

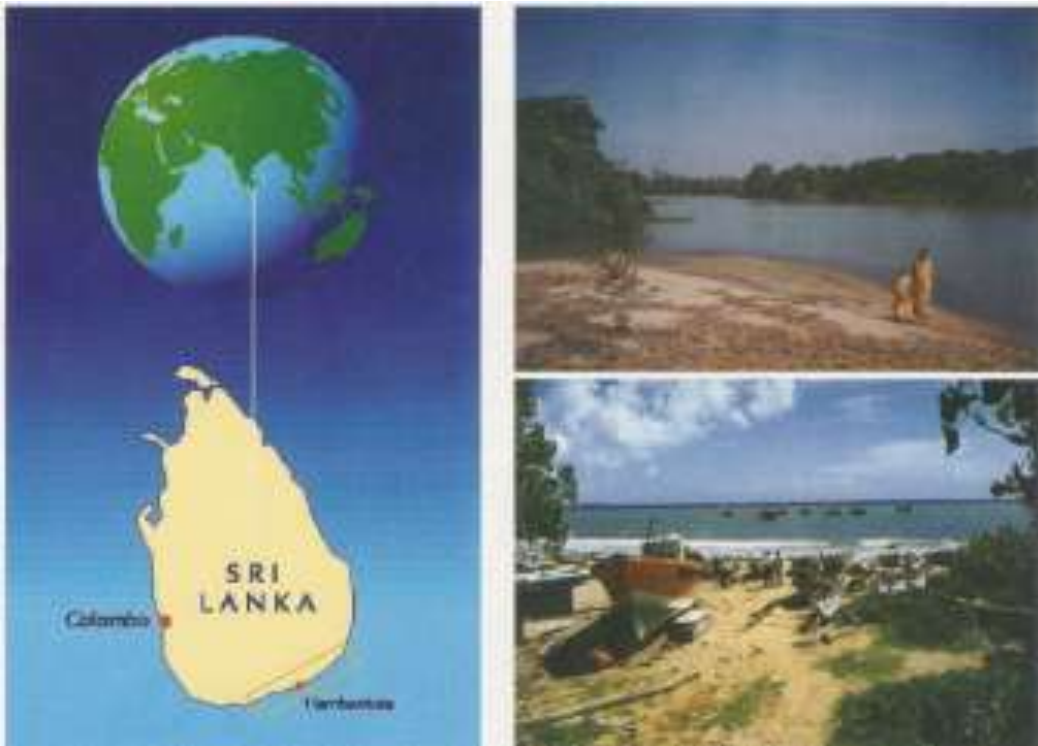
Hambantota

HICZMP

Integrated Coastal Zone Management Project

HICZMP Output
no.2 – Final Report

Conservation Plan for Hambantota Sand Dunes



Southern Development Authority (SDA)
Coast Conservation Department (CCD)

December 2000

HICZMP - Report

Funded by the Government of Norway

HICZMP Office:

15 May Street
Hambantota
Sri Lanka
Phone: (047) 20616/21003
Fax: (047) 21002

e.mail: hiczmp@panlanka.no

Southern Development Authority (SDA)

14 A, Akuressa rd.
Matere
Sri Lanka
Phone: (041) 27333/20076
Fax: (041) 27334

Coast Conservation Department (CCD)

4th Fir Maligawatta Secretariat 10
Colombo
Sri Lanka
Phone: (01) 449756/54
Fax: (01) 438005

Title Conservation Plan for Hambantota Sand Dunes	Serial No. 01/2000	Date 01.12. 2000
	Report No. Sub-No. 1 1	Pages Price 180
Author(s) Professor K.N.J. Katupotha Mr. Indra Ranasinghe	Topic group Output 1	Distribution Free
	Geographical area Hambantota District, Sri Lanka	Printed 250 copies

International Consultant(s) / Task manager(s) Norwegian Institute for Water Research (NIVA) Mr. J. Soerensen <small>hjelpelinje på 4 pt som gir "luft" etter siste linje - skrives ikke ut - er "hidden"</small>	Consultant ref. O-97211 <small>hjelpelinje på 4 pt som gir "luft" etter siste linje - skrives ikke ut - er "hidden"</small>
Abstract This plan provides a framework to conserve the Hambantota sand dunes with a view to maximize the environmental, social and economic benefits to the society while ensuring that conservation and development. Accordingly, the plan expects to: (a) conserve the biological diversity of the dunes to enhance the environmental quality of the dune zone; (b) ensure public safety by protecting and maintaining the dune system as a natural barrier against erosion and coastal floods; (c) prevent loss and degradation of sand dunes due to human interventions; (d) minimize environmental impacts from development activities; and (e) prevent or minimize coastal pollution concerning as a natural heritage. <small>hjelpelinje på 4 pt som gir "luft" etter siste linje - skrives ikke ut - er "hidden"</small>	

Jan Sorensen
Project manager

Dr. K. Nygaard
Task Manager

Claude Fernando
Project Director

CONTENTS

List of Figures and Tables	5
List of Abbreviations	6
Preface	7
Executive Summary	8
CHAPTER 1 INTRODUCTION	11
1.1 Introduction	11
1.2 Management Principles	11
1.3 Planing process, Goals and Objectives	13
CHAPTER 2 HAMBANTOTA SAND DUNES	15
2.1 General description of the conservation area	15
2.2 Physical setting	15
2.3 Demography	19
2.4 Land Use	19
CHAPTER 3 ENVIRONMENTAL, SOCIAL AND ECONOMIC SIGNIFICANCE OF SAND DUNES	21
3.1 Significance of sand dunes	21
3.1.1 Environmental significance	21
3.1.2 Economic significance	22
3.1.3 Social significance	23
3.2 Ecological diversity	23
CHAPTER 4 KEY ISSUES FOR THE HAMBANTOTA DUNES	25
4.1 Dunes vulnerability and degradation	25
4.2 Dune Encroachment	28
4.3 Trampling and Unauthorised constructions	29
4.4 Dumping of Solid Waste	30
4.5 New developments	30
4.6 Lack of public awareness and education	32

