pollution sources, effects and impacts, and control mechanisms.

Strategy 4.1.1

Undertake collaborative programmes with competent agencies for training and skills development for the improvement of water quality in the Coastal Zone.

Proposed Action

1. Carry out a needs assessment to identify the target groups and specific issues and needs that are to be addressed.
2. Identify pressure groups and communication mobilizers 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 pollution sources/types, level of pollution, and abatement methods.

Policy 4.2

Target groups directly or indirectly involved with pollutant emission will be identified and made aware of the adverse impacts of coastal and marine water 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, policymakers, etc.) connected with coastal pollution.

Proposed Action

1. Together with communication partners /relevant organizations, 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 customized training/awareness programmes for selected target groups based on communication needs.
3. Organize 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.

Objective 5

Coastal pollution due to solid waste and marine litter will be minimized through a multifaceted collaborative management approach

Policy 5.1

Coastal pollution due to dumping of solid waste and discharge of marine litter into a coastal zone will be recognized as high-priority management issue that requires multifaceted management interventions.

Strategy 5.1.1

Assessment of impact pathways (tracking waste generation) and degree of social, environmental, and economic impacts of dumping/discharge of solid waste and marine litter/microplastic into the coastal zone

Proposed Action

1. Conduct a study to determine the nature, origin, and spatial distribution/characteristics of the solid waste/microplastics in the coastal zone
2. Identify significant hotspots to formulate marine debris pollution management plans

Strategy 5.1.2

Effective institutional mechanism will be established in collaborative manner to manage pollution due to solid waste in the coastal zone.

Proposed action

1. Promote and strengthen collaborative management with effective participation of local authorities, MEPA, SLTB, and CEA to minimize coastal pollution due to solid waste in the coastal zone
2. Promote the establishment of dedicated incentive scheme for the local authority workers engage in solid waste management in the coastal zone with the patronage of private sector

Policy 5.2 Promote behavioral instruments, which use people's social preferences and/or cognitive limitations to influence behavior in favor of lower plastic pollution.

Strategy 5.2.1

Design and implement behavioral interventions constitute of information provision, pure nudges, and moral nudges to reduce disposal of plastic litter into the coastal environment.

Proposed Actions

1. Strengthen local authorities as well as the civil society through proper awareness creation programmes to enable to fostering an overall attitude change in consumption and disposal behaviours.
2. Implement door-to-door information campaign among tourist hotels, coastal dwellers and fishing communities with the participation of civil society organizations.
3. Promote corporate sponsorship for beach cleanup initiatives.

Policy 5.3 Promote upstream management of solid waste entering the waterways directly or indirectly connected to the coastal zone.

Strategy 5.3.1

Coordinate to establish a participatory institutional mechanism constituted with local authorities, the Department of Irrigation, community groups (river and canal bank dwellers), and Non-governmental organizations to prevent solid waste entering the waterways

Proposed Action

1. Assess the significance of solid waste entering into the upstream areas of the waterways connected to the coastal zone.
2. Formulate an outreach programme to educate and make aware river/canal bank dwellers.
3. Establish waste traps with the collaboration of relevant organizations.

Policy 5.4: Promote sharing of data and information collected through monitoring, research, and development on coastal pollution in the coastal zone and from influenced areas to enable to develop effective management strategies and action.

Strategy 5.4.1

Develop an institutional network for the collaborate sharing of data and information on coastal pollution, utilize new technologies, engage communities, and leverage international cooperation.

Proposed Action

1. Create a centralized platform to enable sharing of coastal pollution-related data and information.
2. Establish an institutional network constituting agencies involved in coastal pollution-related research, monitoring, regulating, development, and awareness creation.
3. Create public data portals where researchers and the public can freely access non-sensitive data related to coastal pollution.

4. Utilize Geographic Information Systems (GIS) to visualize and analyze spatial data on coastal pollution.
5. Launch an awareness creation programme among institutions to promote monitoring of data-sharing practices for coastal pollution control.
6. Develop and implement ethical guidelines to ensure responsible use and sharing of coastal pollution data among institutions leading to better-informed decisions.

REFERENCES

1. Arjuna's Atlas of *Sri Lanka*, ed. T. Somasekaram, M.P. Perera, and H. Godellawatta, Dehiwala: Arjuna Consulting Co. Ltd., 1997.
2. 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.
3. Central Bank of Sri Lanka, 2001. *Annual Report of 2000*. Colombo: Central Bank of Sri Lanka, Sri Lanka.
4. Central Bank of Sri Lanka, 2002. *Annual Report of 2001*. Colombo: Central Bank of Sri Lanka, Sri Lanka.
5. Central Environmental Authority (2016), Directory of Prescribed Activities in Sri Lanka. (Industrial Database)
6. Central Environmental Authority, 2005, Database of Municipal Solid Waste Management.
7. Coast Conservation Department, 2014, Information Compendium on Coastal Pollution, (Unpublished report).
8. Coast Conservation Department, *Revised Coastal Zone Management Plan*, 2004
9. Corea ASCE, 2009, *Trends in Water Quality changes in Main Water Sources for Shrimp Culture and the need for Standards for Shrimp Farms Effluents*
10. 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
11. Department of Census and Statistics, 2001. *Census of Population and Housing 2001: preliminary release*. Colombo:, Department of Census and Statistics.
12. Department of Government Printing, 1992, *Gazette Extraordinary* 595/16 of 02.02.92
13. Department of Government Printing, 2008 *Gazette Extra Ordinary* 1534/18 Dated 01.02.2008.o.
14. Jayaweera, M. 1999. *Environmental Improvement Study, Port of Colombo*. Unpubl. Sri Lanka Ports Authority.
15. Manage, P., Liyanage, G., Abinaiyan, I., Madusanka, D., & Bandara, K. (2022). Pollution levels in Sri Lanka's west-south coastal waters: Making progress toward a cleaner environment. *Regional Studies in Marine Science*, 51, 102193. <https://doi.org/10.1016/j.rsma.2022.102193>
16. Manchanayake, E.P. and C. M. Madduma Bandara, 1999. *Water Resources of Sri Lanka*. Colombo: National Science Foundation.
17. Marine Pollution Prevention Authority, 2002. Database on accidental spills in Sri Lankan waters.
18. Ministry of Environment (2020) National Waste management Policy.
19. 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.

20. MOFE (1999). *Database of Municipal Waste in Sri Lanka*. Colombo: Ministry of Forestry and Environment.
21. MOFE, 2000. *The National Strategy for Solid Waste Management*. Colombo: Ministry of Forestry and Environment, Sri Lanka.
22. MOFE, 2001. *State of the Environment. Sri Lanka*. Colombo: Ministry of Forestry and Environment.
23. Mubarak, A.M. 2000. Water Pollution. In: *Natural Resources of Sri Lanka 2000*. Colombo: National Science Foundation.
24. P.M. Manage et al. (2022), Pollution levels in Sri Lanka's west-south coastal waters: Making progress toward a cleaner environment.
25. Status of Solid Wastes and its Management in the Coastal Environments of Sri Lanka LY Hitige¹, TMWRMB Samarakoon International Journal of Environment, Agriculture and Biotechnology Vol-6, Issue-5; Sep-Oct, 2021.
26. UDA, 1994 b. *Colombo Environmental Improvement Project*, Colombo: Urban Development Authority, 1994.
27. UDA, 1994a. *Environmental Management Strategy for Colombo Urban Area – (III)* : Colombo, Urban Development Authority.
28. University of Moratuwa, 2001. *Feasibility study report for establishment of a central wastewater treatment plan for Ratmalana/Moratuwa industrial/residential areas*, Unpublished. University of Moratuwa.
29. Yong Chang Jang Etal.(2018) “Composition and abundance of marine debris stranded in beaches of Sri Lanka.
30. Ms. Johanna Doerpinghaus, Mr. Amarnath Munnolimath and Ms. Jana Hack – adelphi, Germany, Mr. Samantha Kumarasena and Ms. Nisansala Ranundeniya – National Cleaner Production Centre (NCPC), Sri Lanka POLICY BRIEF (Input Paper): Prevention of Marine Litter in Sri Lanka-(2021).
31. F. Alpizara,b, et al. , (2020) A framework for selecting and designing policies to reduce marine plastic pollution in developing countries.
32. K.H.H. Nirosana¹*, H.B. Asanthi² and P.B.T.P.Kumara (2013), An assessment of water quality and pollution in Puranawella Fishery Harbour, Dewinuware, Sri Lanka.

CHAPTER 5 - SPECIAL MANAGEMENT AREA (SMA)

5.1 INTRODUCTION

Special Management Area (SMA) is a crucial approach to coastal resource management that recognizes the unique characteristics and vulnerabilities of specific coastal areas. It focuses on integrating conservation, sustainable development, and resource management in a comprehensive manner. The importance of SMA in coastal resource management lies in several key aspects: Integrated management approach, conservation of coastal bio-diversity, sustainable coastal resource utilization, climate change adaptation, pollution control, resilience and disaster risk reduction, and stakeholder engagement and community participation.

5.1.1 The Concept

The Concept of Special Management Areas (SMA's) previously referred to as Special Area Management (SAM) has been identified as one of the important management tools in the field of Integrated Coastal Resources Management (ICRM) when the coastal resources are subject to increasing pressure from economic development, increasing population and poverty conditions in the coastal region in Sri Lanka. In addition, the requirement of a new policy

for an integrated collaborative management approach with specific attention to the social and economic needs of the coastal resource users and other stakeholders led to the concept of SMAs. Furthermore, the need for active involvement of the stakeholders of the coastal resources on a site-specific basis was further advocated by various quarters due to inadequate outcomes of the other national Coastal Zone Management (CZM) policies. Thus, Special Management Area Planning was conceived as a “bottom-up” approach for managing coastal resources that complements the “top-down” regulatory approach practiced by the CC&CRMD since its inception. The concept of Special Management Areas (SMA's) evolved based on the co-management principles and involves a collaborative, adaptive and flexible approach to sustainable resource management within a defined geographic area, was formally introduced as an auxiliary CZM policy through the National Coastal Zone Management Plan of 1997. The CZ&CRMP emphasizes the implementation of the “bottom up” approach more strongly in planning Special Management Areas.

Prior to formal adoption, the concept was tested on the ground in two pilot sites at the Hikkaduwa and Rekawa under the Coastal Resources Management Project funded by USAID in 1992. The pilot initiative contributed to demonstrating the potential of adopting the SMA process as an effective tool to manage coastal resources in a collaborative manner. Based on the experience gained from the pilot testing of SMA, the report “*Coastal 2000; Resources Management Strategy for Sri Lanka's Coastal Region*” also recommended the design and implementation of Special Management Area Plans for the specific coastal sites with special ecological and economic significance. Although SMA planning has been tested and formally adopted by the 1997 National CZMP, there were no legal provisions to formulate and implement the SMA Plans formally until the new legal provisions were introduced through the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981 as Amendment Act, No. 49 of 2011. Thus, at the initial phase of the process, administrative arrangements had been made to formulate and implement SMA Plans with the involvement of stakeholders constituting the community, local support institutions such as Pradeshiya Sabas, Divisional Secretariats, outside local beneficiaries, central government institutions such as DWLC, Forest Department, and the external stakeholders. Thus, stakeholder collaboration is sought through awareness creation, education and research formulated according to the Coast Conservation Amended Act, No. 49 of 2011.

5.1.2 Evolution and Operational Experience

The experience gained from the implementation of first generation CZMP prepared in 1990, calls for a greater emphasis on local-level stakeholder participation in managing coastal resources. This requirement stemmed mainly from the strong relationship that exists between the coastal resources and the resource users. The necessity for stakeholder participation further flared up with the nature of the open access regime of the coastal resources. Thus, the SMA planning and implementation process has been adopted with the participation of resource users, considering their social and economic needs, complementary to the heavy emphasis on command-and-control measures adopted in managing coastal resources.

The initial phase of the SMA planning and implementation in Sri Lanka was preceded by two pilot projects at the Rekawa Lagoon and the Hikkaduwa Marine Sanctuary in 1992. This initiative was carried out by CC&CRMD with the financial and technical assistance provided under the Coastal Resources Management Project (CRMP) of USAID. The viability of the SMA concept in the local scenario was tested at both sites. Based on the attractive outcome and novel experience gained from these initiatives, the second-generation CZMP of 1997 endorsed the SMA process by recommending the formulation and implementation of Special Management Area (SMA) Plans for 23 selected coastal sites. In addition, the “Coastal 2000” Strategy for coastal Resources Management also advocated the SMA concept. The SMA site selection was based on the following criteria:

- a) The severity of social, economic, and environmental issues prevailing in the sites.
- b) The relative richness and abundance of coastal ecosystems,
- c) The feasibility of management based on size, location, legal and institutional factors.
- d) The existing or potential value of economic development in the area.

In addition to the site selection criteria, planning steps to be followed in the planning process were also spelled out in the 1997 CZM Plan. In 2005, CC&CRMD and the International Union for Conservation (IUCN) with financial assistance provided by the Global Environmental Facility (GEF) under the United Nations Development Programme (UNDP) formulated and implemented a Special Management Area Plan for Rekawa, Ussangoda, Kalametiya (GEF- RUK) coastal ecosystem covering 20 coastal GND's. The goal of this SMA plan was to ensure the sustenance of the natural resources of the RUK coastal ecosystem while optimizing the social well-being of the communities residing in the Special Management Area.

Subsequently, the CC&CRMD, under the support of the CRMP of 2000-2007 funded by ADB has extended the second round of the fully-fledged SMA process to several sites, namely the Kalpitiya 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 reach in Hambantota.

In addition to the SMAP formulation and implementation in compliance with the 1997 CZMP, CC&CRMD has introduced the concept and related activities into district-level projects. This has led to the incorporation of SMA planning activities in the Hambantota Integrated Coastal Zone Management Project (HICZMP) funded by NORAD, where SMAP activities focused on the Hambantota Dunes and the Mawella Lagoon - Kudawella (Blow hole) coastal area. The 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 identified activities of the SMA process during the planning phase.

5.2 LESSONS LEARNT AND DRAWBACKS

By and large, the SMA planning and implementation initiatives related to Coastal Resources Management in Sri Lanka were largely driven by the government sector which was being led by the CC&CRMD. A total of 12 SMA plans have been formulated and implemented by CC&CRMD since 1992, under four distinct foreign-funded projects. During the last two decades, a number of evaluation/reviews on SMA process in Sri Lanka were carried out by Lowry K et al., (1997), Ingegerd Landstorm (2006) De Silva Sanjive et al., (2012), CC&CRMD (2014). In addition, the in-house discussions were carried out among the CC&CRMD officials Based on the findings of the above reviews and evaluations, the lessons learned and drawbacks identified from the past experience could be highlighted in the main areas of legal and institutional, effectiveness and impacts, sustainability, and challenges as described below:

5.2.1 Legal and Institutional

In terms of the legal and institutional aspects of the SMA, the following lessons and drawbacks have been experienced in the past and are summarized;

- All the formulated and implemented SMA plans demonstrate clear evidence that the administrative or collaborative arrangement itself is not effective without a proper legal framework.
- The Community Coordinating Committees which have oversight on the implementation of the SMA plans are not legally recognized in the CC Act or any other statute. The failure to either statutorily or administratively recognize the CCC's emasculates its authority to implement SMA plans. The functionality of the Community Coordinating Committees (CCC) set up under the planning and implementation process of the SMA was at a standstill in all sites in the absence of a catalytic role and the financial and technical resources of the respective projects.
- The key roles played by the Divisional Secretaries in the planning and implementation process at the initial stages have disappeared during the post-project process over time due to the absence of legal and institutional recognition of their role. In addition, the capacity, resources and orientation of the local-level officials also did not match the envisaged roles to be played by them during the post-project period.
- The auxiliary institutional arrangements made through forming new NGOs and strengthening the existing NGOs to ensure the continuation of the SMA process had failed in many instances.

- After completion of the project phase, the CCCs have to be fully dependent on external donor support for post-project implementation, especially with respect to the implementation of large interventions. The spontaneous switch between total financial dependent status to total independent status does not provide an interim period for consolidation and evolution of institutional capacities and processes.
- The absence or lack of prospects of statutory authority, recognition as well as individual benefits for the community created negative impacts on participation in the SMA implementation process.
- Lack of transparency in local organizations structure and operation has negatively influenced the decision-making process and distributing/sharing benefits.
- Failed to appreciate the influence of community and intragroup heterogeneity on building participatory and consensus-based resource governance.
- Past SMA planning experience reveals that in the process of negotiations with multiple stakeholder groups, a broad range of differentiating factors influence on participation and consensus building in the planning and implementation process.

Although the national policy documents provide guidance for a locally driven collaborative management process in SMA planning, central agencies retain the decision-making functions within their own agencies and strong local organizations have not emerged due to a lack of institutional follow-up and effective social mobilization.

5.2.2 Effectiveness and Impacts

- The past experience revealed that to ensure long-term sustainability and effectiveness, SMA should be a part of the comprehensive national-level CRM planning and management effort.
- The overall status of the SMA process in the majority of the sites indicated approximately 50% of effectiveness (Evaluation of SMA Programme in Sri Lanka 2014).
- The status of conservation measures initiated by other agencies has improved as a result of the SMA process (Evaluation of SMA Programme in Sri Lanka 2014).
- The overall awareness of the importance of coastal resource management among stakeholders increased notably.
- The SMA planning and implementation process has created a sense of ownership among stakeholders and community enthusiasm enhanced.
- Largely the livelihood development initiatives carried out under the SMA process to ensure the social and economic well-being of the communities have created little impact due to the sustainability issues encountered.
- While ensuring sustainability, greater impacts have been created through the implementation of interventions that create common/ individual benefits among stakeholders.
- In terms of objectives of the SMA plans vs. the actual achievements, it was revealed that the majority of the investigated SMA sites accomplished noticeable (Evaluation of SMA Programmes in Sri Lanka 2014).

5.2.3 Sustainability and Challenges

As per the evaluation carried out on the selected SMA sites in 2014, sustainability was measured using the following criteria;

1. Functioning of CCC after the project period.

2. Continuation of Institutional mechanism set up by the project.
3. Continuation of financial support from other sources for SMA.
4. Continuation of projects and programmes introduced by the SMA process.
5. Involvement of CC&CRMD after the project.
 - It was revealed that irrespective of the lead agency involved in SMA, all the CCCs set under the projects were not functioning after the project period.
 - No financial support for the SMA process has been continued after the project period, except in a few instances.
 - The majority of the projects and programmes have not been continued after the project period except in a few instances.

Apart from the above, the following inadequacies also contribute to the lack of sustainability of the SMA process in the past;

- The lack of pertinence of technical solutions adopted in conservation measures created negative impacts.
- The impacts of policies related to the other sectors have negatively impacted the SMA process creating threats to sustainability.
- The CBOs and NGOs actively involved in the SMA process have limits that prevent the achievement of major objectives.
- Accommodating new economic policies in SAM planning and implementation is a major challenge due to the inadequate application of environmental valuation.
- Setting up an institutional mechanism, in compliance with the existing legal provisions will be a great challenge for ensuring the sustainability of the SMA process.