CHAPTER 5	OBJECTIVES, POLICIES AND ACTION FOR CONSERVATION	33
CHAPTER 6	LEGAL AND INSTITUTIONAL SETUP FOR CONSERVATION	38
6.1	Legal framework	38
6.2	Institutional constraints	39
6.3	Management structure	39
6.4	Implementation schedule	41
	References	45
Annex 1	Photographs	46
Annex 2	Details of the cross-sections	51
Annex 3	Details of the vegetation in each cross-section	54

LIST OF FIGURES

FIGURE 1.1	PLANNING STEPS ADOPTED FOR THE FORMULATION OF THE CONSERVATION PLAN FOR HAMBANTOTA SAND DUNES	12
FIGURE 2.1	LOCATION MAP OF THE SAND DUNES IN HAMBANTOTA	16

LIST OF TABLES

TABLE 2.1	FACTORS AFFECTING COASTAL DUNES DEVELOPMENT AND DISTRIBUTION OF SRI LANKA	18
TABLE 2.2	AVERAGE WIND VELOCITY AT HAMBANTOTA STATION	18
TABLE 2.3	EXTENT OF LAND PARCEL SIZE	20
TABLE 4.1	ISSUES PERTAINING TO MANAGEMENT OF SAND DUNES IN HAMBANTOTA COASTAL ZONE	25
TABLE 6.1	THE RELEVANT INSTITUTIONS RESPONSIBLE FOR DUNE MANAGEMENT	40
TABLE 6.2	THE RELEVANT STAKEHOLDER GROUPS AND THEIR MANAGEMENT RESPONSIBILITIES.	40
TABLE 6.3	IMPLEMENTATION SCHEDULE	41

ABRIVIATIONS

BII	Bureau of Infrastructure Investment
BOI	Board of Investment
CCD	Coast Conservation Department
CCC	Community Coordinating Committee
CC Act.	Coast Conservation Act
CBOs	Community Based Organizations
DCS	Dune Care Societies
DCP	Dune Conservation Plan
DPL	Dune Protect Line
ED	Education Department
HWM	High Water Mark
HSDMCC	Hambantota Sand Dune Management Coordinating Committee
SDA	Southern Area Development Authority
SAMP	Special Area Management Plan
SAM	Special Area Management
NCZM	National Coastal Zone Management
GN	Grama Niladhari
M.V.	Maha Vidyalaya
GNDs	Grama Niladhari Divisions
HICZMP	Hambantota Integrated Coastal Zone Management Project
DS	Divisional Secretary (Tangalle)
PS	Pradeshiya Sabha
UDA	Urban Development Authority
DFO	District Fisheries Officer
MWCC	Mawella Coordinating Committee
ID	Irrigation Department
RU	Ruhuna University
CTB	Ceylon Tourist Board
GSMB	Geological Survey & Mines bureau
HDCC	Hambantota District Coordinating Committee
CZMP	Coastal Zone Management Plan
NGOs	Non Governmental Organizations
DFEO	District Fisheries Extension Officer
DEA	District Environmental Authority
SPC	Southern Provincial Council

PREFACE

The Hambantota Integrated Coastal Zone Management Project (HICZMP) is an umbrella project comprising 14 sub-projects (including project administration), which have been implemented in the course of the current phase 1997-2000 (titles are abbreviated):

- 1) Integrated zoning plan for the coastal area of Hambantota district
- 2) Special Area Management (SAM) process at two prioritised sites: Mawelle lagoon and Hambantota dunes
- 3) Awareness campaign on coastal resources management
- 4) Mapping of environmentally sensitive areas, including recommendations for preservation
- 5) Identification of adverse impacts on the environment from development activities and implementation of mitigation measures
- 6) Existing legal provisions reviewed for purpose of streamlining
- 7) Institutional strengthening in support of coastal zone management in Hambantota District
- 8) Mechanisms for project co-ordination, implementation and effective law enforcement
- 9) Technical support to the coastal extension centre/foundation at Rekawa lagoon
- 10) Coastal and marine pollution monitoring program, including baseline survey
- 11) Consultative mechanism to obtain participation of stakeholders in the management and development process
- 12) Program for utilising existing and planned environmental facilities
- 13) Environmental guidelines for developers, and the public
- 14) Project administration.

The project has been funded by a grant from the Government of Norway. The Southern Development Authority of Sri Lanka (SDA) and the Coast Conservation Department (CCD) has been responsible for the co-ordination and the implementation of HICZMP respectively. Inter-ministerial commitment has been ensured through representation in the National Steering Committee (NSC), while the Project Co-ordination Committee (PCC) has been the main forum for the local authorities, non-governmental organisations, and other stakeholders. The project office located in the town of Hambantota has functioned as the focal point for the project activities.

All the sub-projects has been carried out by Sri Lankan consultants with technical support provided by the Norwegian Institute for Water Research (NIVA), and with assistance from the Norwegian Institute for Urban and Regional Research (NIBR).

This report presents the Special Area Management Plan for Hambantota Sand Dunes under HICZMP sub-project no. 2 : Special Area Management process.

It is hoped that this report and the other supporting documents will be useful to the stakeholders in Hambantota district as well as for all those parties, such as state agencies, non-governmental organisations, planners, researchers and donor-agencies, who are involved in coastal zone management in Sri Lanka.

We wish to place on record our appreciation of the devoted work of all those who have participated actively in the implementation of the project, the authors/consultants for preparing the documents and the project management for publishing them.

S. Amerasekera

*Secretary Ministry of Fisheries
And Aquatic Resources
Chairman NSC, HICZMP.*

A. P Amaratunge

*District Secretary
Hambantota
Chairman PCC, HICZMP*

EXECUTIVE SUMMARY

Introduction

Hambantota sand dunes considered in this plan is a part of the longest dune system in the world. It is located close to equator and extends from south to east coasts. The dune segment starts at Godawaya and ends at the sea water intake at Talgasmadiya. It is approximately 12.5 kilometers in length and covers an area of 210 hectares. The geographic area of the dune system comes under the purview of four GN Divisions of Sisilasagama, Mirijjawila, Hambantota West and Hambantota East. The composition of the dune segments varies from primary dunes, secondary dunes and tertiary dunes.