5.3 ROOM FOR COLLABORATION: NEW LEGAL PROVISIONS FOR SPECIAL MANAGEMENT AREA (SMA)

The SMA process has been recognized as a strong collaborative coastal resource management policy and is facilitated through strengthening policy and legal framework for wider participation and collaboration. Even though the policy and legal framework were strengthened in 2011, the status of implementation shows poor performance in the recent past due to the COVID pandemic prevailing in the country and the lack of commitment and involvement of non-government organizations and donor agencies.

When the required provisions have been introduced through Part III-C of the Coast Conservation Amendment Act, No. 49 of 2011, new opportunities are created for the continuation of Special Management Area planning and implementation as a sustainable and effective supplementary planning tool for coastal resources management in Sri Lanka. Similarly, other interested parties such as NGOs and Donor Agencies also play a direct role in planning and implementation under the guidance of CC&CRMD.

As per the new provisions (Section 22E (1)), Special Management Areas could be declared covering land within the coastal zone or adjacent to the coastal zone or comprising both through Gazette notification. The new legal provisions also recognized the adoption of a collaborative approach for planning resources management in the defined SMA's. According to the new legal provisions, Special Management Areas could be declared only if such areas are included in the Coastal Zone and Coastal Resource Management Plan prepared under the provisions of the Amendment Act.

To formulate an effective institutional structure for planning and management of Special Management Areas, new regulations have to be prepared in compliance with the legal provisions provided through Part III-C, Sub Section 2 of 22E of the Amendment Act, No. 49 of 2011. To achieve the desired objectives of SMA planning, regulations should be framed and brought before Parliament as soon as convenient. The new regulations have to be formulated prescribing the manner and mode in which and the persons by whom, such Special Management Area should be administered, the persons entitled to have access to these areas, and the activities which can be carried out within such areas. (under the provision in Section 22E (2)).

Accordingly, the existing legal provisions have to be used with the effective participation of stakeholders comprised of the relevant community and those who are directly attached to the SMA site, local institutions both government and non-governmental, outside beneficiaries and the central government institutions.

5.4 WHY SMA SHOULD BE STRENGTHENED AND ADVOCATED

The Special Management Area concept that is based on the co-management principles could be considered an effective and viable approach to integrated coastal resources management in Sri Lanka. In comparison to other approaches, it properly acknowledges the complex relationship between coastal and marine uses and the coastal ecosystems. The SMA process also promotes linkage and harmonization among varied types of coastal activities and the physical processes of nature. The flexibility of the management system pays proper attention to both coastal resources systems as well as human systems. The main influencing factors behind the requirement of SMA as a complementary tool for Integrated Coastal Resources Management are summarized below:

The SMA process is viewed as an effective means of promoting sustainable management of coastal resources within a defined geographic setting and makes it possible to deal more comprehensively and effectively with complex management issues.

- The decentralization policies that have been pursued since the late 1980s positively contributed to adopting collaborative management.
- Recognition of a need to formalize indigenous or traditional sustainable resources management practices within the legal and wider governance framework to minimize coastal resource depletion, overexploitation and user conflicts.
- The characteristics of the public or state-owned nature of coastal resources and the prevailing status of open access to it present formidable challenges to managing coastal resources.
- Coastal habitats are being rapidly degraded due to both man-induced causes and natural phenomena. Thus, a user-centered management approach is vital.
- To pay systematic and effective approach to counter the spreading of poverty and over-exploitation of marine and coastal resources.
- To facilitate local-level management interventions and to maintain consistency and compliance with national-level coastal resource management policies and regulations.
- Community demand for greater legitimacy and transparency in resource management decision making.
- Counter increasing user conflicts parallel to new development activities taking place in the coastal region.
- Requirement of empowering and building a sense of ownership among civil society, communities and community-based organizations to enable to manage coastal resources in a sustainable manner.
- To address gender issues related to coastal resource uses.

- To incorporate a sustainable livelihood perspective to address site-specific coastal environmental issues.
- To build resilience and reduce vulnerability among coastal communities against natural coastal hazards.
- To enable positive community perception of decentralization policies being pursued in the recent past in administrative and political fields, and to provide an enabling environment for effective and sustainable coastal resources management through SMA.

5.5 REQUIREMENT OF MOVING FROM A PROJECT-BASED APPROACH TO A MORE PROGRAMMATIC APPROACH

The two and half decades of planning and implementation of the Special Management Area process carried out by Coast Conservation and Coastal Resource Management Department and the other agencies in Sri Lanka were entirely on a project-oriented basis. As a result of this, the outcomes of the SMA planning and implementation process and its long-term sustainability of posed a problematic situation. This situation was further complicated due to the absence of a proper legal and institutional framework. Thus, the long-term commitment of the main facilitating agencies came to a standstill when the projects were terminated. Similarly, local-level organizations such as NGOs when involved in the process were also unable to continue the process due to financial constraints and lack of authority, capacity and legal and administrative recognition. The past implementation experience revealed that the post-project implementation including monitoring and scaling up of conservation and livelihood activities have come to a halt with the closure of the project. Therefore, based on the new legal provisions and the regulations to be framed on Special Management Areas, the planning and implementation process has to be moved to a more programmatic approach based on collaborative resources management principles and guidelines. In this respect, careful attention has to be placed on balancing conservation objectives with the development needs in the legally declared SMA sites. In view of the above requirement, a program-based approach has to be adopted while recognizing to practically get the involvement of the communities at the sites. In compliance with this, the following guidelines were incorporated into the CC&CRMP envisaging effective outcomes:

- a) Establishment of a separate Special Management Area Unit within the Coast Conservation and Coastal Resource Management Department under the Director /Coastal Resource Management.
- b) A separate financial vote to ensure adequate funding from the central government for the SMA planning and implementation.
- c) New regulations frame to ensure the legitimacy of community participation and provide decision-making authority to the community at the designated sites.
- d) The need to establish legal recognition for the SMA Committees and the grassroots process to be recognized in selecting representatives for the SMA's.
- e) Operational rules or codes of conduct formulate under the new regulations for SMA Committees.
- f) Arrangements to share experience on co-management with the regional countries with a view to enhance the planning and implementation of SMA's.
- g) Preparation of list of SMA sites based on the new criteria introduced and incorporated into CC&CRMP.

During the planned implementation period of the 2018 Plan, the above recommendations have not been materialized due to several reasons including CORONA pandemic and longer period of lockdowns experienced and the macroeconomic issues confronted during later part of the Plan implementation period.

Although the above recommendations were not implemented, the validity and requirement of implementation during this plan implementation is still binding for effective outcomes.

5.6 IMPROVING EFFICACY FOR SPECIAL MANAGEMENT AREA (SMA)

Even though, there were some drawbacks and deficiencies experienced in the planning, implementation and continuation of the SMA process, the two major rounds of the SMA planning and implementation process carried out by the Coast Conservation and Coastal Resources Management Department has recognized its appropriateness

and effectiveness as an ICM tool. Similarly, the required modifications to produce better outcomes through SMA plans were also identified by the CC&CRMD through lessons learnt. Although this approach is clearly perceived as an effective one for managing coastal resources and their environment in complex settings, several constraints and drawbacks as indicated in the preceding sections have prevented the realization of maximum benefits from this management process. In addition, the sustainability of the SMA approach posed a complex situation. The two major rounds of SMA planning and implementation conducted in 12 sites under external financial support (USAID and ADB - GoN) in project-oriented nature and the other SMA interventions carried out under HICZM and GEF-RUK provide valuable lessons to improve and strengthen future SMA planning and implementation process in other designated sites. Further, the in-depth reviews and evaluations conducted by a number of scholars on the concept of SMAP as well as planning and implementation in the Sri Lankan context were also useful in formulating new guidelines and procedures. In addition, most importantly, the new legal provisions provided through Coast Conservation Amendment Act, No. 49 of 2011 have given ample opportunity to enhance the efficacy of SMA.

In addition, the National Strategy and Action Plan prepared by the IUCN, Sri Lanka office for the National Steering Committee for Mangroves for the Future Programme, Sri Lanka in 2009 recommends that an eco-system based Integrated Coastal Management Policy be adopted in order to overcome the threat that a habitat-based approach leads to driving the focus away from the eco-system unit in which such habitats are nested. Such a change will have to await acceptance of the recommendation at higher levels of policy approval and consequent re-orientation of the CC Act. This should be the focus of the CZM Plan revision that will be done within the next few years as required by the CC Act.

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

➤ **Pre-Planning Phase**

1. Necessary action has to be taken to move from a project-based approach to a program-based approach for planning and implementation of the overall SMA programme of the country.
2. As per the new legal provisions of the Coast Conservation Amendment Act, No. 49 of 2011, a list of appropriate candidate sites for SMA should be selected based on the new criteria and incorporated into this plan.
3. A preliminary situation analysis report should be prepared for each site to determine priority and to identify the legal boundaries of SMA.
4. In compliance with the new legal provisions, new regulations for SMA should be prepared and finalized with wider stakeholder consultation and approval for gazetting should be obtained as soon as possible.
5. Coast Conservation and Coastal Resource Management Department should take the lead facilitator role for the SMAs by formulating a separate unit under a Deputy Director and creating a separate budget vote for SMA.
6. SMA guidebook has to be prepared based on the new legal provisions and regulations in considering the existing and future social environmental and economic trends in the coastal zone.

➤ **Planning Phase**

1. There is no blueprint for SMA. Each site should be considered unique, requiring the application of a specific integrated methodology; planning should be based on site-specific issues, the extent of the area to be covered, etc.
2. Equal opportunities should be emphasized on the social and institutional profile when situation analysis is carried out.

3. There is a greater possibility of success when the area is smaller. Thus legal boundaries of the SMA should be determined by the SMA Committee based on the information provided through preliminary situation analysis and with the consultation of the other relevant stakeholders prior to the declaration of the site as an SMA site through Gazetting. However, the linkages between the SAM site and the ecosystem in which it is nested should be clearly identified.
4. The SMA committee should be established in accordance with the new regulations for SMA and grass root independent selection process should be adopted in selecting representatives for the SMA Committee to ensure the protection of local interest.
5. Formulate operational rules or code of conduct in line with the regulations to govern the SMA committee. The operational rules should be placed specifically on tabling issues, decision-making, disbursement and management of funds, obtaining assistance from the Provincial Councils and the Central Government Agencies and International NGOs.
6. All discussions, decision-making processes, SMA Committee meetings and information compendiums should be prepared in a suitable local language (Sinhala/Tamil) where possible.
7. 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 jeopardize the SMA process.

➤ **Implementation Phase**

1. Agencies and NGOs having an implementation and monitoring role in SMA plans should be obliged to include activities in fulfilment of that role, in their annual work programmes.
2. Attempts should be made to strengthen local organizations, structure, and operating rules to enhance transparency in leadership, membership, and decision-making processes.
3. Full and active participation of representative stakeholder groups at all stages directly underpins the success of SAM planning and implementation and is critical to counteract adverse influences.
4. When institutional development commences at the local level during the planning phase, attention should be placed to establish /strengthen both vertical and horizontal linkages between newly formed/existing organizations and local /central government agencies.
5. Instead of establishing local organizations /institutions across livelihoods and resource bases, community elements should be promoted.
6. Local communities should have opportunities to derive tangible benefits from the initial stages of the SMA process if they are to be motivated to manage natural resources.
7. Communities should be supported at the initial stages of the SMA process with financial and technical assistance to strengthen their organizational capacity for plan implementation; they may also require long-term financial assistance for the socio-economic development of the area.
8. Mechanisms should be built into SMA plans for promoting self-reliance in order to minimize the dependency on external support.
9. Wherever possible SMA processes should be incorporated into the district and provincial development plans or regional projects of the government to be in harmony and in compliance with National and Regional Development Plans.

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

5.7 MECHANISMS FOR SMA PLANNING AND IMPLEMENTATION

- **Identification and Agreement on SMA Sites: The past experience through 1997 and 2004 and 2018 Revised CZMP's**

After the formalization and acceptance of Special Management Area (SMA) as a supplementary ICM tool, 23 sites have been identified through CZMP of 1997 as potential SAM sites with specific complex issues to be resolved. After the identification of potential SMA sites, each site has been rated with respect to “four factors of concern” or the criteria for ranking and the sites with the highest cumulative values have been recommended as high-priority sites for implementation. In view of the importance, additional criteria have been incorporated into the criteria used for ranking SMA sites as indicated below:

Criteria used for ranking potential SMA sites for implementation

- a) The severity of social, economic and environmental issues prevailing in the sites.*
- b) The relative richness and diversity of flora and fauna of coastal ecosystems*
- c) The feasibility of management based on size, location, legal and institutional factors.*
- d) The existing or potential value of economic development in the area.*
- e) Level of exposure/vulnerability to climate change impact.*
- f) Vulnerability to coastal disasters both episodic and chronic.*
- g) Significance of archaeological and historic values of the site*
- h) Presence of migratory species*
- i) National and global conservation status of species*

The 1997 list of potential SMA sites is considered an incomplete one and it does not adequately represent the sites located in the north and the eastern coastal region of the country. This was due to 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 these regions.

- **SMA sites to be declared under the legal provisions of the Coast Conservation Amendment Act, No. 49 of 2011**

The SMA sites identified through the 1997 Revised CZMP as well as the 2004 CZMP including level II sites have no legal recognition for implementation unless those sites are also considered and termed as SMA sites. Therefore, all potential sites including those in which the SMA process had already been initiated under different projects and the appropriate level II SMA sites have to be included in this plan and termed and declared as SMA (Special Management Areas) under the legal provisions of the Part III Section 22E of the Coast Conservation and Coastal Resource Management Act, No 57 of 1981 to establish legal recognition. In this respect following procedures / processes will be adopted by the Coast Conservation and Coastal Resource Management Department.

- **Re-designation and revitalization of SMA sites already implemented through a project-based approach:**

Declaration of SMA Sites

As indicated in the following **Table 5.1**, and **Table 5.2** Special Management Area (SMA) sites in which the planning and implementation process initiated will be re-listed as Special Management Areas and action will be initiated to declare them as SMA sites through a government gazette notification in compliance with the legal provisions of the Coast Conservation Amendment Act, No. 49 of 2011.

Establishment of legal boundaries

In this respect, the legal boundaries of the SMA sites should be re-demarcated emphasizing the following;

- Status of conservation of coastal habitats.
- The Degree of outcomes of the implementation of previous initiatives in accordance with the issues prevailed.
- Social and economic profile of the site.
- Balancing conservation objectives with economic needs.
- Exposure and vulnerability to climate change impacts.

Formation of Special Management Area Coordinating Committees (SMACC)

In accordance with the new regulations to be framed under the provisions of the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981 as amended by the Coast Conservation (Amendment) Act 49 of 2011, Special Management Area Committees (SMACC) will be formulated replacing former CCCs. The SAMC will be represented by central government and local government agencies, local level organizations and other relevant stakeholders. The representatives from the local organization will be selected through grass root selection process as specified in the new regulations. The SMAC will be co-chaired by the Divisional Secretary and the Director General /CC&CRMD, and an appointed Senior Officer from the Coast Conservation and Coastal Resources Management Department. The SMACC will operate in compliance with the code of conduct formulated as per the new regulations for SMA.

Review and update existing SMA Plans

The Special Management Area Coordinating Committee will review and update the existing SMA Plans consistent with the conservation objectives and development needs of the re-designated SMA site. In this process, the situation analysis report should be prepared as appropriate in consultation and guidance of the SMACC.

Formulation of a sustainable financial mechanism

To ensure the long-term sustainability of the SMA process, a sustainable financial mechanism shall be established by the SMACC in consultation with the other stakeholders. In this respect contributions will be envisaged from central government agencies, local government agencies as well as respective provincial councils.

Monitoring and impact analysis

To assess and evaluate the results and impacts of the SMA process, monitoring mechanisms should be established by the SMAC. In this process, emphasis should be placed on monitoring, process, outputs and outcomes.

Table 5- 1: Sites at which the SMA process was initiated through a project-based approach

<i>District</i>	<i>Project</i>	<i>Site</i>
Colombo	CRMP 11	Lunawa Lagoon
Galle	CRMP 11 CRMP 1/11 CRMP 11	Madu Ganga Estuary Hikkaduwa Nature Reserve and environs Unawatuna Bay and Koggala Estuary
Hambantota	HICZMP HICZMP/CRMP1 ADB CRMP 11 CRMP 1/USAID UNDP/GEF-RUK	Hambantota sand dune stretch Mawella Lagoon and Kudawella Blowhole Kalametiya Lagoon Rekawa Lagoon Rekawa, Ussangoda, Kalametiya (RUK)

<i>District</i>	<i>Project</i>	<i>Site</i>
Gampaha	CRMP 11	Negombo Estuary /Muthurajawela Marsh
Puttalam	CRMP 11 BMZ, IUCN, FAO- UNDP	Kalpitiya Bar Reef Puttalam Lagoon
Batticaloa	NECDEP_ADB GEF	Batticaloa Lagoon Wakarai Lagoon
Ampara	GEF	Panama Sand Dunes
Trincomalee	GEF	Pigeon Island

Table 5- 2: A list of sites to be declared as Special Management Areas under the legal provisions of the CC&CRM Act

<i>District</i>	<i>Site</i>
Colombo	<ul style="list-style-type: none"> • Lunawa Lagoon • Bolgoda Lake • Dehiwal-Mt.Lavinia Beach Stretch
Kalutara	<ul style="list-style-type: none"> • Kaluganga Estuary
Galle	<ul style="list-style-type: none"> • Dodanduwa estuary Rathgama Lake • Madampe Lake • Madu Ganga Estuary • Hikkaduwa Nature Reserve and environs • Unawatuna Bay and Koggala Estuary
Matara	<ul style="list-style-type: none"> • Weligama Bay • Hirikatiya and surrounding Beach area • Polhena beach
Hambantota	<ul style="list-style-type: none"> • Rekawa Lagoon • Rekawa-Ussangoda-Kalametiya Cluster • Kalametiya- Lunama Lagoon complex • Mawella Lagoon and Kudawella Blowhole
Ampara	<ul style="list-style-type: none"> • Arugam bay and Arugambay Lagoon • Periya Kalapuwa(Lagoon)-Korai Kalapuwa(Lagoon) • Komari lagoon • Panama Sand Dune
Batticaloa	<ul style="list-style-type: none"> • Batticaloa estuary • Kayankani reef and adjacent terrestrial area • Kalkudah – Passikudah bays • Thanadi bay, Valachchanai Estuary • Punnaikudah, Kaluwankerni bays • Uppar- Panichankerni Estuary • Sallativu Island and associated coastal area
Trincomalee	<ul style="list-style-type: none"> • Trincomalee bay • Nilaveli beach, Pigeon Island, Periyakarachchi and Sinnakarachchi Estuary • Kuchchveli-Poduwakattau (including Pirate Cove) coastal area • Kokilai Lagoon

Mullaitivu	<ul style="list-style-type: none"> Nanthikadal Lagoon Nai Aru Estuary
Jaffna	<ul style="list-style-type: none"> Manalkadu Dunes Jaffna Estuary(Town area) Kankasanturai and Keeramalai coastal area Mandativu, Valanai,Ninativu, Delft Islands Thondaimanaru Lagoon Karainagar (including <i>Casuarina</i> beach) coastal area Navali coastal area
Mannar	<ul style="list-style-type: none"> Gulf of Mannar, South bar, Vankalai. coastal area Talaimannar coastal area Vidaltativu coral reef and associated ecosystem Sillavathurai , Arippu and Aruvi Aru coastal area and Bay of Kondachchi
Puttalam	<ul style="list-style-type: none"> Puttalam Estuary Dutch bay, Kala oya river mouth , Gangewadiya associated eco system Chilaw Estuary Mundal Lake and Puttalam corridor channel

5.8 GUIDELINES FOR THE SMA PROCESS

In addition to the specific guidelines spelled out in the preceding section for the purpose of reformulating the ongoing or already initiated SMAs, the following general guidelines are given for planning and implementation of the SMA process in the new sites. These guidelines have been developed based on the new legal provisions introduced for SMA through Coast Conservation and Coastal Resource Management Act 57 of 1981 as amended by Coast Conservation Act, No. 49 of 2011 and taking into consideration the lessons learned in the past. However, they have to be adapted to meet the needs of the specific sites.