The Revised Coastal Zone Management Plan 1997 has recognized the importance of Hambantota dunes as one of the prime habitats for management. Thus it has been recommended that a SAM process based on participatory approach be adopted. The goal of the SAM process is to make it is possible for the community and the other stakeholders to manage the sand dunes effectively.

Environmental, Social and Economic significance of sand dunes

The sand dunes play an important role in protecting people, property and low lying coastal areas from storm damage and freak conditions occurring during monsoon periods. They also provide excellent opportunities for recreational activities based on the aesthetic beauty of the area. In addition, the sand dunes serve as a barrier preventing or minimizing damage to agriculture and dwellings by strong winds.

The dunes in Hambantota serve as a useful source of fuel wood for the residents of the area. They are also used for fisheries related activities such as boat landing, dry fish processing and net mending. The dunes have a significant economic function by supporting tourism and recreational activities in the area. Beside these functions, the dunes provide large quantities of sand for filling and other construction activities.

In terms of social significance, the dunes perform a number of functions useful for the day to day life of the residents in the area. Of these functions, providing space for social activities and dumping solid waste are important problems.

Ecological diversity

In terms of ecological diversity, a large variety of floral and faunal resources are found within the Hambantota dune areas. The primary dunes or fore dunes are covered with creeping vegetation such as *Spenifix littorus* (Maharawana) and *Ipomea asarifolia*.. The center dune ridges are mostly covered with creeping vegetation and stunted bushes. The back dunes, which are more stable, contain larger trees and shrubs. The number of species as well as the intensity of their occurrence increases progressively as they extend from the fore dunes to the middle ridges and further to the back dunes.

Besides the variety of floral resources, a number of faunal resources are found within the dune areas. Although the low nutrient status of dune plant communities is not favourable to intensive food collection or farming, dunes provide temporary habitats for animals, birds and mammals.

Key management Issues

Among the number of issues prevailing in connection with the dunes in Hambantota, the following priority issues have been considered for management.

- Dune vulnerability and degradation
- Dune encroachment
- Unauthorized constructions and trampling
- Dumping of solid waste
- Impacts of new development

Based on the findings of the investigations and issue analysis, comprehensive objectives, policies, and actions have been formulated for management.

Management Objectives Policies and Actions

In considering the magnitude of the issues, availability of resources, stakeholder agreement and future potential for obtaining financial assistance more practical and viable management policies/actions are presented as far as possible in this plan. The institutional arrangements for implementation of management policies and actions are also identified in this plan.

However, in view of the development priorities given for the Southern Province in the present political agenda, careful co-ordination among government agencies, non-governmental agencies and policy makers is imperative. Thus, flexibility of modifying and introducing new management policies and actions to the plan in the future will enable to achieve the overall objectives of this plan.

CHAPTER 1 - INTRODUCTION

1.1 Introduction

In general, Sri Lanka's Coastal Zone Management Programme is primarily focused on mitigating emerging issues that have surfaced as a result of the abuse of resources. The planning outcome of the two National Coastal Zone management (NCZM) Plans which have been produced since 1990 clearly demonstrates that the management efforts are more or less directed on controlling physical development rather than the direct conservation of the resource in question. Since the critical coastal habitats such as coral reefs, sand dunes, seagrass beds, salt marshes and lagoon/estuaries are vulnerable coastal eco-systems, it is necessary to focus management on individual habitat considering the interrelationship among such habitats. While implementing national management policies on coastal habitats, formulation and implementation of site-specific conservation programmes are the prime concern at present.

Recognising the priority and the need to conserve critical habitats or areas of particular concern as part of the wider coastal ecosystem, 23 sites have been identified as Special Area Management Plan (SAMP) sites in the Revised CZMP of 1997. Sand dunes located in Hambantota are among these 23 SAMP sites identified for management. Considering the environmental, economic and social significance of the sand dunes in Hambantota the management approach and the planning process have focused on conservation.

1.2 Management Principles

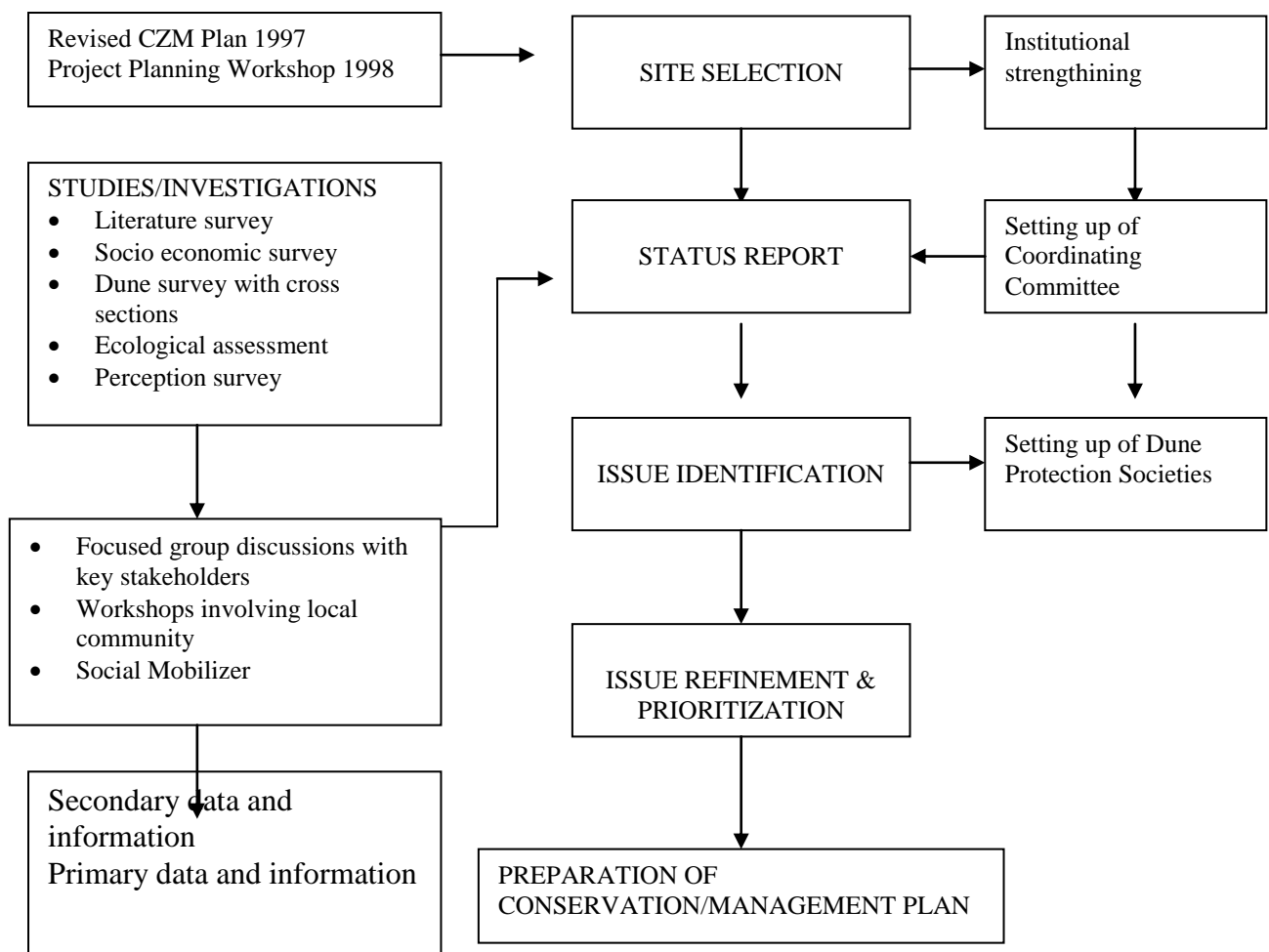
Sand dunes are a unique coastal habitat which requires a special management and planning approach. Thus the following management principals shall be used as a basis for developing an efficient management plan.