1. Selection and declaration of a site

As per the new legal provisions, only SMA sites listed in the CZ&CRMP of 2024 (Table 5.1 and 5.2) can be selected by CC&CRMD for declaration and Gazetting as a Special Management Area, to adopt a collaborative resource management process. In addition some sites could be merged and consider as mini-coastal landscape for effective management considering the totality of the ecosystem.

2. Establish legal boundaries

In conformity with the legal provisions and the regulations made under such provisions, the legal boundaries of the SMA site should be determined taking into consideration both land within the coastal zone and adjacent areas as required.

3. Establishment of a Special Management Area Committee (SMAC)

4. Prioritization of identified issues and preparation of an environmental profile or situation /site reports

5. Conduct stakeholder analysis

6. Preparation of the draft SMA Plan

7. Adoption of the Special Management Area Plan

8. Implementation of Selected Activities Simultaneously with the Planning Process

9. Establish Sustainable Financial Mechanism

10. Monitoring and Evaluating of Plan Implementation

5.9 MANAGEMENT OBJECTIVES, POLICIES STRATEGIES AND ACTIONS

Objective 1

SMA processes are oriented towards continuous enhancement of the value of natural assets of the ecosystems and improve livelihoods in the designated area through the application of appropriate management tools.

Policy 1.1

The Special Management Area (SMA) process will be implemented at the District /Divisional/local level including terrestrial and associated coastal waters with identified stakeholder collaboration.

Strategy 1.1.1

Prepare comprehensive SMA plans in compliance with the legal provisions of the Coast Conservation and Coastal Resource Management Act, No. 57 of 1981 as amended by Coast Conservation (Amendment) Act, No. 49 of 2011 and regulations framed under it for identified priority sites with the collaboration and effective participation of local communities, non-governmental and governmental agencies.

Proposed Actions

1. Select sites that should be managed as SMA sites.
2. Establish legal boundaries and declare such sites through *Gazette* notification as SMA sites
3. Establish institutional mechanisms as per the guidelines provided in the CZ&CRMP 2024 in the planning of the SMA process with local collaboration and facilitate the implementation at local/district/divisional levels.
4. Establish sustainable financial mechanisms.
5. Develop participatory monitoring plans to assess the progress and impacts of the SMA process.

Strategy 1.1.2

Develop a mechanism to enhance local collaboration and participation in SMA planning, implementation and post-implementation processes.

Proposed Actions

1. Conduct stakeholder analysis in respective sites to identify and determine factors helping or hindering stakeholder collaboration and participation in the process.
2. Develop a communication plan to ensure better collaboration and participation of all stakeholders in the SMA process.
3. Establish both vertical and horizontal links between central government/local government agencies, SMACC and the stakeholder groups.
4. Develop an incentive scheme to encourage local collaboration and participation by ensuring tangible benefits to communities.

Policy 1.2

Re-designate and revitalize SMA sites already implemented through project-based approaches in the past.

Strategy 1.2.1

Declare SMA sites already planned and implemented on a project-based approach as SMA sites through a *Gazette* notification to strengthen and rectify the weaknesses experienced during implementation.

Proposed Actions

1. Establish SMACC as per the new regulations framed under the Coast Conservation Amendment Act, No. 49 of 2011.
2. Follow the guidelines given in Section 5.2.
3. Identify main constraints, analyze lessons learnt, carry out a situation analysis and find solutions to rectify the shortcomings experienced in the implementation of ongoing SMA plans and facilitate continuity of the process.
4. Institutionalize a programme to monitor and evaluate SMA projects, and establish a feedback mechanism to assist enhance management efficiency.

Policy 1.3

All SMAP should be formulated and implemented in compliance with national-level legislations.

Strategy 1.3.1

Ensure maintaining consistency in planning and implementation of SMA plans /planning process with other relevant national-level legislation.

Proposed Actions

1. Prepare a guidebook describing procedures, means, and ways to maintain consistency of SMA planning and implementation process with the national level legislation.
2. Conduct awareness programmes on the SMA process among provincial, district and divisional level stakeholders.

Policy 1.4

The capacity of local authorities and concerned state agencies will be strengthened to enhance the implementation of SMA Plans.

Strategy 1.4.1

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

Proposed Actions

1. Promote training and awareness programmes on SMA processes.
2. Further strengthening of the legal framework for SMA planning.
3. Promote collaborative management of coastal habitat conservation through SMACC.

4. Include guidelines for and responsibilities of communities, government /semi-government organizations, District Secretariats and SMACCs for implementation of the SAM Plans.
5. Strengthen the capacity of local-level officials for SMA planning.

Policy 1.5

The Special Management Area process will be harmonized with national and regional development efforts.

Strategy 1.5.1

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

Proposed Actions

1. Coordinate with the Ministry responsible for economic development to identify a mechanism to incorporate SMA Plans in regional projects/ integrated national projects.
2. Establish a mechanism to facilitate private sector participation in activities of SMA processes.

Policy 1.6

SMA planning and implementation shall utilize comprehensive valuation and the incorporation of the hitherto unrecognized economic value of ecosystem services.

Strategy 1.6.1

Recognition and due consideration will be placed on the real economic value of the ecosystem services when decisions are made with respect to environmental conservation, development and livelihood initiatives while balancing conservation objectives with development needs.

Proposed Actions

1. Conduct environmental valuation with respect to services of the ecosystems to determine effective and fruitful decisions where possible.
2. Carry out outreach programmes to highlight the importance and value of the hidden or unrecognized services of the coastal ecosystems.
3. Enhance the capacity of the collaborative institutions to conduct environmental valuations.

Policy 1.7

The livelihoods of the communities in the SMA sites will be enhanced /up-scaled to ensure sustainable utilization of the coastal resources.

Strategy 1.7.1

The issues related to livelihoods and coastal resources management will be comprehensively investigated and the required mechanism to improve the livelihoods in the communities in a sustainable manner will be incorporated into the SMA process.

Proposed Actions

1. Investigate issues related to the utilization of coastal resources and livelihoods of the communities at the SMA sites.
2. Formulate and implement sustainable livelihood enhancement strategies based on past experiences to minimize issues identified.
3. Promote private sector participation in developing and scaling up of livelihoods in the SMA sites.
4. Adopt appropriate monitoring mechanisms to evaluate, process, outputs and the outcomes of the livelihood development programmes implemented.

Policy 1.8

Planning and implementation of designated SMA sites will be promoted among local and international NGOs and Donor Agencies.

Strategy 1.8.1

Facilitate involvement of International and local NGOs and Donor agencies to enable to play major partner roles in planning and implementation of designated SMA sites

Proposed Actions:

1. Framed new regulations to enable to play a major role in planning and implementation of designated SMA sites
2. Coordinate with the Ministry of Environment, Department of External Resources and other related agencies to promote planning and implementation of designated SMA sites through programmes of international organizations such as UNDP-GEF small grant programme.

Objective 2

Sensitive coastal ecosystems will be sustainably managed by implementing SMA process at identified priority sites.

Policy 2.1

Promote direct involvement and meaningful participation of NGOs and Private sector entities to plan and implement SMA process in identified high priority sites.

Strategy 2.1.1

Set legal and institutional platform for NGO and private sector for participation and direct involvement in SMA planning and implementation

Proposed Action

1. Frame regulations to enable to take responsibility to plan and implement SMA sites under the purview and guidance of CC&CRMD.
2. Prepare operational guidelines with time line to enable to facilitate external stakeholder involvement in planning and implementation of SMA
3. Conduct awareness campaign to obtain support and stimulate interest among NGOs and Private sector entities

REFERENCES:

1. Coast Conservation and Coastal Resource Management Department, (2014), Evaluation of Special Management Area (SMA) in Sri Lanka (unpublished).
2. Coast Conservation and Coastal Resource Management Department, (2004), Revised Coastal Zone Management Plan.
3. Government of Sri Lanka, (2012) Coast Conservation and Coastal Resource Management Act, No. 57 of 1981.
4. Government of Sri Lanka, (2011) Coast Conservation (Amendment) Act, No. 49 of 2011.
5. Clemett, Alexandra; Senaratne, Sonali; and Banda, R; (2004) Can Coastal Zone management in Sri Lanka. Sustain Local livelihoods and Ecosystems? Policy Process Analysis Paper 2, Improving Policy Livelihood Relationship in South Asia, Stockholm Environmental Institute (SEI), York, UK.
6. De C, osse, P.J., and Jayawickrama, S.S. 1996. Co-management of resources in Sri Lanka: Status, Issues and Opportunities. USAID/Sri Lanka Natural Resources and Environmental Policy Project, Colombo.
7. De Silva, Sanjiv; Senaratne, Sellamuttu, Sonali; Kodituwakku, DekshikaCharmini; Atapattu, Sitara S; (2011) Governance Performance in Integrated Coastal Management in Sri Lanka, Country Report, Colombo IUCN Sri Lanka.
8. CCD. 1997. Revised Coastal Zone Management Pan, Sri Lanka, 1997. Colombo: Coast Conservation Department. Ministry of Fisheries and Aquatic Resources Development.
9. 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.
10. Landstorm Ingegerd (2006), Towards Collaborative Coastal Management in Sri Lanka? a study of Special Area Management in Sri Lanka's Coastal Region.
11. Lowry, K.,;Pallewatte, N.,; and Dainis.A.P. 1997. Special Area Management Projects at Hikkaduwa and Rekawa.A Preliminary Assessment. CRMP, Colombo.
12. 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.
13. Wickramaratne, H.J.M. and A.T.White. 1992. Concept paper on Special Area Management for Sri Lankan Coasts. Work-ing Paper No.10, 1992. CRMP Colombo.
14. Senaratna, S. 2003. Factors influencing the sustainability of livelihoods in rural coastal communities in Sri Lanka. PhD Upgrade Report. Imperial College London.
15. 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.
16. 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.

CHAPTER 6 - REGULATORY MECHANISM**6.1 INTRODUCTION**

THE regulatory framework of the Coast Conservation and Coastal Resources Management (CC&CRM) Act, No.57 of 1981 is being used as an effective management instrument by the Coast Conservation and Coastal Resources Management Department (CC&CRMD) for managing activities and the resources within the Coastal Zone. To address the major coastal issues and to ensure the sustainability of the management measures, adopting other auxiliary management instruments such as Special Management Area (SMA), Inter-Agency Coordination, Compliance Monitoring, Research and Investigations, and Public Education and Awareness plays a vital role. This is complementary to the regulatory instruments in the coastal resources management strategy of the CC&CRMD in the recent past.

The Regulatory Mechanism pertaining to the Coastal Zone constitutes the following:

- Implementation of a permit procedure
- Prohibition of activities for which permits are not issued
- Designation of setback standards, variances, and exemptions
- Compliance Monitoring for development activities
- Control of development activities
- Controlling unauthorized development activities
- Provision of standards and guidelines for specified development activities
- Requirement of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE)
- Designation and control of Affected Areas
- Declaration of Conservation Areas
- Designation and management of Special Management Areas (SMAs)
- Designation and management of tourism development areas

6.1.1 Definition of the Coastal Zone

The definition of the “Coastal Zone”, as defined in the CC&CRM Act, No. 57 of 1981 as amended by Act, No. 49 of 2011 is as follows:

“Coastal Zone” means an area lying within a limit of three hundred meters landwards of the Mean High Water line and a limit of two kilometers seaward of the Mean Low Water Line and in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight baseline drawn between the natural entrance points thereof and shall include the waters of such rivers, streams, and lagoons or any other body of water so connected to the sea, and shall also include the area lying within a further extended limit of one hundred meters inland from the zero Mean Sea Level (MSL) along the periphery”;

(The locations of natural entrance points considered to establish the straight baseline are to be determined by the CC&CRMD.)

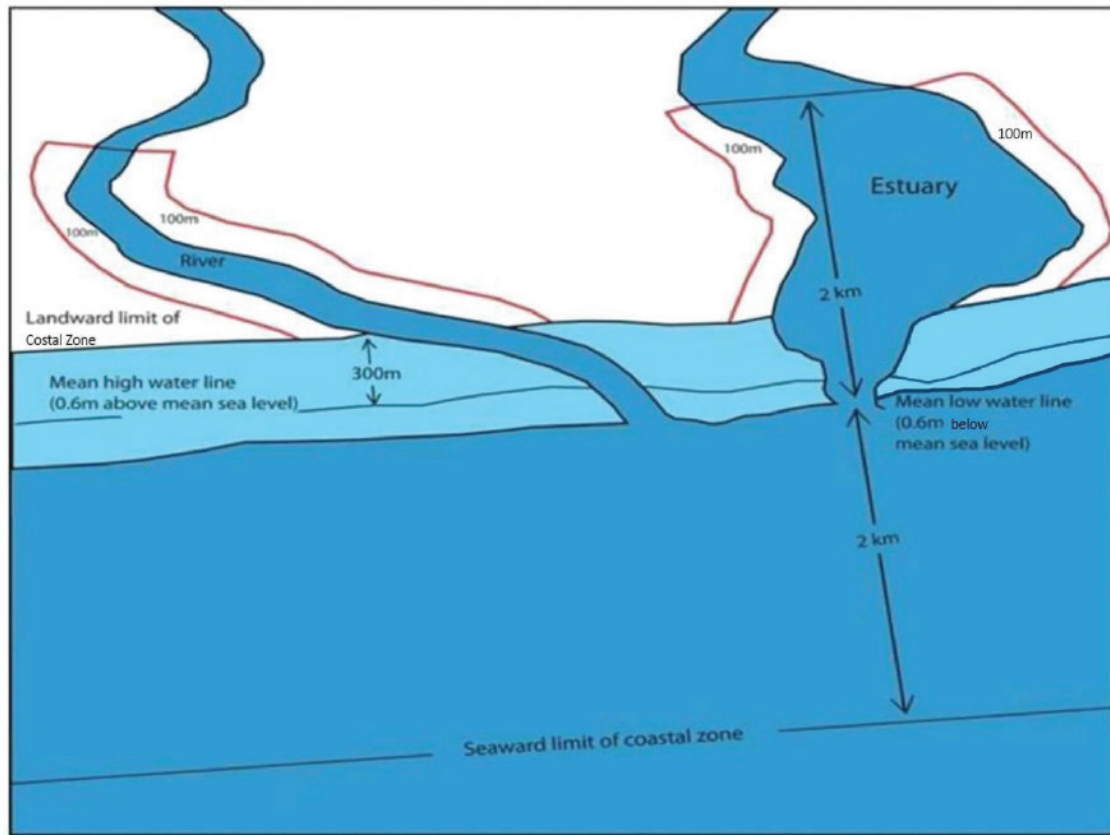


Figure 6.1: Coastal Zone as defined in CC&CRM Act, No. 57 of 1981 as amended by Act, No. 49 of 2011

6.2 PERMIT PROCEDURE

The principal regulatory tool used by the CC&CRMD in managing development activities of the “Coastal Zone” is the Permit Procedure. The main objective of this procedure is to direct development activities in the “Coastal Zone” in such a manner that negative impacts of development activities are averted or minimized. Through this procedure, activities that are harmful or not compatible to the coastal environment are controlled and the quality, stability, and productivity of the “Coastal Zone” are maintained. Thus, it is made mandatory under the CC&CRM Act for any person, whether in the private or the state sector or, intending to engage in a development activity within the “Coastal Zone” (except for the prescribed activities for which permits are not required) to obtain a permit issued by the Director General (DG) of the CC&CRMD. Activities that may be engaged in without a permit have been prescribed by Coast Conservation Regulation No.1 of 1983 and published in *Gazette* No. 260/22 of 2nd September 1983. Activities for which a permit is required are given in the section below:

6.2.1 Development Activities within the “Coastal Zone” for which a Permit is required

For many development activities within the “Coastal Zone,” a Permit is required from the DG of CC&CRMD. Some examples for such activities are as below:

- Infrastructure for residential purposes and related structures, such as parapet walls
- Industrial and other commercial structures
- Infrastructure facilities for tourism and recreational purposes such as swimming pools
- Commercial and fisheries harbour structures and navigational channels

- Roads, bridges, tunnels and railway lines
- Infrastructure facilities for public and religious purposes
- Shoreline protection works to be carried out by any private party other than the CC&CRMD
- Infrastructure facilities for waste water treatment, conveyance and disposal, sea outfalls
- Infrastructure facilities for desalination of sea water, sea water intake facilities, reject water disposal facilities (sea outfalls)
- Aquaculture facilities and sea farming structures
- Disposal of solid waste
- Dredging, filling, grading or breaching sand bars
- Landscaping and development of beach parks
- Mining and mineral extraction
- Power generation projects
- Removal of sand, seaweeds or and seashells
- Reclamation and creation of islands and additional buffers
- Construction of conveyance lines
- Construction, mining and breaching related to flood or hazard control by any private party other than the CC&CRMD.
- Construction of structures to prevent bank erosion of any waterbody and filling of
- any water area within the “Coastal Zone”
- Any other activity likely to alter the physical nature of the “Coastal Zone”

6.2.2. Prescribed Activities that may be engaged in without a Permit issued by the DG of CC&CRMD within the “Coastal Zone”

- Fishing
- Cultivation of crops that do not destabilize the coast
- Planting of trees and other vegetation (except in the beach area)
- Construction and maintenance of coast protection works by the CC&CRMD in compliance with the Coastal Erosion Management Strategy and the emergency procedures as outlined in Chapter 2 of this Plan.