- Dunes are a relatively fragile but an adaptable and responsive system
- Due consideration should be given in integrating Biological, Geomorphological and Anthropogenic aspects for dune conservation plan
- The major management goal of the conservation is the sustainable use of the dunes.

- The Multiple-use management should be adopted whereby economic and social benefits are maximized and conservation and development becomes compatible goals
- The government agencies and the other stakeholders must (be made to) get involved in Planning and Management

The principles adopted for the formulation of the Conservation Plan for the sand dunes are shown in Figure 1.1

FIGURE 1.1 PLANNING STEPS ADOPTED FOR THE FORMULATION OF THE CONSERVATION PLAN FOR HAMBANTOTA SAND DUNES



1.3 Planing Process, Goals and Objectives

Planning Process

The Special Area management sites selected under the Revised CZMP of 1997 were rated in terms of criteria such as severity of resource management issues, bio-diversity, viability and economic significance. According to this classification, Hambantota sand dunes have been identified as one of the high priority sites that require specific management focus. In this context, when the HICZMP was identified in 1997, the stakeholders who attended the project formulation workshop recommended the selection of sand dunes as a site for a SAMP. This decision received the overwhelming agreement of the state agencies, local institutions, non-governmental organizations and other concerned parties. The planning process for this activity was initiated towards the end of 1998 under the Hambantota Integrated Coastal Zone Management Programme funded by NORAD (the Norwegian Aid Programme).

In view of the unique and fragile nature of the dune system in Hambantota, specific attention has been paid to acquire a detailed knowledge and understanding on the environmental, economic and social significance of the ecosystem. Thus, the planning approach and the process have been directed on the following aspects of the sand dunes.

1. Biological aspects
2. Geomorphological aspects
3. Anthropogenic aspects

The preparation of a status report was undertaken to include site specific data and information to ascertain the issues related to the dunes with a view to reflecting the present social, economic and environmental condition of the target geographic setting. In this process, exiting data was collected on environmental and socio-economic issues. Subsequently, necessary investigations and studies have been carried out to fill whatever information gaps were identified. To verify the validity of the findings of the primary investigations and the field studies, the views of the community were obtained through open discussions, interviews and perception surveys which involves the community and

the stake holders and makes it possible to identify valuable local knowledge. A series of meetings were held in order to provide the community and the school children at large with information on dunes and related issues. A documentary film was made to illustrate the features, value and the issues pertaining to the dunes. At the end of this process, priority issues relating to the management of dunes were defined. Besides the above tasks, institutional considerations for management were studied, and attempts were made to strengthen the role of institutions. As part of this planning process, a Community Coordinating Committee (CCC) comprising stakeholders from the area was appointed. To stimulate the public awareness and education three Dune Care Societies (DCS) were also established in three of the schools located in the area Mirijjawala Vidyalaya, St Mary's National School and Zahira College.

Planning Boundaries

The proposed conservation plan covers the stretch of sand dunes located extending from Godawaya outlet to the Seawater Intake (Koholankala) in Bundala National Park. This is hemmed between the Tangalle - Tissamaharama Main Road and the sea.

Goal and Objectives

The overall goal of this plan is to conserve the sand dunes with a view to maximizing the environmental, social and economic benefits to society while ensuring that conservation and development are compatible. The main objectives of Dune Conservation Plan for Hambantota (DCP) are to:

1. Conserve the biological diversity of the dunes to enhance the environmental quality of the coastal zone
2. Ensure public safety by protecting and maintaining the dune system as a natural barrier against erosion and coastal floods
3. Prevent loss and degradation of sand dunes due to human interventions
4. Minimize environmental impacts from development activities
5. Prevent or minimize coastal pollution
6. Increase public awareness and education in regard to sand dune conservation

CHAPTER 2 - HAMBANTOTA SAND DUNES

2.1 General Description of the Conservation Area

The conservation plan is focused on the dunes located on either side of the Hambantota town stretching from Godawaya (Chitrakala outlet) to the Sea-Water Intake of the Lanka salt Company (east of Talgasmandiya – Mahalewaya,). Sand dunes described here are situated within longitude $81^{\circ} 03'$ - $81^{\circ} 09'$ and latitude $6^{\circ} 04' 30''$ - $6^{\circ} 09' 30''$ (Figure 2.1 & 2.2). The rest of the dune sector which traverses through Bundala and Yala national parks have not been included in this plan since that area is located within the already protected reserves. The total length of the dune area focused under this plan is 12.5 kilometers and covers an area of 210 hectares which come under the purview of five Grama Niladari Divisions Sisilasagama (124), Mirijjawila (123), Hambantota West (094), Hambantota East (093) and Koholankala (089).

The composition of the dune system varies within the planning area varies from place to place with the existence of fore-dunes (primary), secondary dunes and tertiary dunes. The dune area considered under this plan for conservation have been identified as a part of the longest dune stretch in the world situated close to the equator.

2.2 Physical setting

A number of factors contribute to dune development in Sri Lanka. They include geomorphic, climatic and biotic factors together with sand supply. Geologically, the southern coastal zone where the sand dunes are found are underlain predominantly by the Vijayan Complex crystalline rocks (amphibolite facies rocks) belonging to the Precambrian age. The left bank of the Walawe River mouth, from which sand dunes stretch to the east, lies on this Vijayan Complex rocks. These rocks are comprised of biotite gneiss, hornblende-biotite gneiss, migmatitic and granitic gneiss (Hapuarachchi, 1989; Balendran, 1968; Resource of the Walawe Ganga Basin, 1980, Geological Survey Department, 1982; and Cooray 1984). As a result of local weathering, the above rocks provide adequate materials for the formation of dunes in this area. The material composition of the dunes with a concentration of Garnet, ilmenite and monazite sands illustrate the geological process which has taken place in this area.

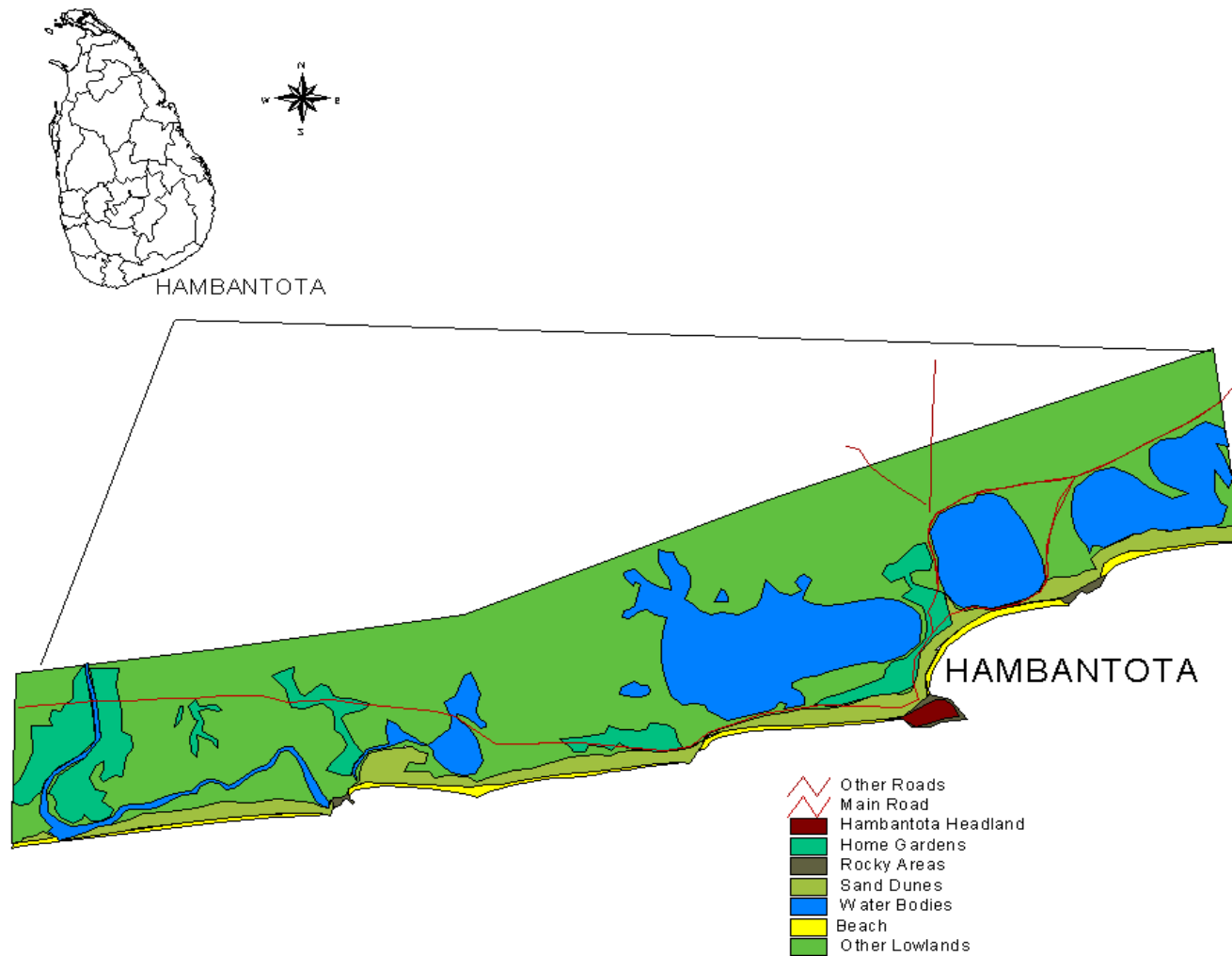


FIGURE 2.1 LOCATION MAP OF THE SAND DUNES IN HAMBANTOTA

Behind the coastal margins the terrain is often low-lying, and includes large lakes, known locally as *lewayas*. Based on the elevation and the morphological characteristics, the southern coastal area can be broadly divided into three units ¹. The study area is located in the “*Flat terrain*” (Lowland I, <30 m) that has been altered by aeolian and marine influences. The nature of the terrain has much influence on piling up of sand, which leads to dune formation.