6.2.3 Categorization of Permits

Altogether, three categories of Permits have been introduced through Coastal Zone Management Plans (CZMPs) of 1990, 1997, and 2004 respectively. Accordingly, Major

Permits, Minor Permits, and Emergency Permits have been issued. As of 2024 CC&CRMP, permit categories are confined to two. Accordingly, all development permits issued by the DG of CC&CRM are under two categories viz. “Type A” Permit and “Type B” Permit.

Type “A” Permit	Type “B” Permit
A permit issued for a development or other activity which requires an IEE or an EIA is referred to as a “Type A” Permit	<p>A permit issued for a development or other activity which did not require an IEE or an EIA is referred as a “Type B” Permit</p> <p>A Permit issued to minimize adverse impacts due to an emergency is also included under the category of “Type B” Permit.</p>

The purposes during emergency situations for which “Type B” permits are issued to minimize adverse impacts are as follows;

- Flood or any other natural hazard control measures
- Removal of sand bars to prevent floods
- Construction of sea-water intrusion prevention structures on a temporary basis
- Interventions at a time when threat/destruction is likely to be caused to life of people or public/private property, until such time a “Type A” / or” Type B” Permit is obtained
- National security

The duration of the permits issued under emergency situations is determined by the DG of the CC&CRMD.

6.2.4 Criteria to be assessed by the DG of CC&CRMD to issue Permits

Whether the proposed activity;

- Is consistent with the management policies spelt out in Chapter 2 – 5 of this Plan and any supplementary guidelines
- Is not prohibited by this Plan
- Is in compliance with the stipulated guidelines for variances and exceptions for setback standards where applicable
- Meets the National Standards set by the Central Environmental Authority (CEA) for air/water quality, noise, vibration
- Will not infringe upon the right of public access to and along the beach and will ensure the right of vertical and lateral public 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 recognized by CC&CRMD
- Is not located within the Coastal Zone abutting Protected Areas as specified in Table 6.3
- Is not located within a radius specified by the Department of Archaeology for designated archaeological, historic or cultural sites
- Is not located in an Affected Area or Conservation Area declared under the CC&CRM Act
- Is not located in an unauthorized filled area
- Complies with the planning requirements with respect to reservations for roads, canals, rivers, streams lagoons or any other body of water connected to the sea either permanently or periodically
- Will not denude beachfront vegetation cover
- Shall have provisions for efficient and adequate means to dispose liquid and solid waste, if commercial structures, dwelling houses and industries in underserved areas are included in the activity
- Is not carried out in a way that leads to disruption of the natural processes of the sand dunes

6.2.5 Guidelines for issuing Permits for Removal of Sand

The following guidelines shall apply to permits issued for sand removal from the Coastal Zone for non-commercial use. It should however be noted that, considering the dynamic nature of the Coastal Zone, site-specific guidelines will be issued from time to time during the plan implementation period.

- Removal of sand shall be permitted only from the locations specified by the CC&CRMD. As determined by the department, the specified locations are subject to change from time to time.
- Removal of sand will not be permitted within the distance of 500 m from the mouth of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically
- Sand removal within the “Restricted Development Zone” (i.e. the area within the distance of 500 m from the mouth

of rivers, streams, lagoons or any other body of water connected to the sea either permanently or periodically) will be permitted to facilitate navigational activities or to control floods

- Permits will be issued/concurrence will be given to remove sand bars to prevent adverse impacts of the floods under the direct purview of the District Secretaries of the respective areas, the Officials of the Irrigation Department and Disaster Management Centre.
- Removal of sand should not be carried out in a manner that causes damage to the existing vegetation cover adjacent to the sand removal site
- Removal of sand shall not have adverse impacts such as sea-water intrusion.

Unless under exceptional circumstances, permit will not be issued for:

- * Mechanical extraction of sand within the Coastal Zone
- * Removal of sand from the non-accreting beaches, barrier beaches, and sand spits
- * Removal of sand from the newly accreted beaches identified by the CC&CRMD or artificially nourished beaches.
- * Removal of sand from specified locations where erosion has occurred within the past twenty-four months
- * Exploration or mining permits will not be issued within 2km seaward of the MSL or less than 15m depth for the commercial purpose
- * Removal of sand from locations where bank erosion is visible in the rivers and the streams lagoons or any other body of water connected to the sea either permanently or periodically and closer to the water intakes
- * Mining of sand will not be permitted from the riparian land of the waterbodies lying within the Coastal Zone
- * Sand shall not be extracted within 200 to 500 meters from any crucial hydraulic structure such as pumping stations, water intakes, and bridges. The exact distance should be ascertained by the Department of Irrigation and CC&CRMD based on the local situation

In exceptional circumstances in which such a permit will be issued if the following are met;

- * Comply with the ecological compensation process that require restoration and enhancement of environmental condition of the sand removal/mining area
- * The beach and/or dune system are capable of supporting the proposed removal activity including impacts associated with mining and transportation'
- * Potential noise to be generated must comply with the CEA standards
- * Groundwater condition should not be altered and, contamination of surface and groundwater should be avoided.
- * Existing wildlife habitat and turtle nesting areas should not be disturbed
- * The mining/removal as proposed would not weaken the overall dune system
- * The removal is necessary to protect life or property in disaster situation

6.2.6 Prohibited Activities within the Coastal Zone

Activities prohibited by the CC&CRMD, under the Coast Conservation and CC&CRM Act, within the "Coastal Zone" are:

- Removal of corals (note: in case of removal for research purposes and for the establishment of nurseries for replanting, a permit may be issued by the DG of CC&CRMD specifying type, quantity, location, and period for removal)
- Removal of sand except in areas identified by the CC&CRMD as specified locations

- Any development activity that will significantly degrade the exceptional scenic and cultural value of the Coastal Zone
- Developments within designated Protected Areas as declared by the Department of Wildlife Conservation and Forest Department
- Development activities within a specified periphery from the boundary of the archaeological, cultural, and historic sites designated by the Department of Archaeology within the coastal zone
- Development activities within designated “Affected Areas”, “Conservation Areas”, unauthorized filled areas, and sand dunes

6.2.7 Prohibited Activities in the “Affected Areas”

In accordance with the legal provisions of the CC&CRM Act, No. 57 of 1981 as amended by the Act, No. 49 of 2011, Affected Areas could be declared within or adjacent to the Coastal Zone or falling within both such areas or within any waterbody or part of any waterbody or within any lagoon or part of any lagoon or any peripheral area of a lagoon by *Gazette* Notification as required.

As per the above provisions, any development activity that could be carried out in terms of a permit obtained under Section 14 of the CC&CRM Act in an Affected Area is considered a prohibited activity. Further, filling, erection, obstruction, pollution or introduction of any waste matter or any activity which will harm the aquatic or marine life in Affected Areas is prohibited.

6.2.8 Prohibited Activities in the “Conservation Areas”

In accordance with the legal provisions of the CC&CRM Act, No. 57 of 1981 as amended by the Act, No. 49 of 2011, any area in which special measures need to be taken for the protection of the coastal and aquatic ecosystem could be declared as a “Conservation Area”

As per the above provision, no development activity or collection and extraction of aquatic resources shall be carried out in the Conservation Areas, except for engagement in scientific study and research in such areas with a permit issued by the DG of the CC&CRMD.

6.2.9 Setback Distances for Protected Areas

The setback distances specified in Table 6.1 of this Plan are not applicable in respect of Protected Areas, which will be considered “No Build Zones”.

Protected Areas include Ramsar Wetland Sites, Buffer Zones, Sanctuaries, Reserved Forests, Conservation Forests, National Heritage Wilderness Areas, Strict Nature Reserves, National Parks, Nature Reserves, Jungle Corridors, Refuges and Marine Reserves. 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 setback of 200 m shall be applied to all archaeological sites within the Coastal Zone designated by the Department of Archaeology.

6.3 SETBACK AREAS

6.3.1 Revision of Setback Areas as per the Amended Legal Provisions

With the amendments made to the CC&CRM Act, No. 57 of 1981 through the Amendment Act, No. 49 of 2011, the definition of the “Coastal Zone” has been changed by the inclusion of 100 m riparian land of the waterbodies within the “Coastal Zone” defined prior to the amendment. Accordingly, to minimize the impact of development activities in the riparian land, the responsibility and the authority of managing such development activities are also

vested with the CC&CRMD through the new amendments. Although both areas have strong and close connectivity with each other, the bio-physical characteristics as well as the level of vulnerability of both areas are varied. Thus, when determining the criteria for delineating Setbacks or Buffer Areas, different criteria have been adopted.

6.3.2 Desired Objectives of Setbacks

- Protecting lives and properties from coastal hazards
- Minimizing public investment in coast protection structures
- Protecting and enhancing the scenic value of coastal environments, protecting vulnerable coastal ecosystems, and unique natural sites
- Providing Buffer Zones for the protection of sites of archaeological, historical cultural and religious significance in the Coastal Zone
- Minimizing user conflicts between different activities in the Coastal Zone
- Ensuring public access to and along the coast
- Maintaining consistency among national and regional laws and plans
- Ensuring consistency between national development goals and environmental objectives

6.4 DEFINITION OF COASTAL SETBACK AREA

A coastal setback area is a geographical strip or band within the Coastal Zone or within which certain development activities are prohibited or significantly restricted. It comprises a Reservation Area and a Restricted Area lying between the Seaward Reference Line and the Landward Reference Line of a Coastal Segment specified in this Plan.

The Seaward Reference Line and the Landward Reference Line are defined in Section 6.3.1.

6.4.1 Coastal Setback Area for the Development Activities Landward of the Mean High Water Mark Seaward Reference Line and the Landward Reference Line

a) Seaward Reference Line:

The CC&CRMD reserves the right to demarcate the setback from the permanent vegetation line on the beachfront where Coconut (*Cocos nucifera*), Wetakeiya (*Pandanus sp* Mudilla (*Barringtonia speciosa*) or other floral species identified by CC&CRMD as permanent vegetation exist. However, in the absence of a permanent vegetation line on the beachfront, CC&CRMD has the right to demarcate the setback from a seaward reference line such as an appropriate contour line above MSL, the seaward edge of the top of a cliff/rock outcrop, existing coast protection structure or dyke.

b) Seaward Reference Line for the sand dune areas:

If the proposed land is located in a coastal area comprised of sand dunes, the seaward reference point of the setback should be delineated from the landward toe of the back dune.

6.4.2 Reservation and Restricted Areas of Setback

The entire coastal setback strip of the country is divided into 105 Coastal Segments. For each Coastal Segment, numbers are assigned from 1 to 92 (Table 6-1). Each segment is further subdivided into two areas; Reservation and Restricted Area (Figure 6-2).

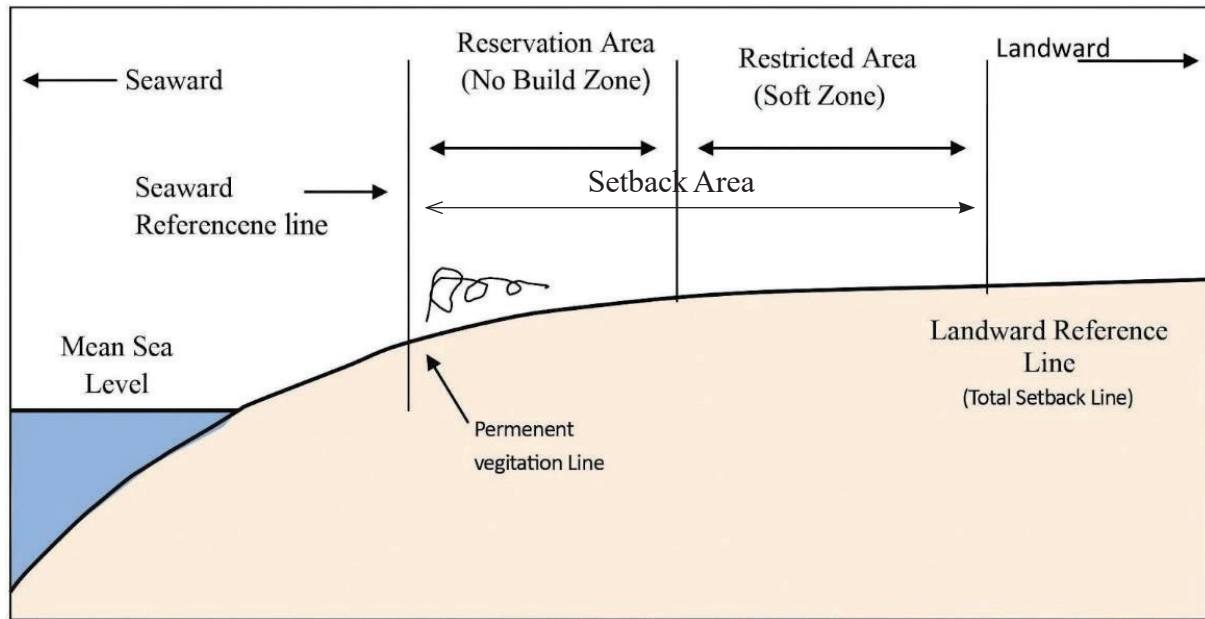


Figure 6- 1: Locations of the Setback Area, Reservation Area, and Restricted Area within the Coastal Zone

- i. Reservation Area is nearest to the shoreline and corresponds to a “No Build Zone” in which only the uses/activities that are absolutely essential are allowed.
- ii. Restricted Area (or Soft Zone) can be used for a few low impact activities.

The width of the Reservation and Restricted areas varies according to the vulnerability, protection status, and exposure to extreme events and other geophysical characteristics of the particular coastal segment criteria used in the demarcation of setback areas

The criteria used by the CC&CRMD in delineating setbacks for the development activities landward of the Seaward Reference Line are as follows:

- Coastal erosion rates
- Level of the erosion rates of the wedge of the water bodies of the “Coastal Zone”
- Exposure to extreme natural hazards such as tidal waves, tsunami, cyclone, storm surge
- Tidal variation, significant wave height and vulnerability to sea level rise
- Geomorphological characteristics
- Vulnerability of coastal habitats ecosystems
- Protected areas
- Extent of coast protection measures carried out
- Significance of other natural characteristics such as scenic beauty, naturalist, recreational, and environmental service values
- Significance of cultural and archaeological sites
- Level of development
- Level of user conflicts
- Statutory limitations
- Legal status of the site
- National security considerations
- Commercial harbours, fisheries harbours and anchorages

6.4.3 Permissible Developments/Activities in the Reservation Area

The DG of CC&CRMD may issue permits to persons engaged in the following developments/activities if it can be proven to the satisfaction of the DG that the development/activity concerned will not have any significant adverse impacts on the particular coastal segment or on the adjacent segments and shall not obstruct vertical and lateral access to and along the beach.

- Coast protection structures which comply with the Coastal Erosion Management Strategy of the CC&CRMD
- Harbour and fishery harbour facilities, jetties, piers, cable lines and slipways
- Submerged sea water intakes, tube-wells and associated structures
- Removal of navigational obstructions
- Extraction of minerals of commercial value
- Submerged communication, waste disposal, power generation, sand replenishment, gas and oil distribution and other public facilities in the near-shore
- Submerged navigational facilities in the near-shore
- Conservation activities approved by the CC&CRMD for enhancing aesthetic value and stabilization of the coastal areas
- Temporary structures for a period not exceeding six (6) months exclusively for fisheries activities at the Gazetted Madel Padu (Beach Seine Fishing) locations identified in the *Gazette* Notification No.337/48 of February 21, 1985, provided the following criteria are met:
 - Roof material: Cadjan, Illuk, canvas, cloth or tar sheets,
 - Wall material: Cadjan, planks, plant leaves, bamboo, canvas, plastic or paper
 - Floor material: Sand, mud, clay (non-processed) or wood
 - Foundation type: No permanent foundation (such as pile, concrete or brick foundations) and;
- Other environmentally friendly structures of width less than 30 % of the width of the beach and length less than 10 m (33 feet) Facilities for Madel Padus (Beach Seine sites) planned and provided by the Department of Fisheries and Aquatic Resources (DFAR) (or by the state agency for fisheries)
- Reclamation to provide additional buffers
- Waterfront developments complying with the guidelines and criteria spelt out by the CC&CRMD in specified coastal segments
- Life guard towers/structures, Observation towers/structures, Hazard shelters
- Activities comply with the guidelines for the temporary occupation of reservation area

6.4.4 Permissible Developments/Activities in the Restricted Area (Soft Area)

Whilst it is good management practice to leave the Restricted Area free from any development activity, this may not always be socially acceptable in view of the existing land use patterns, very high population densities, development pressure, and the small land parcel sizes within the Coastal Zone. Hence, a less stringent management strategy will be required. Constructions within the Restricted Area will be limited to dwellings and tourism-related activities, provided however that such dwellings or tourism-related developments/activities do not restrict vertical and lateral access to the beach.

6.4.5 Setback Exemptions

A setback exemption implies a significant deviation from the intent of the setback guidelines stipulated in this Plan. Exemptions will only be granted if public interest warrants it. Exemptions may be granted by the DG only if the Coast Conservation and Coastal Resources Management Advisory Council (CC&CRMAC) determines that there are compelling reasons for allowing an exemption and recommends such exemption. Exemptions are granted to engage in restricted activities within the setback area only if and when the applicant has demonstrated that such activities meet specific criteria. The following criteria need to be satisfied to consider granting exemptions.

- The proposed activity should serve a public purpose, which provides benefits to the public as a whole as opposed to individual or private interests, and must be one or more of the following:
 - * Associated with public infrastructure such as utility, energy, communications, and transportation facilities
 - * Water dependent, generating substantial economic gain to the community or providing better public access to the beach
 - * Associated with national security
 - * Related to environmental improvement interventions such as urban/city beautification and landscaping
 - * Hazard mitigation measure that leads to protection of lives and property
- There are no reasonable alternative locations for serving the compelling public purpose stated
- All reasonable steps will be taken to minimize negative environmental impacts and/or user conflicts if an exemption is granted

6.4.6 Setback Variances

A setback variance implies a reduction of setback guidelines stipulated in this Plan. Unlike in the case of a setback exemption, private interests may seek setback variations. Setback variances may be granted by the DG only if the CC&CRMAC determines that there are compelling reasons for allowing a variance and recommends such a variance. Setback variances may be granted only if the following criteria are met.

- The proposed development activity is strictly limited to the Restricted Area (Soft Area) and/or the area landwards of the Restricted Area
- The proposed alteration will not lead to any significant adverse environmental impacts or user conflicts. To establish the degree of environmental impacts, the CC&CRM AC shall consider the following:
 - o existing coastal erosion rates in the area in which the proposed variance is requested
 - o the degree to which the activity for which the variance is requested might reasonably be expected to accelerate erosion rates
 - o the degree to which impacts associated with the activity for which the variance is requested will adversely affect coastal ecosystems in the vicinity
 - o the degree to which geomorphological characteristics of the site, such as rocks, vegetation, or dunes, reduce or amplify potential adverse impacts
 - o the elevation of the site for which the setback variance is requested based on the stability and landform of the particular site
 - o the reciprocal effects of the proposed activity on existing coast protection structures
 - o the type of precedent that is set by a decision, on the application for variance
- Due to conditions at the site in question, the setback will cause the applicant an undue hardship
- The variance requested by the applicant is the minimum necessary to relieve an undue hardship
- The undue hardship is not the result of any prior action by the applicant
- The allowable limit of variance to be granted shall be determined by the DG CC&CRMD based on scientific reasoning

6.4.7 Control of the Public Activities/Usage of Foreshore

Prohibited Activities within the Foreshore

- Construction of fences
- Planting of trees
- Disposal of wastewater and solid waste
- Construction activities using containers and non-operative fishing vessels or equipment

i. Permissible Uses for Public Purposes and Special Purposes related to National Development within the foreshore

- Beach scene operations and construction of huts for such operations
- Ocean Outfalls, seawater intakes
- Structures related to ports and fisheries harbours
- Lifesaving towers (Hazard warning towers, Life guard towers/structures, Observation towers/structures)
- Underwater cables and communication lines
- Activities associated with national security
- Other activities/uses approved by the CC&CRMD under temporary permit procedure

Setback limits for the landward of the commercial ports, fisheries harbours and anchorages with protected structures

Setback standard is not applicable for the public or private coastal land plots located landward of the commercial ports, fisheries harbours and anchorages. The boundaries of such infrastructure will be determined by the CC&CRMD on case-by-case basis

6.4.8 Guidelines for Issuing Permits for Refurbishments and Expansion of Existing Structures

Due to urban development and expansion, historic, cultural, and sentimental values, and the prevailing land scarcity and the higher land prices within the Coastal Zone, a tendency could be seen to expand and refurbish the existing buildings within the Coastal Zone. When the CC&CRMD issues development permits for such activities, contradiction or ambiguity on prevailing setback standards is inevitable. To avoid such situations, the following guidelines shall apply to refurbish and expand existing buildings within the Coastal Zone

- The ground floor footprint of an existing building should not be altered, if it is located within the reservation area and the present floor area of the ground floor of the existing building should not be increased
- No septic tanks, swimming pools, seawalls, or other structures are allowed seaward of the existing building to be refurbished
- If the existing building or the structures possess historic, religious or archaeological value, prior approval of the Department of Archaeology is required for any modification
- Approval of the refurbishment plans of the existing buildings should comply with the waterfront development plans and the coast protection plans if any
- In accordance with these guidelines, no permission will be granted for the buildings constructed after Oct 1st 1983 when the CC act came into operation
- Permission will be granted only for the buildings constructed before oct1st 1983 and confined to the old footprint of the building.

6.4.9 Guidelines for Waterfront and Island Developments for Tourism and Recreational Activities

With recent developments in tourism and recreational activities, a demand exists for developments in islands (in the Coastal Zone) and waterfront developments to facilitate such activities. The current demand mainly focused on many small islands located in shallow waters off the Jaffna Peninsula and Kalpitiya.

The main environmental and socio-economic issues that could result from developments in islands and waterfront developments for tourism and recreational activities may be diverse and need to pay attention on the following bio-physical characteristics and impacts:

- Low level of environment threshold (ability to withstand stresses) due to the fragile nature of environmental resources in the area of developments
- Limitation of the carrying capacities of the coastal ecosystems including the beaches

- Potential impacts of construction of structures such as jetties, berthing facilities, and other marine structures (which may cause obstructions to sand movement around the islands/waterfronts, alterations of current movement due to dredging, sedimentation on corals, sea grass, and other marine ecosystems, destruction of marine ecosystems due to dredging and other constructions in water bodies.
- Construction of additional protective structures to minimize damages to the developments carried out.
- Removal of vegetation causing changes in erosion and accretion patterns
- Environmental pollution due to the accumulation of solid and liquid waste
- User conflicts between traditional fishing activities and tourism and recreational activities
- Inadequacy of historical data and information on coastal processes for assessing the dynamic behavior of the islands/locations

Considering the significant characteristics and potential impacts related to waterfront and islands development for tourism as highlighted above, the following guidelines shall apply for issuing permits for such developments.

1. A permit may be issued based on the findings of an EIA or IEE procedures adopted in compliance with the existing legal provisions (CC&CRM Act, National Environment Act and other related Acts) on a case-by-case basis, by the DG of the CC&CRMD.
2. Based on the findings of an EIA or IEE, an Environmental Management Plan (EMP) should be prepared and implemented by the respective developer to ensure sustainable management of the coastal environment.
3. Waterfront development activities shall not be located in/or adjacent to the live coral reef areas and sea grass beds.
4. Waterfront development activities shall not be allowed within a distance of 1.6 km from a National Park declared by the Department of Wildlife Conservation (DWC).
5. Permission from the DWC should be obtained for siting of waterfront development activities in sanctuaries or marine protected areas on a case-by-case basis.
6. Waterfront development will be restricted to 500 m of the water body and the riparian land from the riverine estuary, lagoon, or canal mouth.
7. All waterfront developments to be located within rivers, streams, and other water bodies will be permitted subject to the approval of Irrigation Department.
8. Approval should be obtained from the Central Environmental Authority (CEA) for all waterfront development activities to be located within designated “Environmental Protected Areas”
9. An environmental Protection License (EPL) should be obtained from the (CEA) to discharge, emit, or deposit any waste or reject water from desalination from the waterfront development activities within the “Coastal Zone”
10. The traditional fishing activities, fishing grounds and fish migratory routes shall not be disturbed by the proposed waterfront development activities.
11. Waterfront development within small islands shall be permitted only if an adequate service area is available in the mainland (terrestrial area).
12. No waterfront development activities shall be permitted in the areas subject to security restrictions or specific measures imposed for national security.

13. The necessary approval should be obtained as per the provisions of the state land ordinance.
14. Any development activity shall not be permitted within the “Conservation Areas” or “Affected Areas” declared under the CC&CRM Act, No. 57 of 1981.
15. Provisions should be provided to ensure public access within the islands.
16. All precautionary measures/evacuation plans to minimize the impacts of natural hazards should be submitted by the developer to the CC&CRMD and approval for such measures/plans need to be obtained.

6.4.10 Guidelines for Development of Floating Facilities for Tourism and Recreational Purposes

The development of floating facilities (such as floating restaurants, recreational floats, boat houses etc.) for tourism and recreational activities within the coastal zone of Sri Lanka are not very significant yet. But with the current development trends and the diversification needs that have emerged pertaining to the tourism industry, emphasis will be placed on development such facilities in the near future. Although these facilities are important for tourism and recreation, they also can have negative impact on traditional socio-economic activities, shoreline ecology, aesthetic and navigational aspects. Therefore, to ensure sustainable tourism and recreational activities within the Coastal Zone, the following guidelines will be applicable for construction and establishment of floating facilities for tourism and recreational purposes.

1. The floating facilities for tourism and recreational purposes within the Coastal zone will be allowed only in the specific locations identified by the CC&CRMD.
2. The preliminary proposal should be submitted to the CC&CRMD prior to formulation of the detail proposal to avoid delays in the approval process.
3. The proposals for floating facilities for tourism and recreational purposes are subjected to the EIA/IEE process on case-by-case basis based on the discretionary powers vested with DG CC&CRMD.
4. Floating facilities for tourism and recreational purposes are not permitted rest on the bed (substrate) of water bodies in the Coastal Zone
5. No floating facilities for tourism and recreational, including recreational platforms for fishing and swimming, is are permitted where coral reefs and sea grass beds are located and adjacent to the turtle nesting areas.
6. Floating facilities for tourism and recreational purposes will not be permitted in areas declared as Conservation Areas, Affected Areas and areas identified for mineral extraction, including sand.
7. Floating facilities for tourism and recreational purposes will not be permitted in close proximity to the beach scene areas or other traditional fishing practices (such as stake net and still fishing) are carried out.
8. Dumping of solid waste water from the floating facilities for tourism and recreational purposes in to the coastal waters or other water bodies in the coastal zone will not be permitted
9. Moorage facilities should not interfere with legal public access to the shoreline or uses of the Coastal Zone.
10. Wood or any other material treated with toxic compounds should not be used for the construction and operation of floating facilities for tourism and recreational purposes..
11. Spreading of artificial night lighting should be avoided as much as possible by focusing the lights, and using shades that minimize illumination of the surrounding environment of the floating facility.

12. All foam material, whether used for floatation or for any other purpose related to the structure floating facility must be encapsulated within a shell that prevents breakup or loss of the foam material into the water and is not readily subject to damage by ultraviolet radiation or abrasion.
13. Floating should be positioned at least 10 m of native aquatic vegetation.
14. To ensure safety of the coastal water users and to curtail safety hazards, floating facilities should be adequately marked with reflectors.
15. No floating facilities are permitted to be located in close proximity to the defence establishments.

6.4.11 Guidelines for Siting Over Water Structures (Water bungalows)

When constructing water bungalows for tourism in environmentally sensitive areas like oceans, lagoons, estuaries, or rivers, it is essential to follow environmental guidelines to minimize the negative impact on the ecosystems and potential user conflicts arising out of it. The following general guidelines need to be adhered to such development as applicable:

1. Conduct a thorough EIA or IEE before starting the project to identify potential environmental impacts and propose mitigation measures.
2. Choose a location that has minimal ecological value, avoids critical habitats (coral reefs, seagrass beds, etc.), and is less likely to affect marine life and traditional livelihood practices such as stake net and still fishing.
3. Use sustainable building materials, energy-efficient designs, and low-impact construction techniques to minimize resource consumption and waste generation.
4. Implement effective waste management practices to minimize plastic and other non-biodegradable waste. Use recycling and proper disposal methods.
5. Use advanced wastewater treatment systems to ensure sewage discharge does not harm marine life and water quality and other water-based recreational activities.
6. If located closer to coral reef areas, implement measures to protect them from construction activities and tourists, such as installing buoys to prevent anchoring and providing guided snorkeling/diving to minimize physical contact.
7. Protect the local flora and fauna and establish rules to avoid feeding or disturbing wildlife.
8. Avoid discharge of reject water from desalination process into the coastal or lagoon waters .
9. Minimize noise and light pollution to avoid disturbing marine life and maintain the area's tranquility.
10. If the proposed development intervention is to be located at an SMA site, involve the local community and support local initiatives for conservation and sustainable development.
11. Raise awareness among guests about the fragile ecosystem and the importance of conservation efforts.
12. Establish a monitoring program to assess the environmental impact of the bungalows over time and make necessary adjustments.
13. The permit issued for construction of water bungalows and over water structures are subject to ecological compensation process.

6.4.12 Guidelines for Renewable Energy Development

The development of renewable energy in coastal areas, including wind, solar, and ocean thermal energy conversion, wave energy conversion, requires careful planning and consideration of environmental, social, and economic factors. The following guidelines will facilitate the sustainable development of renewable energy projects in the coastal zone:

1. Conduct an environmental impact assessment (EIA) or IEE (Initial Environmental Examination) to identify potential social, environmental, and ecological impacts considering the following;
 - Sensitive coastal habitats and coastal ecosystems
 - Wildlife migration routes
 - Significant archaeological sites/resources
 - Traditional fishing practices
 - Sensitive security installations
 - water quality
2. The EIA should also consider cumulative impacts in conjunction with other existing or planned coastal developments
3. The proposed project sites should not be located in, affected areas, and/or conservation areas as declared/specified.
4. The coastal land grading should be carried out at a minimum level without altering the physical nature of the coastal land form
5. Separate permission must be obtained for amalgamation of other development with the renewable energy development projects.
6. Ensure stakeholder engagement through the Involvement of local communities, and other stakeholders in the decision-making process. Engage them early in the planning stages to gather local knowledge, address concerns, and consider their input on project design and location.
7. Design wind turbines and solar installations with aesthetics in mind to reduce visual impacts on coastal landscapes. Consider using offshore wind farms in suitable locations to minimize visibility from shore.
8. Implement measures to mitigate noise pollution from wind turbines and minimize potential harm to birds and marine life. For example, use turbine designs that reduce noise and consider seasonal restrictions during sensitive wildlife migration periods.
9. Implement ecosystem restoration and offset measures to compensate for any unavoidable environmental impacts. For example, support habitat restoration projects in nearby areas to enhance biodiversity and ecosystem health.
10. For offshore projects, ensure that they adhere to safety standards and do not pose hazards to navigation or marine traffic. Properly mark and light structures to avoid collisions.
11. Establish a robust monitoring program to track the environmental and social impacts of the projects over time by relevant authorities. The collected monitoring data should be handed over to the CC&CRMD by the project proponent.
12. Develop a clear plan for the decommissioning and restoration of the site once the project reaches the end of its operational life. This plan should address how to remove infrastructure and restore the area to its original state or an agreed-upon alternative use.

6.4.13 Guidelines for Issuing conditional use permit (temporary permit) for the occupation of beach areas for tourism and recreational activities

The purpose of considering issuing temporary use permits for the occupation of the beach area (reservation area of the titleholders and the selected beach stretches) is twofold. Firstly, control of unauthorized development in tourism-related significant coastal areas while ensuring sustainable financial mechanisms for coastal resource management in the wake of the financial crisis confronted by the country. Secondly, issuing temporary permits for the occupation of beach areas (Reservations are of the titleholders and the selected beach stretches) for tourism and recreational activities can be a way to manage and regulate these activities while preserving the coastal environment. The details of issuing the conditional temporary permit is described below:

Application Process:

To obtain a conditional use permit (temporary permit) interested parties, such as hoteliers, tour operators or event organizers, shall submit an application detailing their proposed activities, dates, and the area they wish to occupy.

Permit Duration:

The duration of the temporary permit will be determined based on the nature of the activity and its potential impact on the beach area. This category of permits will be issued ranging from a few days for a specific event to several months for seasonal activities as specified below;

Designation of Specific Zones:

The CC&CRMD will identify specific zones or designated areas on the beach where certain temporary activities are allowed. The designated areas may change from time to time based on the dynamic nature of the particular beach stretch. This helps manage the impact of tourism and recreational activities on different parts of the beach.

- **Short duration events** (Not more than seven days): Occupying a selected/designated public beach area for events such as musical shows, dramas, and practical training conducted by professional institutes.
 - o The selected beach area from free of traditional fishing activities such as beach seine, still fishing, etc
 - o The selected beach stretch should be free from turtle nesting areas
 - o Ensure adequate vehicle parking facilities without causing inconvenience to other neighboring activities
 - o Other approval should be obtained from the local authority, religious and other institutions located nearby as relevant

Capacity Limits: A limit on issuing the number of permits for any given time will be determined by the DG CC&CRMD to avoid overcrowding and protect the beach's carrying capacity.

Seasonal Restrictions: The seasonal restrictions on certain activities to protect sensitive beach habitats, nesting sites for wildlife, or areas with high erosion risk will be notified by the CC&CRMD.

Conditions for occupying Reservation Area

- o Permanent structures should not be cited within the reservation area
- o Only 75% of the reservation area could be used for temporary structures
- o The height limit of the temporary structures should be limited to the ground floor level
- o The size and intensity of the contemplated temporary structure should be desirable and compatible with the other development
- o No temporary structures should be built on the existing coast protection structures (breakwaters, revetments, groins, seawalls, gabion walls, etc.)

- o Construction and siting of septic tanks or wastewater storage tanks will not be permitted
- o An adequate lateral access along the beach should be ensured by providing broad walk or other suitable means
- **Permit Period:** The temporary permit for the usage of the reservation area should be limited to six months and renewed based on the coastal environment and development screening process
- **Ecological Compensation:** Temporary permit will subject to ecological compensation process to restore and enhance ecosystem damaged
- **Minimization of Risk:** Permit holder require to carry liability insurance to cover potential damages or accidents resulting from their activities.
- **Awareness Creation:** Permit holder needs to create awareness among tourists, visitors, and other beach uses about responsible beach use, shared responsibility for coastal environmental conservation, and adopting safety measures
- **Emergency Response Plans:** Require permit holders to have emergency response plans in place to address evacuation during unforeseen incidents or adverse weather conditions (Coastal erosion, overtopping, oil pollution)
- **Termination/ Right to remove at short notice:** If the respective developers violate permit conditions or an emergency situation, the DG CC&CRMD has the right to terminate the permit and request the developer to remove temporary structures built on the reservation with immediate effect without any compensation.
- **Decommissioning:** A reasonable refundable cash deposit determined by the DG CC&CRMD shall impose on issuing temporary conditional use permits to enable the reservation area to be placed into its original state

Compliance Monitoring: CC&CRMD will regularly monitor activities of the permit holders to ensure they comply with the terms and conditions of their permits, including environmental regulations and responsible tourism practices.

6.4.14 Guidelines for Issuing temporary permits for establishment and operating surfing equipment outlets in the foreshore area

To consider issuing temporary permits for the establishment and operating surfing equipment outlets for recreational purposes on commercial basis requires a well-defined set of guidelines to ensure safety, environmental protection, and proper use of public spaces. Thus, the following general and specific guidelines will be followed to issue temporary permits;

General Guidelines

1. The service provider/applicant must describe the nature and scale of the surfing equipment outlet to be established within the foreshore area and the intended use of recreational equipment including surfing, diving equipment.
2. The permit period for the establishment and operating surfing equipment outlets is confined to six months as specified by the CC & CRMD for the South, South West, West, North, and East Coast depending on the tourist season.
3. The temporary permit for the establishment and operating surfing equipment outlets will be issued only for the coastal segments/locations designated by the CC & CRMD.
4. An applicable permit fee should be paid by the applicant as determined by the CC & CRMD
5. Renewal of a temporary permit issued for the establishment and operation of surfing equipment outlets on the foreshore area will mainly depend on the permit condition compliance and the stability of the coast.
6. The CC&CRMD has the discretionary right to cancel the temporary permit with short notice in the event of coastal erosion or any other significant coastal hazard without any compensation.
7. CC & CRMD may impose restrictions in the event of the appearance and movement of sensitive coastal habitats such as turtles.

Specific Guidelines

No permanent structures are allowed for surfing equipment outlets and allowed only to use open and movable racks.

1. The public vertical and lateral access to and along the beach should not be disrupted
2. Surfing equipment must meet safety standards set by relevant authorities.
3. Equipment should be designed to minimize environmental impact. For instance, the use of non-toxic, biodegradable materials is encouraged.
4. The maximum capacity of the beach area to accommodate surfing equipment outlet will be decided by the CC&CRMD on case-by-case basis considering the prevailing beach uses.
5. Waste disposal plan must be submitted and approved, ensuring no pollution or harm to the beach or to the aquatic environment.
6. Permits may include restrictions on times or conditions of use to protect localized movement of habitats.
7. Operators may be required to hold certifications from recognized surfing or water sports organizations.
8. A refundable cash deposit is required to ensure the dismantlement of the facility and cleaning of the beach area at its original state.
9. The temporary permit issued for establishment and operation of surfing equipment outlets are subject to periodic inspections by the CC&CRMD to ensure compliance with permit conditions.