Four main soil groups contained in the study area have a close relationship with the geological characteristics, the micro-relief and the climatic conditions (Soil Map of Sri Lanka, 1977). Out of these, *two* soil types occur along the coastal strip (Panabokke, 1997). They are *Regosols* on recent beach, dune sands in flat terrain and *Reddish Brown Earth* and Low Humic Clay Soils in undulating terrain, located behind the coast.

In terms of climatic conditions, the low level of rainfall is more conducive for dune formation. The rainfall station at Hambantota shows two maximum seasons during the Southwest monsoon (May to September) and convectional-cyclonic-depression during the months of October and November. This shows that the dry zone in this area lasts over approximately 7-8 months (Table 2.1). These climatic conditions favour the rapid evaporation of lagoons and lakes and for the formation and distribution of sand dunes. The average wind velocity as well as the number of months per year with wind in the Hambantota area is very high (Table 2.2). Those figures are higher than the areas such as Trincomalee, Jaffna, Galle and Puttalam (Swan, 1983). Accordingly, the formation of dunes most commonly occurs parallel to, and behind the beach, in the study area in different shapes and types

Hambantota area is characterized by rather stable conditions in terms of coastal erosion and accretion. The existing aerial photographs of 1956, 1972, 1994 and the past records pertaining to coastal hazards do not show any major physical changes in the sand dunes stretching from the Walawa river mouth towards eastern coast.

¹ Katupotha 1992: - (a) Flat terrain (Lowland I, <30 m); (b) Flat to slightly undulating terrain (Lowland II, <30 m); and (c) Undulating terrain (Lowland III, 30-150 m). The Flat Terrain (Lowland I, <30 m)

TABLE 2.1 FACTORS AFFECTING COASTAL DUNES DEVELOPMENT AND DISTRIBUTION OF SRI LANKA

FACTOR	FAVOURABLE	COMMENTS
Climatic	Strong persistent, onshore winds; long dry season	The area has approximately 7-8 months dry season
Biotic	Prostrate plants and others capable of fixing sand particles blown behind the berm	Human interference, including the cultivation of coconut groves behind the berm, appears to have acted as a partial deterrent to dune development in wetter areas
Geomorphic	Abundance of quartzose sand within 62 to 500p; high broad berm, low lying terrain behind; low water table	Coastal retreat has obliterated many fore dunes; changing coastal configuration, e.g. the growth of spits, has starved tracts in their lee of sand deterring dune growth.

Source: Swan, 1983

TABLE 2.2 AVERAGE WIND VELOCITY AT HAMBANTOTA STATION

VELOCITIES (M/SEC)	Annual	Maximum month
	5.5	6.6
NUMBER OF MONTHS PER YEAR WITH WINDS	> 5 m/sec	> 4 m/sec
	8	11

Source: Swan, 1983

In terms of the vegetation cover, the dune system located east of Hambantota town primarily contains natural coastal vegetation. However, the dune system between Godawaya and Hambantota town is mainly covered with casurina an exotic plant introduced and planted by the Department of Forest Conservation. Creeping vegetation such as *Spinifex littoratus* and *Ipomoea pescaprae* as well as stunted trees/scrublands (*Cassia auriculata* - Ranawara, *Feronia limonia* - Divul, *Dichrostachys cinerea* - Andara, *Carissa spinarum* - Karamba etc.) also cover most of the dunes area. Among the trees scattered within the scrublands are *Manilkara hexandra* - Palu and *Nerium odorum* – Veera in Bundala National Park.

2.3 Demography

According to 1998 figures, a total of 14,588 people live in the four coastal GN Divisions where the planning area is located. Among the four GN divisions, Hambantota West and East contains the highest population density. In terms of population distribution within the coastal dunes and adjacent areas, high density can be seen in places such as Murry Road, U.C Housing Scheme, Sisilasagama and Mirijjawila. Thus in these areas population pressure on the sand dune ecosystem is quite considerable. The field investigations revealed that in 1999, a total of 525 housing units are located within the planning area seawards of the Main Road. This elaborate how this figure revised implies that 3080 people are living in the vicinity of sand dunes and the adjacent areas.

In terms of ethnic composition, there are 47% Sinhala, 46% Muslim and 7% Tamil people living respectively within the planning area. Religion wise the study area comprises Buddhist (46%), Muslim (46%) Catholic (3%) and Hindus (2%).

2.4 Land Use

The major land uses associated with the sand dune system comprises coconut cultivation, home gardening, tourism related establishments such as hotels and restaurants, fish landing centres, casurina plantations and some cottage industries. Apart from the above land uses, there is no major agriculture or industries located in this area. The northern segment of the study area contains homesteads and coconut plantations on the sand dunes (Figure 2.2). The dune segment starting from Godawaya outlet towards Sisislasagama is also largely covered with coconut plantations. A total of 525 dwellings with home

gardens concentrated in pockets are located within the study area. Of these 525 dwellings, a fair amount has been built by encroaching on the dune system by extending their buildings or home gardens into the dune area. The nature of the housing units revealed that, 394 permanent, 49 semi-permanent 52 temporary and 30 unauthorised units located in the area. The majority of the land parcels located within the planning area in which the housing units are located range between 10 perches to 80 perches. However, it is also found that there were 64 housing units located in the same area without proper land ownership. The extent and number of land parcels within the planning area are given in Table 2.3.

TABLE 2.3 EXTENT OF LAND PARCEL SIZE

Extent (in perch)	No of Plots
10>	97
11-20	183
21-40	22
41-80	152
>80	7
Squatters	64
TOTAL	525

Apart from dwelling units, a number of public buildings such as Kachcheri complex, Court complex, Market complex, schools and other government and non-government office buildings occupied the land area adjacent to the dunes. The major tourist establishments in the area are located in close proximity to the dune system in Sisilasagama (Oasis Hotel), and in Galwala to the east of Hambantota town (Peacock Beach Hotel). There are few fish landing centres can be seen in Godawaya, Sisilasagama, Rathupasgodella and in Hambantota town.

CHAPTER - 3 ENVIRONMENTAL, SOCIAL AND ECONOMIC SIGNIFI-CANCE OF SAND DUNES

3.1 Significance of sand dunes

Most parts of the landward area of the sand dunes in Hambantota which comes under this plan lies below the mean sea level (msl) and is prone to possible erosion or storm surge damage. In general, coastal dunes that are located on the landward edge of the beach act as important natural barrier against coastal erosion and provides protection to life and property within the coastal zone by absorbing the energy of the waves. More importantly, they provide a reservoir of sand to replace the considerable quantities of sand that are carried away by severe storms. They also provide an important habitat for a number of plants and animals.

3.1.1 Environmental significance

The sand dunes located in the study area play an important role in protecting people, property and beaches from storm damage and freak conditions. Under the southeast monsoon as well as any unusual climatic conditions, the natural process utilises dune materials for sand replenishment. The constant and temporally asymmetric sediment exchange between beach and dune is an important natural process for maintaining beach stability and ecological diversity in the area. According to the Revised Coastal Zone management Plan of 1997, the annual coastal erosion rate in Hambantota district where the dunes are located is approximately between 0.1 – 0.2 m. per year. It is also noteworthy that there are no coast protection measures in this area during the past couple of decades which is the case for many other coastal areas of Sri Lanka. This illustrates the significance of the sand dunes as a natural barrier against sea erosion by absorbing wave attacks in the area.

Apart from the above noted environmental benefit, the dunes located in the management area provide excellent opportunities for recreational activities based on the aesthetic beauty in the area. The dune landscape and the vegetation cover typical of the dunes greatly enhance the scenic beauty of the area. In addition, the existing sand dunes serve as a wind barrier and prevent or at least minimise damage to agriculture and dwelling

houses. This barrier effect also prevents the dissemination of salt/sea spray to the inland areas.

There are considerable extents of low-lying water bodies and salt marshes behind the dunes, and these areas are prone more to floods. The field investigations carried out revealed the dunes have been considerably responsible for the protection of such inland areas from floods, and in many cases, minimising the damages through floods.

3.1.2 Economic significance

The dunes have traditionally served a useful function as a convenient source of fuel wood for the residents in the vicinity. Even now, it is reported that a large part of their day to day requirements of fuel wood is obtained from dune-vegetation including the casurina plantation of the Forest Department. Among the other economic uses of the dunes are their utilisations for fisheries related activities such as boat landing/parking, dry fish processing and net mending. In a few places the villagers also have got used to leading their cattle to the dune areas for grazing.

The dunes also perform a significant economic function by supporting tourism and recreational activities in the area. The field observations revealed that almost all the tourism related facilities in the area are located in and around dune areas. Apart from these, dunes have also supplied large quantities of sand for filling and other construction purposes. This however is considered an abuse of resources and is being officially discouraged.

There are also indications that there may be good possibilities of dunes being used for certain special purposes and activities such as the development of herbariums; however the technical as well as the environmental feasibility of this needs to be investigated. Garnet is a valuable dune-based mineral resource and from the interests shown by private investors garnet mining on the dunes appears to be a good commercial proposition. However an extended environmental cost benefit analysis could throw much light on its social and environmental feasibility. The environmental impact would most probably be serious.

3.1.3 Social significance

In addition to what has been mentioned above, dunes perform an useful function in providing space for social activities, picnics and outings and other sports activities and events especially for the children of the area. Most of the people in the area spend their leisure time in and around dunes mostly walking around. Field investigations revealed instances of the residents using dunes for a number of purposes/activities ranging from burials, dumping solid waste, and in some rare instances even for defecation where proper toilets are not available.

3.2 Ecological diversity

The ecological diversity of dunes has been termed by scientists as a ‘secret weapon’ because it allows rapid adjustment to changing conditions (Carter, 1988). The investigations carried out on the aspect of dune ecology includes both primary dunes and the back dunes. Primary dunes, which are located on the seaward side, receive significant wind-blown sand input which support dune development. The back-dunes receive little or no fresh sand input and soil development is taking place. The knowledge of the functional conditions of the dune system are vital when studying dune ecology.

Floral Resources

The investigations revealed that dunes in the study area are vegetated according to a very distinct sequence (Annex 1.1A, 1.1B, 1.1C & 1.1D). The primary dunes, which are directly exposed to the full force of the wind and the shifts in formation resulting from wind direction, contains the least vegetation. Most of the primary dunes are largely covered with *Spenifix littorus* (Maharawan) and *Ipomea asarifolia* (Mudu Bintamburu). These plants appearing in the sand are fragile and highly sensitive and susceptible to human disturbances or rapid changes in dune configuration. These are rapid growers and spread themselves by forming runners (creepers) from their underground root systems. When there is centre dune ridge located between primary dunes and back dunes creeping vegetation, shrubs (Thakkada – *Scaevola* spp. and Pathok – *Euphorbia nerifolia*) and stunted bushes such as Andara, Kohomba and Divul can be observed.

The back-dunes, which are more stable than the other dunes, are covered with bushes and trees. It was observed that the number of vegetation species as well as the intensity of occurrence increases progressively as they extend from the fore-dunes to the intermediate, and on to the back dunes. In back-dunes, Spenifix littorals and creeping vegetation is replaced by less fragile woody vegetation, shrubs and trees such as Andara (*Dichrostachys cinerea*), Ranawara (*Cassia auriculata*), Kohomba (*Azadirachta indica*) and Divul (*Feronia limonia*). Tal (*Borassus flabellifer*), which was introduced to the area at the turn of the last century are found thriving in the back dune in some places near the salterns and in the Mrijjawala/Sisilasagama areas. When the dunes become vegetated, they become more or less stabilised. The ability of the dune to hold sand depends largely upon the vegetation cover.

Faunal Resources

The dune plant communities has a low nutrient status and is not very productive although the dunes provide permanent or temporary habitats for a wide variety of animals and temporary habitats for resting, nesting or feeding by birds and small mammals. Though it was not possible to observe and record fauna at first hand during field investigations, information has been collected through interviews with the knowledgeable persons in the area. From these it was revealed that the sea turtles are an important nester in the dune front and in the upper beach in the study area. Apart from turtles, permanent dwellers such as ghost crabs, cobra, wiper, rabbits, rats, and a variety of birds use the dune areas as their habitat. According to the findings of the investigations carried out on fauna, the animal population in the dune areas is decreasing rapidly due to various factors such as planting of *Casurina* spp., construction of hotels and houses, wind and salt spray, burning of dune vegetation, trampling and grazing by goats and cows and occasionally through slaughter by hunters.