6.4.15 Setbacks for Artificial Islands, Reclaimed Coastal Lands

In view of the requirement of EIA or IEE for such development, appropriate setback or the buffer area will be determined on a case-by-case basis.

Considering the location, vulnerability, type of development, design features and other relevant information, setbacks for artificial islands and reclaimed coastal lands are to be determined by the CC&CRMD.

6.5. SETBACK AREA FOR THE DEVELOPMENT ACTIVITIES IN THE RIPARIAN LAND OF THE WATER BODIES IN THE COASTAL ZONE

In the case of riparian land of the water bodies in the Coastal Zone, a setback area can be defined as an area in which certain activities are prohibited or restricted. The setback area for the riparian land of water bodies in the Coastal Zone is delineated landwards from an appropriate reference line such as the Full Supply Level (FSL), Mean High Tide Level, or edge of the bank of the water body or any other line determined based on the site conditions.

An adequate setback should be delineated for the development activities within the riparian land of the bodies in the Coastal Zone. Traditionally, demarcating reservations for water bodies has been practiced by the Irrigation Department for development activities located in the riparian land of the water bodies. In considering the bio-physical characteristics of the water bodies, setback areas are defined under the following three major categories

- Lagoons and riverine estuaries
- Major rivers
- Other water bodies connected to the Sea

6.5.1 Guidelines for Riparian Buffer Zone Setback limits in the riparian areas of water bodies in the Coastal Zone consistent with the Department of Irrigation guidelines

Setback limits in riparian areas of water bodies in the coastal zone are typically governed by a combination of guidelines issued by the Department of Irrigation and the CC&CRMD. These guidelines aim to protect the bio-physical structure of the waterbodies, water quality, aquatic ecosystems, and the overall health of coastal environments. The specific setback limits can vary depending on the location, and size of the water body.

These guidelines spelled out in this Plan are only applicable to the area of the waterbody lying within the “coastal zone” as defined in the Coast Conservation and Coastal Resource Management Amendment Act, No. 57 of 1981.

1. The delineation of the Riparian Buffer Zones should be measured from the edge of the water body.
2. The Riparian Buffer Zone is applicable for both sides of a river, lagoon, or other water body that lies within the coastal zone.
3. A minimum of 10m riparian buffer zone should be delineated for development activities other than bank protection from the edge of the water body.
4. The natural vegetation within the riparian buffer zone should be protected to enable it to filter pollutants, stabilize the banks of the waterbodies, and provide a habitat for wildlife.
5. A larger riparian buffer zone may be stipulated for the water bodies that are subjected to floods or located in flood-prone regions.
6. The approval of the CC&CRMD should be obtained for the construction or application of any bank protection measures other than vegetative stabilization.
7. Developers encourage to use of native vegetation and appropriate landscaping practices within the riparian buffer zone to enhance water quality and habitat value.
8. Public access and traditional pathways (lateral or vertical) leading to recreational areas and bathing places along the banks of the water bodies should not be impeded.
9. Reclamation will be allowed only beyond 10 m from the lagoon edge towards water area

6.5.2 “No Development Zone” and “Restricted Development Zone”:

In view of the high level of vulnerability and bio-physical characteristics of the estuarine water areas, riparian land located in close proximity to the mouths of the rivers, lagoons and the other water bodies in the Coastal Zone are designated as either “No development Zone” or “Restricted Development Zone” as follows;

- The water area within 500 m from the mouth towards extending upstream of the lagoons and major rivers are designated as “Restricted Development Zones” (RDZ).
- All rivers, lagoons and other water bodies located in the Coastal Zone of the Protected Areas are designated as “No Development Zones” (NDZ).
- A 500 m linear segment of riparian land extending towards the interior from the mouth of major rivers are specified as “Restricted/No Development Zone”.

6.5.3 Setback for Riparian Land of the Major Rivers, Canals and Streams

A setback or structure free reservation will be applied for development activities in the riparian land of rivers located within the Coastal Zone in conformity with the Government Land regulation (1) No.9912 of 1948.10.15 and guidelines/standards practiced/stipulated by the Irrigation Department. The riverside, canal side or streamside reference line is from the edge of the riverbank or Full Flood Level(FFL). The river categories are as follows;

<i>River Category</i>	<i>Width</i>
Major River	More than 15 Meters
Medium size river	5m-15m
Small river and other canals	Width less than 5m

Reservations used by Irrigation Department will be applied for development activities in the riparian land of rivers and canals.

Legal definitions of reservations are covered by Section 49,50,55,101 of the State Lands Ordinance No 8 of 1947 and Orders No.11,22 published with relevant to above sections under the *Gazette notification* No. 9912 of 15th October 1948. This has further described at sections 227 to 230 of Land Manual on State Land. In addition to that, Fauna and Flora Protection Ordinance No. 02 of 1937 on animal and tree conservation, Ordinance No. 24 of 1940 on Archeology sites and monuments conservation, Thoroughfare Ordinance No. 10 of 1861 on Roads and Pathways, Law No. 41 of 1978 on Urban Development Authority, Act, No. 12 of 1962 on Cemetery and Burial Ground, Sri Lanka Land Reclamation and Development Corporation Act, No. 15 of 1968 as amended by Sri Lanka Land Reclamation and Development Corporation (Amendment) Act, No. 52 of 1982 and LawNo.27 of 1976 also indicate reservations relevant to activities under above Laws.

However, if there is no reservation stipulated for riparian land of rivers and canals by the Irrigation Department or any other law, CC&CRMD will decide the reservation for the riparian land of rivers and canals within the Coastal Zone.

6.5.4 Setback for Riparian Land of the Lagoons

A minimum of 10 m meter setback is required for the development activities in the riparian land of the lagoons within the Coastal Zone. However, in view of the complex nature and bio-physical variations of the riparian land lying within the Coastal Zone of the lagoons, a setback exceeding 10 m could be delineated by the DG of the CC&CRMD as appropriate.

6.5.5 Reference Lines with respect to the Riparian Land of the Water Bodies in the Coastal Zone

Lagoon side Reference Point Line: Full Flood Level (FFL) or the Mean High Tide Line of the lagoon waters.

Riverside Reference Point Line: Edge of the riverbank, Edge of the bank protection structure, or the Full Flood Level (FFL) of the river

Reference line for Canals and other Waterways: Edge of the canal or stream bank or Edge of the bank protection structure

6.5.6 Guidelines for issuing permits for Reclamation within the Riparian Land of the Water Bodies in the Coastal Zone

- No reclamation activities will be permitted in the Coastal Zone except for the conservation and stabilization of riverbanks, edges of the lagoons, and other water bodies.

- Reclamation of riparian land of the water bodies in the Coastal Zone will be permitted for national security and urban beautification programmes on a case-by-case basis
- No solid waste or e-waste dumping sites will be located in the riparian land of the water bodies (Reclamation by dumping solid waste is not permitted within the riparian land of the water bodies in the Coastal Zone.
- Reclamation of riparian land of the water bodies **using solid waste or e-waste** in the Coastal Zone will not be permitted in the area within 20 m of the bank of such water bodies.

6.6 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND INITIAL ENVIRONMENTAL EXAMINATION (IEE)

The legal provisions made for the requirement of Environmental Impact Assessment (EIA) stated under the Section 16 of the CC&CRM Act, No. 57 of 1981 has been as amended by the Coast Conservation (Amendment) Act, No. 49 of 2011 are as follows:

“Upon receipt of an application for a permit to engage in a development activity within the Coastal Zone as required by subsection (3) of section 14, the Director General may require the applicant to furnish an Initial Environmental Examination (IEE) report or an Environmental Impact Assessment (EIA) report relating to the development activity as the case may be or both such reports. It shall be the duty of the applicant to comply with such requirement”.

In compliance with the above legal provision, when an application is received for a permit to engage in a development activity within the Coastal Zone, the DG of CC&CRMD will determine whether such activity requires an EIA or IEE. Although the DG has discretionary powers in determining the requirements of an EIA or IEE, the CC&CRMD will consult the CEA and other relevant state agencies where necessary and due consideration will be given to the list of prescribed projects under the National Environmental Act (NEA). It shall be the duty of the applicant to comply with the relevant requirements.

6.6.1 Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) has been is defined in the CC&CRM 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.”

An EIA report will be required in case of a project that is considered by the DG to have significant impacts on the coastal environment or determined based on the adequacy of IEE report. The Terms of Reference (TOR) for the EIA will be prepared by the CC&CRMD in consultation with the related agencies on the basis of a consolidated review process and will be provided to the proponent of the project. It is the responsibility of the applicant to prepare the EIA report in conformity with the given TOR and the general guidelines for the preparation of an EIA that are given above. The developers (i.e. the project proponents) are advised to consult with CC&CRMD during the design stage and preparation stage of the EIA report. This will enable the CC&CRMD to assist the developer to prepare a concise, cost-effective EIA report that focuses on the most relevant issues.

On receipt of an EIA report from the developer, the Director DG shall submit a copy of the EIA report to the CC&CRM for comments. The DG shall also publish a notice in the *Gazette* and in one newspaper each in Sinhala, Tamil and English, indicating the place and time the EIA report can be inspected by the public and invite the public to submit their comments within 30 days. The CC&CRM will submit its comments to the DG within 60 days. The DG shall consider all comments received and within 60 days of receipt of comments make a decision whether a permit can be issued and the conditions thereof (Figure 6.3).

6.6.2 Initial Environmental Examination (IEE)

In issuing a permit, the director DG is required to ensure that the development activity will not have an adverse effect on the environmental quality of the Coastal Zone and sustainability of the coastal resources. To ensure this, the DG may request the developer to submit an Initial Environmental Examination (IEE) report in accordance with the legal provisions of the Section 16 (1) of the CC&CRM Act amended by Coast Conservation Act, No. 49 of 2011. The IEE report is defined in the Amendment Act as follows:

“Initial Environmental Examination Report means a written report wherein possible impacts of the development activity on the environment shall be assessed with a view to determining whether such impacts are significant, and therefore requires the preparation of an Environmental Impact Assessment report and such report shall contain all details and, descriptions, data, maps, designs and other information which is relevant to the development activity”.

Apart from the prescribed development activities for which an IEE report would not be necessary, such a report will be required in the case of development activities that is are considered to have significant impacts on the coastal environment and the resources as described in “Guidance for Implementing the Environmental Impact Assessment Process”. It is the responsibility of the applicant to prepare the IEE report. The general guidelines for the preparation of an IEE report are given below. A checklist and TOR for an IEE will be prepared by CC&CRMD in consultation with the relevant agencies and will be provided to the applicant.

On receipt of an IEE report, the CC&CRMD will review the report and if the report is sufficient to make a decision to issue or not issue the permit, a copy of such report may be submitted to the CC&CRMAC for its comments. The CC&CRMAC shall furnish its comments to the DG within thirty days. If the IEE report is insufficient to make a decision, the DG shall request an EIA from the project proponent.

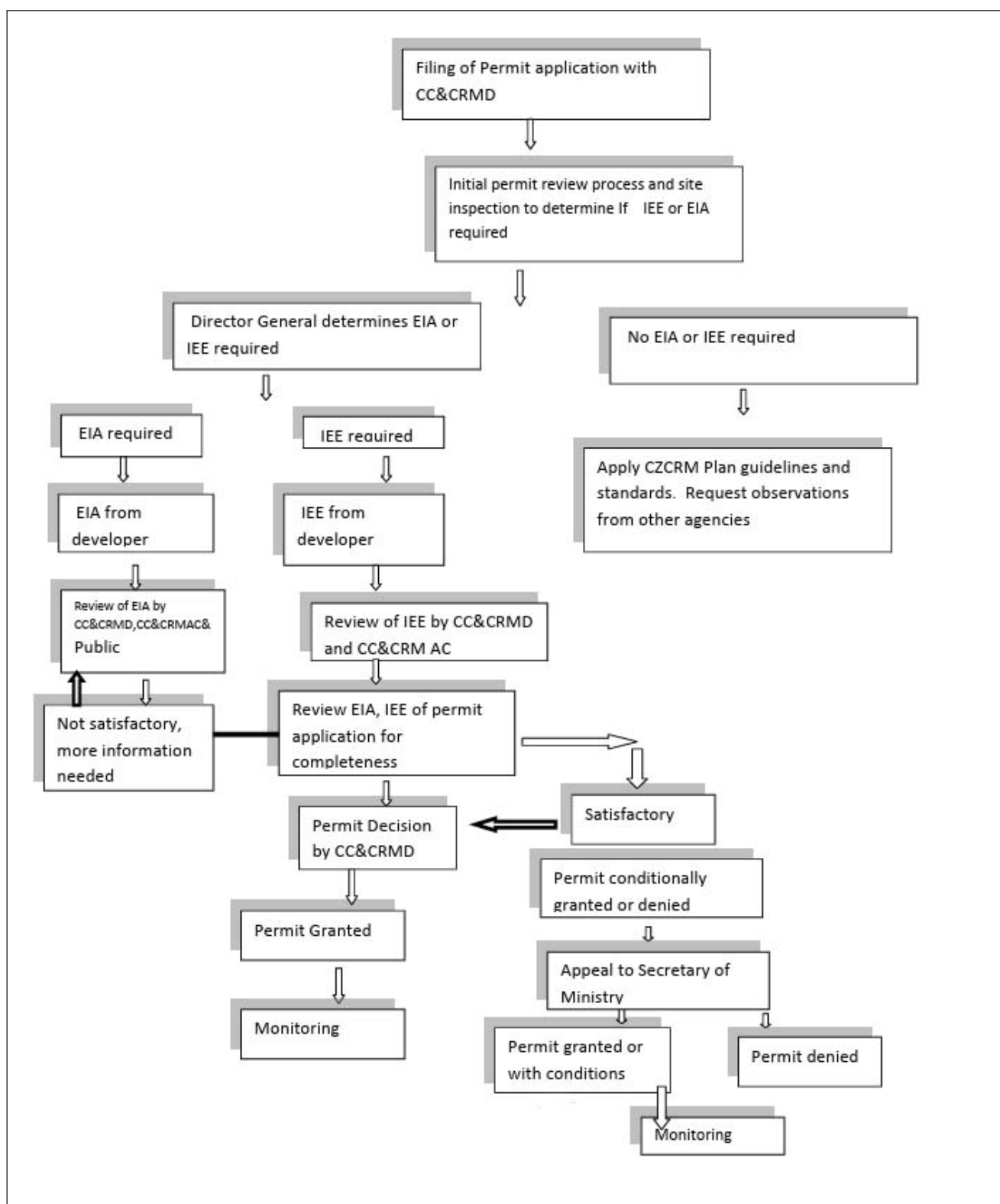


Figure 6- 2: Procedure for Reviewing and Issuing Development Permits

6.6.3 General Guidelines for Preparation of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Reports

The main details, typically to be included in an IEE or EIA report, are as below. More details, including site/project specific and other, are included in the TOR issued for the IEE or the EIA.

(a) Description of Proposed Activity

- (i) Description of the nature, aims and scope of proposed activity
- (ii) Description details of the activity during construction and operational phases
- (iii) Description of the methodology to be adopted during construction and operational phases
- (iv) Description of socio-economic and ecological benefits/costs of the proposed activity and,
- (v) Description of the long-term monitoring program for the proposed activity

(b) Description of approvals and (other) permits required to implement the proposed activity Site Description

- (i) A description of the area within which the activity, development or operation is proposed to be sited and its environs which should include:
 - Location of proposed activity marked on a 1 inch to 1 mile map or 1:50,000 metric sheet published by the Survey Department of Sri Lanka
 - A copy of map produced through Google Earth to show details of the site
 - A site map at a scale suitable to show the proposed activity,
Delineation of coastal habitats as defined in Chapter 3 of this Plan 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 6.4 in this Plan and any high priority recreational sites
 - 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 and its resources. 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 of this Plan
 - 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
 - Consequences on national security aspects

(d) Proposed Impact Mitigation Measures

A detailed 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, those should be stated and reasons for selection of the proposed mitigation measures be given.

(e) Additional Requirements

The DG/Scoping Committee may, on a case-by-case basis, specify other particulars to be included in the IEE or EIA report. The procedures for obtaining a CC&CRMD permit are summarized in Figure 6.3. 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 CC&CRMD and reading referring this Plan and appropriate references early in the project planning stage are advised to facilitate the permit granting process.

(f) Monitoring

As per the amendments made to the principle act Principal Act on-Coast Conservation, the geographic extent of the Coastal Zone has been extended by the inclusion of a part of the riparian land of the water bodies within the Coastal Zone. Thus, the controlling of development activities also has increased accordingly. In this context, monitoring of compliance is critical requirement for the management of the Coastal Zone and its resources. In view the above requirement, improved guidelines have been provided in the CC&CRMP 2024 in order to facilitate compliance monitoring. The main objectives of compliance monitoring carried out by the CC&CRMD are to:

- Determine whether approved permits meet the standards and guidelines stipulated in the CC&CRMP
- Determine the adequacy of CC&CRM guidelines and standards in achieving CC&CRMP objectives
- Detect potential or existing inconsistencies between permit decisions and the objectives of the CC&CRMP
- Evaluate the performance of the regional and local level officials of the CCCRMD and the adequacy of resources at the local level
- Determine the effectiveness, adequacy and support of the other agencies in CZM CC&CRM policy implementation.

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

- Periodic inspection by CCC&CRMD 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 including conditions imposed through EIA and IEE procedures
- Cumulative impact assessment monitoring emphasizing the collective and incremental impacts of numerous individual permit decisions spread over time and space in each coastal segment
- Verification of required developer reports, surveys, tests stipulated by CEA or any other agencies, relevant to the development activity
- Verification of Certificates of Conformity required obtained from local authority or other designated agency that the permit conditions have been adhered to.

Table 6- 1 Setbacks for Development Activities in the Coastal Zone – 2024

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
1	Vellai, Palliyamulla, Baththalanguanduwa and Other Islands (Islands Around Kalptiya Peninsula)	Puttalam	8°32'26.82"N	79°46'56.70"E	Medium (-)	20	30	50
			8°24'19.50"N	79°48'44.76"E				
2	Uchchamunai to Mohoththuwarem (Mohoththuwarem Split Northern Boundary)	Puttalam	8°23'01.20"N	79°47'14.90"E	Medium (+)	25	35	60
			8°15'00.60"N	79°44'20.20"E				
3	Mohoththuwarem (Mohoththuwarem Split Northern Boundary) to Mohoththuwarem /Kudawa Split Southern Boundary (Conservation /No Build Zone)	Puttalam	8°15'00.60"N	79°44'20.20"E		No Build Zone	No Build Zone	No Build Zone
			8°13'41.50"N	79°43'52.10"E				
4	Mohoththuwarem/Kudawa Split Southern Boundary (Kudawa Start Point) to Udappuwa Mouth	Puttalam	8°13'41.50"N	79°43'52.10"E	Medium (+)	25	35	60
			7°44'55.98"N	79°47'21.50"E				
5	Udappuwa Mouth to Daduru Oya Mouth Northern Boundary	Puttalam	7°44'55.98"N	79°47'21.50"E	Medium	20	35	55
			7°37'6.70"N	79°47'56.50"E				
6	Daduru Oya Mouth Northern Boundary to Chilaw Cemetery End Point (Conservation Zone/ No Build Zone)	Puttalam	7°37'06.70"N	79°47'56.50"E		No Build Zone	No Build Zone	No Build Zone
			7°35'48.90" N	79°47'11.60"E				
7	Chilaw Cemetery End Point to Nainamadama Wellamankaraya Gin Oya River Mouth	Puttalam	7° 35'48.90" N	79°47'11.60"E	Low (+)	15	30	45
			7°18' 08.39"N	79°50'16.14"E				
8	Nainamadama Wellamankaraya Gin Oya River Mouth to Duwa Pitipana weediya Mora Wala	Puttalam /Gampaha	7°18' 08.39"N	79°50'16.14"E	Low (-)	10	25	35
			7°12'13.00"N	79°49'02.50"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
9	Duwa Pitipanaweediya Mora Wala to Kelani River Mouth	Gampaha/ Colombo	7°12'13.00"N 6°58'43.55"N	79°49'02.50"E 79°52'10.09"E	Low (+)	15	30	45
10	Kelani River Mouth to Colombo Port	Colombo	6°58'43.55"N 6°56'19.34"N	79°52'10.09"E 79°50'42.78"E	Low (+)	15	30	45
11	Colombo port to Beira Lake Mouth (Port City Development Segment)	Colombo	6°56'19.34"N 6°55'45.81"N	79°50'42.78"E 79°50'33.75"E	Special Segment I	Port City Regulations will apply		
12	Beira Lake Mouth to Mount Lavinia Hotel	Colombo	6°55'45.81"N 6°50'02.91"N	79°50'33.75"E 79°51'44.83"E	Low (-)	10	25	35
13	Mount Lavinia Hotel to Pinwatta Thalpitaya Outlet	Colombo/ Kalutara	6°50'02.91"N 6°40'56.76"N	79°51'44.83"E 79°55'02.46"E	Low (-)	10	25	35
14	Pinwatta Thalpitaya Outlet to Kalutara Estuary Northern Bank	Kalutara	6°40'56.76"N 6°35'16.09"N	79°55'02.46"E 79°57'19.92"E	Low	15	25	40
15	Kalutara Estuary Northern Bank to Avani Hotel Katukurunda (Southward Boundary of Kalutara Estuary) (Proposed to Kalido Strip as a Conservation Zone)	Kalutara	6°35'16.09"N 6°34'14.95"N	79°57'19.92"E 79°57'34.09"E		No Build Zone		
16	Avani Hotel Katukurunda (Southward Boundary of Kalutara Estuary) to Beruwala Kechchimale Mosque	Kalutara	6°34'14.95"N 6°28'13.40"N	79°57'34.09"E 79°58'24.47"E	Low	15	25	40

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
17	Beruwala Kechchimale Mosque to	Kalutara/ Galle	6°28'13.40"N	79°58'24.47"E	Low (+)	15	30	45
	Induruwa Headland (Saman Villa Hotel)		6°23'44.92"N	80°00'15.33"E				
18	Induruwa Headland (Saman Villa Hotel) to	Galle	6°23'44.92"N	80°00'15.33"E	Low	15	25	40
	Hikkaduwa River Mouth		6°08'58.03"N	80°05'57.27"E				
19	Hikkaduwa River Mouth	Galle	6°08'58.03"N	80°05'57.27"E	Low (-)	10	25	35
	Bambagala Ela		6°01'40.23"N	80°14'32.42"E				
20	Bambagala Ela to	Galle	6°01'40.23"N	80°14'32.42"E	Low	15	25	40
	Unawatuna Welledewalaya		6°00'23.34"N	80°14'39.16"E				
21	Unawatuna Welledewalaya to	Galle/ Matara	6°00'23.34"N	80°14'39.16"E	Low (-)	10	25	35
	Goyambokka Peace Heaven Hotel Headland (Julgahawella Fishing Landing Site)		6°00'51.30"N	80°47'10.38"E				
22	Goyambokka Peace Heaven Hotel Headland (Julgahawella Fishing Landing Site) to	Hambantota	6°00'51.30"N	80°47'10.38"E	Low	15	25	40
	Rakawa West		6°02'32.19"N	80°51'38.27"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
23	Rakawa West to	Hambantota	6°02'32.19"N	80°51'38.27"E	Medium (-)	20	30	50
	Kalamatiya Henagahapugala		6°04'31.10"N	80°56'10.44"E				
24	Kalamatiya Henagahapugala to	Hambantota	6°04'31.10"N	80°56'10.44"E	Medium (+)	25	35	60
	Ussangoda Wild Life National Park Southern Boundary (Lunama Side) (Kalamatiya Wild Life Sanctuary Area)		6°05'13.04"N	80°58'37.61"E				
25	Ussangoda Wild Life National Park Southern Boundary (Lunama Side) to	Hambantota	6°05'13.04"N	80°58'37.61"E		300		300
	Ussangoda Wild Life National Park Northern Boundary (Close to Ussangoda Fishery Harbor) Ussangoda Wild Life National Park		6° 05'43.00"N	80°59'23.90"E				
26	Ussangoda Wild Life National Park Northern Boundary (Close to Ussangoda Fishery Harbor) to	Hambantota	6° 05'43.00"N	80°59'23.90"E	Low	15	25	40
	Godawaya Walawe River Mouth (Close to CC&CRMD Office)		6°06'24.48"N	81°03'02.31"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
27	Godawaya Walawe River Mouth (Close to CC&CRMDOffice) to	Hambantota	6°06'24.48"N	81°03'02.31"E	Medium (-)	20	30	50
	Hambantota Sea Port Southern Boundary (Mirijjawila)		6°06'52.85"N	81°05'46.64"E				
	Sub - Newly formed land (Reclaim area)					10	0	10
28	Hambantota Sea Port Southern Boundary to	Hambantota	6°06'52.85"N	81°05'46.64"E	Medium (+)	25	35	60
	Hambantota Fishery Harbour		6° 7'24.05"N	81° 7'45.18"E				
29	Hambantota Fishery Harbour to	Hambantota	6° 7'24.05"N	81° 7'45.18"E	Medium	20	35	55
	Bundala National Park Southern Boundary		6° 08'01.51"N	81°07'59.32"E				
30	Bundala National Park Southern Boundary Hambantota to	Hambantota	6° 08'01.51"N	81°07'59.32"E		300		300
	Kirindi Oya River Mouth (Bundala National Park)		6°11'46.70"N	81°17'44.90"E				
31	Kirindi Oya River Mouth to	Hambantota	6°11'46.70"N	81°17'44.90"E	Extremely High	45	80	125
	Kirinda Andagala Headland Start Point (Close to Andagala Modara)		6°11'55.94"N	81°19'26.88"E				
32	Kirinda Andagala Headland Start Point (Close to Andagala Modara) to	Hambantota	6°11'55.94"N	81°19'26.88"E	High (-)	25	40	65
	Kirinda Temple Rock		6°12'50.15"N	81°20'16.27"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
33	Kirinda Temple Rock to	Hambantota	6°12'50.15"N	81°20'16.27"E	Extremely High	45	80	125
	Yala Palatupana SLTDA Tourism Zone End Point (Gode (Kalapuwa) Lagoon Boundary)		6°16'26.67"N	81°25'11.56"E				
34	Yala Palatupana SLTDA Tourism Zone End Point (Gode (Kalapuwa) Lagoon Boundary)to	Hambantota/	6°16'26.67"N	81°25'11.56"E		300		300
	Yala National Park Northern Boundary (Okanda)	Ampara	6°21'46.50"N	81°31'44.00"E				
35	Yala National Park Northern Boundary (Okanda)to	Ampara	6°21'46.50"N	81°31'44.00"E	Extremely High	45	80	125
	Panakala Lagoon mouth (Panama Conservation Zone Start Point)		6° 43'29.37" N	81°48'06.97"E				
36	Panakala Lagoon mouth (Panama Conservation Zone Start Point) to	Ampara	6° 43'29.37" N	81°48'06.97"E		10		10
	Panama Lagoon Mouth Beacon Lamp Rock (Panama Conservation Zone End Point)		6° 46'02.61" N	81°49'32.37"E				
37	Panama Lagoon Mouth Beacon Lamp Rock to	Ampara	6° 46'02.61" N	81°49'32.37"E	High (+)	35	60	95
	Kudakalli Crocadile Rock (Hada Oya River Mouth)		6° 48'35.38"N	81°49'28.11"E				
38	Kudakalli Crocodile Rock (Hada Oya River Mouth) to	Ampara	6° 48'35.38"N	81°49'28.11"E	High (-)	25	40	65
	Arugambay Ulla Sand Dune Start Point		6°50'4.63"N	81°50'14.24"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
39	Arugambay Ulla sand dune start point to	Ampara	6°50'4.63"N	81°50'14.24"E	Extremely High	45	80	125
	Arugambay Ulla surfing point		6°50'21.76"N	81°50'08.89"E				
40	Arugambay Ulla Surfing Point to	Ampara	6°50'21.76"N	81°50'08.89"E	Low (+)	10	30	40
	Arugambay Bridge		6° 51'03.20"N	81°49'55.10"E				
41	Arugambay Bridge to	Ampara	6° 51'03.20"N	81°49'55.10"E	Medium (-)	20	30	50
	Viski Point Sand Dune Start Point (Kanahar Gramam (326 Km Post)		6° 55'05.55"N	81°50'51.78"E				
42	Viski Point Sand Dune Start Point (Kanahar Gramam (326 Km Post) to	Ampara	6° 55'05.55"N	81°50'51.78"E	Medium	20	35	55
	Sangamankanda Point		7° 01'21.39"N	81°52'42.46"E				
43	Sangamankanda Point to	Ampara	7° 01'21.39"N	81°52'42.46"E	High	30	50	80
	Thambattai (Close to Thambattai Kovil and Gayatri Thapovanam 354 .5Km Post)		7°08'17.96"N	81°51'27.50"E				
44	Thambattai (Close to Thambattai Kovil and Gayatri Thapovanam 354.5 Km post) to	Ampara	7°08'17.96"N	81°51'27.50"E	Very High	40	70	110
	Alayadiwembu (Narrow Strip)		7°12'26.40"N	81°51'43.75"E				
45	Alayadiwembu to	Ampara	7°12'26.40"N	81°51'43.75"E	High (-)	25	40	65
	Oluvil Harbour Northern Boundary (Close to Light House)		7°16' 48.18"N	81°51'58.01"E				
46	Oluvil Harbour Northern Boundary (Close to Light House) to	Ampara	7°16' 48.18"N	81°51'58.01"E	High (-)	25	40	65
	Sand Bar Starting Point		7°27'58.08"N	81°48'58.66"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
47	Sand Bar Starting Point	Ampara / Batticaloa	7°27' 58.08"N	81°48'58.66"E	High	30	50	80
	Kaththankudy Dean Road Al Tharika Mosque		7°41'40.26"N	81°44'05.38"E				
48	Kaththankudy Dean Road Al Tharika Mosque to	Batticaloa	7°41'40.26"N	81°44'05.38"E	High (-)	25	40	65
	Kallady Beach Park (Sarawanaady Road)		7°43'04.71"N	81°43'10.19"E				
49	Kallady Beach Park (Sarawanaady Road) to	Batticaloa	7°43'04.71"N	81°43'10.19"E	Extremely High	45	80	125
	Batticaloa Light House (Paalmeenmadu)		7°45'18.42"N	81°41'07.46"E				
50	Batticaloa Light House (Paalmeenmadu) to	Batticaloa	7°45'18.42"N	81°41'07.46"E	High	30	50	80
	Punniyakudah Point		7°49'40.60"N	81°37'10.90"E				
51	Punniyakudah Point to	Batticaloa	7°49'40.60"N	81°37'10.90"E	High (-)	25	40	65
	Outlet Near Pasikudah Fishery Landing Site		7°56'06.76"N	81°33'38.13"E				
52	Outlet Near Pasikudah Fishery Landing Site to	Batticaloa	7°56'06.76"N	81°33'38.13"E	Very High	40	70	110
	Nasivanthive Lagoon Mouth		7°56'46.50"N	81°32'42.80"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
53	Nasivanthive Lagoon Mouth to	Batticaloa	7°56'46.50"N	81°32'42.80"E	High	30	50	80
	Challitivu Munai Point (Close to Challitivu Island)		8°06'35.36"N	81°27'33.88"E				
54	Challitivu Munai Point(Close to Challitivu Island)to	Batticaloa / Trincomalee	8°06'35.36"N	81°27'33.88"E	High	30	50	80
	Lankapatuna		8°21'24.60"N	81°23'19.00"E				
55	Lankapatuna to	Trincomalee	8°21'24.60"N	81°23'19.00"E	High (+)	35	60	95
	Foul Point (Thirukonamalai Light House)		8°31'31.33"N	81°19'07.15"E				
56	Foul Point (Thirukonamala Light House)to	Trincomalee	8°31'31.33"N	81°19'07.15"E	Medium (-)	20	30	50
	Muthur East River Mouth (Close to Police Station)		8°27'42.54"N	81°15'33.37"E				
57	Muthur East River Mouth (Close to Police Station) to	Trincomalee	8°27'42.54"N	81°15'33.37"E	High	30	50	80
	Gangei Bridge		8°27'37.44"N	81°13'44.08"E				
58	Gangei Bridge to	Trincomalee	8°27'37.44"N	81°13'44.08"E	Medium (-)	20	30	50
	Irrakkandy bridge (River Mouth)		8°43'55.40"N	81°10'24.60"E				
	Sub Zone- Thambalagamuwa Bay Sub Zone	Trincomalee	8°30'19.49"N	81°11'25.40"E	Special Segment II	10	20	30
	Thambalagamuwa Bridge Southern Point		8°29'16.91"N	81°08'02.94"E				
	Sub Zone Intermediate Points		8°30'37.60"N	81°06'57.18"E				
	Thambalagamuwa Bridge Northern Point		8°32'41.94"N	81°08'57.12"E				
			8°31'34.01"N	81°10'39.21"E				
	Thambalagamuwa Bridge Northern Point		8°30'47.61"N	81°11'07.71"E				
			8°30'32.00"N	81°11'32.62"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
59	Irrakkandy bridge (River Mouth) to	Trincomalee	8°43'55.40"N	81°10'24.60"E	High	30	50	80
	Salpayaru Bridge		8°47'27.02"N	81°07'13.03"E				
60	Salpayaru Bridge to	Trincomalee	8°47'27.02"N	81°07'13.03"E	Medium (-)	20	30	50
	Kuchchaveli Puduwakattu		8° 51'33.28"N	81°04'8.77"E				
61	Kuchchaveli Puduwakattu to	Trincomalee	8° 51'33.28"N	81°04'8.77"E	High (-)	25	40	65
	Pulmude Arisimale Point		8°56'17.05"N	81°00'26.64"E				
62	Pulmude Arisimale Point to	Trincomalee	8°56'17.05"N	81°00'26.64"E	Extremely High	45	80	125
	Kokilai Lagoon Southern Boundary		8° 59'02.80"N	80°58'00.20"E				
63	Kokilai Lagoon Southern Boundary to	Mullaitivu	8° 59'02.80"N	80°58'00.20"E	Very High	40	70	110
	Mullaitivu Town		9° 16'03.02"N	80°49'15.96"E				
64	Mullaitivu Town to	Mullaitivu	9° 16'03.02"N	80°49'15.96"E	High	30	50	80
	Mullaitivu Mohothuwaram/Vattuvam Lagoon		9°16'33.75"N	80°49'0.39"E				
65	Mullaitivu Mohothuwaram/Vattuvam Lagoon to	Mullaitivu	9°16'33.75"N	80°49'0.39"E	Very High	40	70	110
	Naliatamitoduvay (Chundikulam National Park Southern Boundary)	Kilinochchi	9°27'28.40"N	80°37'19.06"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
66	Naliatannitoduvay (Chundikulam National Park Southern Boundary) to	Kilinochchi	9°27'28.40"N	80°37'19.06"E		300		300
	Chundikulam National Park Northern Boundary (Kaddaikadut)		9°33'43.45"N	80°29'24.20"E				
67	Chundikulam Northern Boundary (Kaddaikadut) to	Jaffna	9°33'43.45"N	80°29'24.20"E	Very High	40	70	110
	Thumpalai (Point Pedro)		9°49'05.00"N	80°15'16.60"E				
68	Thumpalai (Point Pedro) to	Jaffna	9°49'05.00"N	80°15'16.60"E	Low (-)	10	25	35
	Ponnalai		9°46'31.54"N	79°54'37.72"E				
69	Ponnalai to	Jaffna	9°46'31.54"N	79°54'37.72"E	Special Segment III	10	0	10
	Ariyalai		9°38'11.50"N	80°42'5.40"E				
70	Karaitivu Island exposed to Sea	Jaffna	9°45'50.76"N	79°53'30.99"E	High	30	50	80
	70 (a) to 70 (b)		9°42'24.92"N	79°51'55.53"E				
	Karaitivu Island exposed to Land	Jaffna	9°42'24.92"N	79°51'55.53"E	Special Segment III	10	0	10
	70 (b) to 70 (a)		9°45'50.76"N	79°53'30.99"E				
71	Mandative Island	Jaffna	9°35'58.20"N	79°58'43.20"E	Medium (-)	20	30	50
			9°38'16.20"N	79°59'19.56"E				
72	72 (a) Kytes Island section I (Allapiddy to Velanaiyanar Kovil)	Jaffna	9°42'10.47"N	79°51'49.14"E	Medium (-)	20	30	50
	72 (b) Kytes Island Section II		9°37'14.33"N	79°58'47.86"E	Special Segment III	10	0	10

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
73	Punkudutivu Island	Jaffna	9°35'22.40"N	79°48'26.60"E	High (-)	25	40	65
			9°35'17.50"N	79°48'07.50"E				
74	Nainathive Island	Jaffna	9°37'08.30"N	79°46'30.70"E	High (-)	25	40	65
			9°35'05.30"N	79°46'23.30"E				
75	Delft Island	Jaffna			High	30	50	80
76	Analaivitu, Eluvaitivu, Kachehativu and other Islands	Other Island Jaffna/ Kilinochchi			High (-)	25	40	65
77	Iranativu Island	Kilinochchi			High	30	50	80
78	Pooneryn Kalmunai Point to Pallikuda	Kilinochchi	9°35'57.25"N	80°03'07.56"E	Medium (-)	20	30	50
			9°29'10.95"N	80°11'09.71"E				
79	Pallikuda to Devil Point	Kilinochchi	9°29'10.95"N	80°11'09.71"E	High (-)	25	40	65
			9°23'19.50"N	80°03'11.10"E				
80	Devil Point to Nachehikuda (Nawanthurai Point)	Kilinochchi	9°23'19.50"N	80°03'11.10"E	High	30	50	80
			9°16'06.10"N	80°06'46.80"E				
81	Nachehikuda (Nawanthurai Point) to PalliAru North Ward Point	Kilinochchi/ Mannar	9°16'06.10"N	80°06'46.80"E	High (+)	35	60	95
			9°09'33.20"N	80°05'57.92"E				
82	PalliAru North Ward Point to Wankalai Point	Mannar	9°09'33.20"N	80°05'57.92"E	Extremely High	45	80	125
			8°56'36.55"N	79°55'07.28"E				
83	Mannar South Bar to Erukkalampiddi Causeway Point to Thona	Mannar Island	8°57'53.10"N	79°53'08.55"E	Medium (-)	20	30	50
			9°01'38.96"N	79°53'35.76"E				

Segment No.	Segments	Source Map	Latitude	Longitude	Level of Vulnerability	Proposed Setback(M)		
						Reservation	Restricted	Total Setback
84	Erukalampidi Causeway Point Thona to	Mannar Island	9°01'38.96"N	79°53'35.76"E	High	30	50	80
	Pesalai Vankalaipadu		9°04'46.49"N	79°50'52.46"E				
85	Pesalai Vankalaipadu to	Mannar Island	9°04'46.49"N	79°50'52.46"E	Medium (-)	20	30	50
	Thalaimannar Light House/Pier		9°06'27.23"N	79°43'49.12"E				
86	Thalaimannar Light House/Pier to	Mannar Island	9°06'27.23"N	79°43'49.12"E	High	30	50	80
	Mannar Island South Bar		8°57'53.10"N	79°53'08.55"E				
87	Mannar Island South Bar to	Mannar Island	8°57'53.10"N	79°53'08.55"E		No Build Zone	No Build Zone	No Build Zone
	Vankalai Point (Proposed Conservation/No Build Zone.)		8°55'50.40"N	79°54'26.28"E				
88	Vankalai Point to	Mannar	8°55'50.40"N	79°54'26.28"E	Extremel High	45	80	125
	Vankalai Sanctuary Southern Boundary		8°53'26.30"N	79°55'44.70"E				
89	Vankalai Sanctuary Southern Boundary to	Mannar	8°53'26.30"N	79°55'44.70"E	High	30	50	80
	Arippu East		8°47'44.63"N	79°55'27.45"E				
90	Arippu East to	Mannar	8°47'44.63"N	79°55'27.45"E	High (-)	25	40	65
	Pukkulam Modaragam Aru		8°33'48.67"N	79°55'12.80"E				
91	Pukkulam Modaragam Aru to	Puttalam	8°33'48.67"N	79°55'12.80"E		300		300
	Kala Oya River Mouth (Wilpattu National Park)		8°17'43.80"N	79°50'02.96"E				
92	Kala Oya River Mouth (Wilpattu National Park)	Puttalam	8°17'43.80"N	79°50'02.96"E	High	30	50	80
	Puttalam Lagoon enter Point		8°13'58.04"N	79°47'22.33"E				

6.2 Classification of Coastal segments by level of Vulnerability and Setback distances (in meters)

	<i>Level of Vulnerability</i>	<i>Reservation Area</i>	<i>Restricted Area</i>	<i>Total Setback</i>
	Low (-)	10	25	35
	Low	15	25	40
	Low (+)	15	30	45
	Medium (-)	20	30	50
	Medium	20	35	55
	Medium (+)	25	35	60
	High (-)	25	40	65
	High	30	50	80
	High (+)	35	60	95
	Very High	40	70	110
	Extremely High	45	80	125

Special Coastal Segments

	Segment	Reservation Area	Restricted Area	Total Setback
	Conservation Zones	300		300
	Protected Areas	No Build Zone		
	Out of the Affected area declared by CC&CRMD	10	0	10
	Special Segment I (Port City Segment)	Port City Regulations will apply		
	Special Segment II	10	20	30
	Special Segment III	10	0	10

Note: Setback standard is not applicable for the development taking place in the landward area covered within the routes of the breakwaters of the fishery harbors as determined by the DG CC&CRMD.

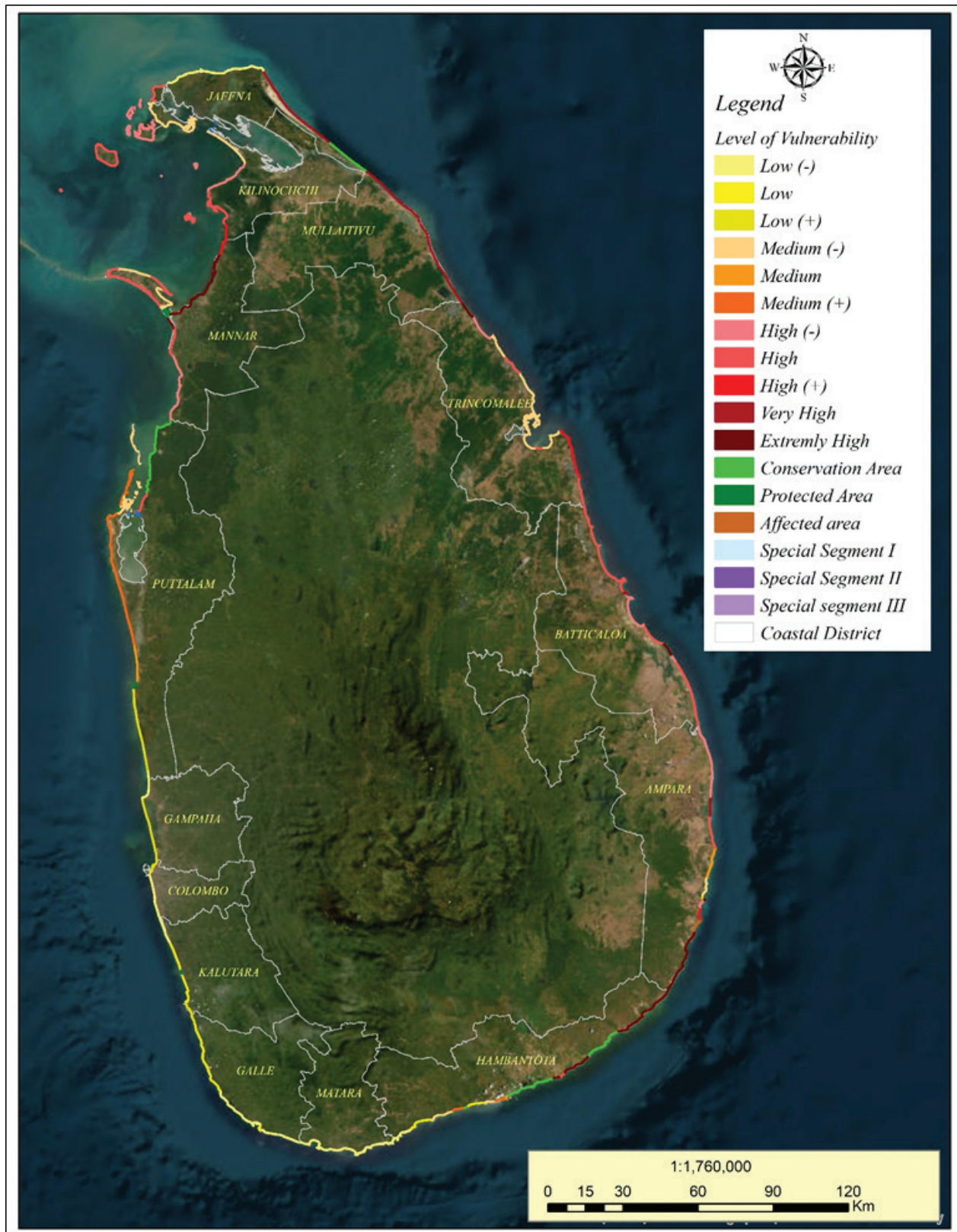


Figure 6- 4: Coastal Vulnerability Map of Sri Lanka

Table 6- 3 : Protected Areas Bordering the Coastal Zone of Sri Lanka

Name	Location/Geographical Coordinate** Latitude(N) Longitude (E)	Coastal Length (km)	Extent (ha)	Year of Establishment
1. Bar reef Sanctuary	8°16'00 - 8°32'00" 79°40'75 - 79°49'70"	75	30,670	1992.04.03
2. Honduwa Island Sanctuary	6°27'17 - 6°23'55" 79°58'31 - 80°00'16"		9	1973.11.19
3. Telwatta Sanctuary*	6°16'00 - 6°08'55" 80°01'53 - 80°03'52"		1,425	1938.02.25
4. Ambalangoda – Hikkaduwa rocky islets Sanctuary	6°09'00 - 6°08'00" 80°08'00 - 80°05'00"	638 m	1	1940.10.25
5. Hikkaduwa National Park		04.8	102	2002.10.08
6. Parappaduwa Nuns island and Polgasduwa Sanctuary*	Entire Island and lagoon 22		1,988	1988.08.17
7. Kalametiya lagoon Sanctuary*	6°05'00 - 6°06'00" 80°56'00 - 80°59'00"	4.72	2,525	1984.06.28
8. Bundala National Park	6°07'00 - 6°14'00" 80°07'00 - 81°17'00"	21.33	6,216	2004.07.28
9. Nimalawa Sanctuary	6°08'20 - 6°46'05 81°08'46 - 81°49'25"	03.25	1,066	1993.02.18
10. Ruhuna(Yala) – National Park*	6°16'00 - 6°42'00 81°15'00 - 81°41'30"	45.4	97,881	1938.02.25
11. Yala Strict Natural reserve*	6°16'00 - 6°42'00 81°15'00 - 81°41'30"		28,906	1938.03.01
12. Kumana National Park*	6°16'00 - 6°42'00 81°04'00 - 81°45'00"	15.4	35,665	2006.09.05
13. Kudumbigala Sanctuary *	6°46'05 - 6°57'23 81°49'25 - 81°51'30"	12.35	6,534	2006.02.20
14. Seruwila – Allel Sanctuary *	8°20'00 - 8°25'00 81°20'00 - 81°23'00"	15.8	15,540	1970.10.09
15. Greater Sober Island	Entire Island	03.91	65	1963.06.21
16. Little Sober Island Sanctuary*	Entire Island	898 m	7	1963.06.21
17. Pigeon Island National Park	Entire Island	08.34	471	2003.06.04
18. Kokilai Lagoon Sanctuary*	8°56'00 - 9°03'00 80°52'00 - 80°58'00"	01.15	1,995	1951.05.18
19. Chundikulam National Park*	9°26'00 - 9°32'00 80°24'00 - 80°37'00"	32.56	19,565	2015.06.22
20. Paritivu Islands Sanctuary*	Entire Island	02.38	970	1973.05.18
21. Wilpattu National Park*		36.8	131,667	1938, 1941, 1973
22. Madampawila Sanctuary		01.2	1,217	2007.09.21
23. Rekawa Sanctuary		3.58	271	2006.05.25
24. Godawaya Sanctuary		4.15	232	2006.05.25
25. Ussangoda National Park		04.0	349	2010.05.06
26. Rumassala Sanctuary		5.0	171	2003.01.03
27. Vankalai Sanctuary		14.8	4,839	2008.09.08
28. Adams bridge National Park		57	18,990	2015.06.22
29. Delft National Park			1,846.28	2015.06.22
30. Veduthalathivu Natural reserve		32.8	29,180	2016.03.01

Sources:

1. IUCN Directory of South Asian Protected Areas 1989
2. Department of Wildlife Conservation (2016), Marine Protected areas & associated Marine Protected areas

6.7 MANAGING SITES OF SPECIAL SIGNIFICANCE AND PUBLIC ACCESS

The previous CZMPs of 1990, 1997 and 2004 the issue of loss and degradation of sites of special significance within the Coastal Zone that include archaeological, historical, religious, cultural sites and scenic areas as a separate Chapter. In addition, enhancement and protection of both lateral and vertical access to and along the coast was also emphasized. However, to maintain consistency and produce user-friendly CC&CRMP, these aspects have been incorporated into the chapter on Regulatory Mechanism in the CC&CRMP 2024 similar to CC&CRMP2018, instead of addressing as a separate issue. The sites of special significance located within the Coastal Zone are of considerable importance for the preservation of the cultural heritage of the country. These sites are prone to be despoiled than the monuments in the hinterland due to natural causes such as coastal erosion, other coastal hazards as well as rapid development activities. Thus, it is important to take necessary management interventions to preserve these sites through adequate management interventions.

6.7.1 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. With the rapid development of the Coastal Zone in the recent past, public access to and along the coast emerged as a critical issue. The public right to access to the beach for purposes of, recreational and economic activities has been traditionally recognized in the past. However, in recent times, the rapid development of fishing activities, shrimp aquaculture, tourism, harbour development, coast protection, human settlements and national security requirements have caused restrictions in access to, and along the beach in numerous ways. In the context of economic development activities thriving in the Coastal Zone after the conflict that prevailed in the northern and the eastern coastal regions, 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.

In considering the importance of ensuring public access to and along the beaches, new legal provisions have been introduced through Coast Conservation (Amendment) Act, No. 49 of 2011 to formulate “Coastal Access Plan” under Part 111d Section 22 of the Amendments. Thus in compliance with the legal provision, action has been initiated by the CC&CRMD to formulate and implement a “National Coastal Access Plan”. Mapping of beach access in Baticaloa District has been carried out in 2021 and mapping of beach access in Mannar, Kilinochchi, Jaffna and Mulathivu Districts has been initiated in 2022 by the CC&CRMD.

6.7.2 Sites of Archaeological, Historical, Religious and Cultural Significance

The high priority archaeological, historical, religious and cultural sites have been identified through a field survey conducted in 1989 and updated in 2002. The list of high priority sites is given in Table 6.4. As per the field survey, the following management issues have been identified;

- o Absence of proper management guidelines has led to degrading the quality of the high priority sites within the Coastal Zone due to unplanned and unauthorized development activities.
- o Lack of awareness on the importance of the sites among the public and the sectoral agencies have led to degradation due to encroachments and development.
- o Lack of financial commitment from the respective agencies for implementing conservation plans resulted in loss and degradation of the sites.
- o Some of the high priority sites in the Coastal Zone of north and the eastern provinces have been damaged due to the civil conflict that prevailed during the last over three decades until 2009.

- o Lack of proper consideration of the value and significance of the sites have contributed to degradation and inadequate attention of the relevant authorities.

In view the above management issues, necessary policy guidelines, management strategies and actions have been introduced by the CC & CRMD through the 1990, 1997 and 2004 the 2018 CC & CRMP respectively. Although the effectiveness of previous management strategies and actions could not be presented in a quantifiable manner, the development activities in the vicinity of such sites have been effectively controlled through the development permit system, EIA and IEE procedures, while enhancing the public awareness.

In view of the above, specific attention will be given to protect these valuable monuments (see Table 6.4) through the development permit system and application of new legal provisions in the CC&CRM Act, No. 57 of 1981. More over inter agency coordination will be promoted to ensure effective management.

Table 6- 4: High priority archaeological, historical, religious and cultural sites within the Coastal Zone

Puttalam District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 Church	H/C/R	Ulhitiyawa North	294

Gampaha District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 Headquarters	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 Rajasinghe	H/C	Fort	20
51	Old 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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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	Mount Lavinia	47
64	Dutch Church	R/H/C	Mount Lavinia	541
65	St. Thomas College	H/C	Mount Lavinia	541
66	Grand Hotel	H/C	Mount Lavinia	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	Talarukkhamaya	R/H/C	Katukurunda	555
73	Bodhirajaramaya	R/H/C	Egoda Uyana	556

Kalutara District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 Chetiaramaya	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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 Subhadramaya	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	Subhadramaya	R/H/C	Totagamuwa	61
107	Sailabimbaramaya	R/H/C	Dodanduwa	51
108	Nashir Mohamed Mosque	R/H/C	Gintota	103
109	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 Subhadramaya	R/H/C	Koggala	144 A

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
124	Birth Place Of Martin Wickramasinghe and Folk Museum	H/C	Koggala	144 A
125	Devagiri Vihara (Hirugal Devale)	H/C	Koggala	144 A
126	Air Base	H	Koggala	144 A
127	Aluth Walawwa	H/C	Kataluwa West	162

Matara District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 Subhadramaya	R/H/C	Mirissa South	406
133	Samudragiri Viharaya	R/H/C	Mirissa South	406
134	Sri Subhadramaya	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	R/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.	473/47 3a
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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
155	Wdukaramaya	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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
175	Megalithic Site, Kumana	A	Kumana	1
176	Samuddra 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. L	3
181	Arugam Bay Port	A/H	Potuvil Dir. L	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	96

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
186	Chitra Velayudha Kandaswamy Kovil	R/H/C	Thirukkivil	10
187	Kirulegama Monastic Site	A/R/H/C	Thirukkivil	10
188	Kannaki Amman Alayam	R/H/C	Thambavil Div.L	12
189	Palukamam Kovil	R/H/C	Padiruppu Div.L&2	66
190	Draupathi Amman Kovil	R/H/C	Padiruppu Div.L & 2	66
191	Kudikadakarai Mosque	R/H/C	Kalmunai Div.3	59

Batticaloa District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
192	Dutch Fort	H/C	Koddaikallar Div-L&2	113
193	Amparavillippillaiyar Kovil	R/H/C	Koddaikallar Div-L&2	113
194	Kannaki Amman Kovil	R/H/C	Eruvil	115
195	Jami-Ul Lafreen Mosque	R/H/C	Katthankudi Div.L	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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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	228L
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 Osterberg	H/C	Trincomalee Town	244B

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
214	Floating Dock Wreck	A(M)	Trincomalee Town	244B
215	Kuchchaveli Monastic Site	A/H/C	Kuchchaveli	239
216	Palvakki	H/C	Kuchchaveli	239

Mullaitivu District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
217	Mulaitivu Fort	H/C	Mulaitivu Town	233
218	Monastic Site, Kurundanmalai	A/H/C	Mulaitivu Town	233

Jaffna District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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	Allaipiddy	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

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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 West	03
250	Elephant Pass Fort	H/C	Mukavil	153

Mannar District

	<i>Place</i>	<i>Type</i>	<i>GN Division</i>	<i>GND No.</i>
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****REFERENCES:**

- Government of Sri Lanka: 1981. Coast Conservation and Coastal Resources Management Act, (No. 57).
- Government of Sri Lanka: 1981. Coast Conservation (Amendment) Act, (No. 64).
- Government of Sri Lanka: 2011. Coast Conservation (Amendment) Act, (No. 49).
- Government of Sri Lanka: 1980. National Environment Act, (No. 47).
- CCD: "Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region".
- CCD: Coastal Zone Management Plan 2004.
- Government of Sri Lanka: 1940. Archaeological Ordinance and the subsequent revisions of 1956, 1998 and 2000.
- Ministry of Public Administration: Circular No. 21/92 of 21st May, 1992.
- Government of Sri Lanka: 1985. *Gazette Notification* No. 337/48 of Feb 21st.
- IUCN, 1989, directory of SA Protected areas.

EOG 09-0108