In general, plants and animals in the dune areas face a constant struggle to survive. The soil contained in the dunes is nutritionally poor. At the same time, exposure, sand engulfment and drought are all hazards to be added to the usual stresses of competition, perdition and disease on animals living in the dune area.

CHAPTER - 4 KEY ISSUES FOR THE HAMBANTOTA DUNES

A number of environmental social and economic issues pertaining to management of sand dunes in Hambantota coastal zone have been identified. These issues are illustrated in Table 4.1

TABLE 4.1 ISSUES PERTAINING TO MANAGEMENT OF SAND DUNES IN HAMBANTOTA COASTAL ZONE

Environmental, Social and Economic Issues related to sand dune management in Hambantota
<ul style="list-style-type: none"> • Encroachment • Sand mining • Dumping of solid waste • Unauthorized constructions • Ill planned development activities • Floods • Depletion of fauna and flora • Grading • Introduction of exotic plants • Lack of public awareness • Lack of coordination and enforcement • Urbanization and town expansion • Scarcity of land with infrastructure

However in considering the urgent management needs and the prevailing management capacity, the plan addresses only the key management issues. These issues relate primarily to the environmental and institutional aspects of sand dune management.

4.1 Dune vulnerability and degradation

An attempt was made to assess based the present vulnerability level of the dune system located within the study area on sample location. This assessment was done using the results from the land survey (Annex 1.2A & 1.2B) and the field investigations based on 12 cross sections done in the area between Thalgasmandiya to Godawaya. This exercise mainly focused the following aspects (Annex. 2 & 3):

- Morphology of the dunes
- Condition of the beach
- Character of seawards side
- Pressure of use
- Protection measures

The cross-sections 1, 2 and 3 are located at Talgasmandiya. The cross-section 1 approximately extends 175 m and the other two extend around 120 m each respectively from the Matara – Kataragama road to the beach. Damages are not so high in the areas covered by cross-sections 1 and 2. However, the vegetation covers is secondary compared with the vegetation cover found adjacent to the Bundala National Park. The floral diversity of the area is considerably high in the back-dune area and its seaward side is mostly covered by *Spenifix littorus*. People have damaged the dune area of the starting point the westward cross-section No. 3 by removing sand. However, the top of the dune and seaward side of the cross section is almost similar to cross-sections 1 and 2.

The cross-section No. 4 traverses from the Kachcheri Complex towards the sea. In this section, about 75 percent of the surveyed area are located on a gravel bed, and the rest (seaside) contains low dunes covered with *Tephrosia purpurea* and *Desmodium triquetrum* species. This area is currently use for grazing and the vegetation cover has been removed for the purpose of serving as a play ground by the residents.

Cross-sections Nos. 5 and 6 which are in the Murray Road area show that the sand , particularly the back dunes, have been completely damaged by residents. These back-dunes have been used to construct houses, commercial structures, goat-yards and for coconut cultivation. However, the seaward side is thinly covered by *Spenifix littorus*.

The cross-section No. 7 is located in Hambantota west, and the transact stretches about 300m from the main road to the sea. Along this transact, two crests can be clearly identified. The old dune located close to the road has been damaged in the course of construction of houses, footpaths and other access roads and coconut cultivation. The second sand ridge towards the seaside is nearly 15m high. Small holder landowners as

well as illegal squatters have used the valley of both these dune ridges. Besides, *Casuarina* sp. has recently been introduced in to the area. The species such as *Spinifex littorus* and *Dichrostachys cineria* are dominant flora on the seaward side and are generally intact without much damage.

People have been responsible for damaging the dune area located in front of the (No. 8) Karagan Lewaya for landscaping purposes, removal of sand, cultivation of coconut and *Casuarina quaietifolia*. The seaward side of this cross-section has a steep slope to the beach, which is covered by creeping vegetation. The dunes at Ratupasgodella (reddening dune sands) are much older. Cross-section No. 9 in this area indicates that the whole area has been landscaped. The accumulation of sand on the seaside at this point is a very slow and gradual process.

Sand dunes at Mirijjawila (near sections Nos. 10 and 11) are approximately 16m high (on the landward side). Cross-section No. 10 indicates that the landward side has been damaged in the process of planting *Casuarina quaietifolia*. Micro-morphology inside the casurina stretch in this particular area is not usual. The fore-dune area has a steep slope leading to a wider beach. Cross-sections Nos. 12 and 13 are located at Sisilasagama and Godawaya. The dune in Sisilasagama area has turtle back shape, but at Godawaya it is almost flat. In both areas, the dune morphology has got transformed as a result of its use for housing, hotel and other recreational facilities, commercial purposes and coconut cultivation.

To identify the actual environmental, social and economic issues pertaining to sand dunes and related ecosystems within the study area, different methodologies were adopted. At the outset, the existing secondary information was collected and thereafter a structured questionnaire was employed to gather information. Thirdly, field investigations were conducted in the study area to observe and collect first hand information. During this process, all the stakeholders were consulted through three workshops to obtain more information. These were held during the month of October². As a result of these processes, an assessment of the dune ecology and the environmental, social and economic

² Three workshops held respectively at Mirijjawila MV, Hambantota St.Marys College, Hambantota Women's Federation Center, 1998.

significance of the dune system was done and the key issues concerned with the degradation of sand dunes and related ecosystems were identified.

4.2 Dune Encroachment

The dune environment is frequently tagged as ‘fragile’, ‘sensitive’ or ‘vulnerable’ due to its propensity for change even under slight environmental stress. By and large, the several segments of the existing dune systems have been irreversibly altered or damaged by human activities both by design and non-meditated improper uses.

During the study, an attempt was made to ascertain the cause and effect relationship related to degradation of dunes within the study area. Field investigations reveal that a large part of the dune system, especially back dunes in Mirijjawila, Ratupasgodella, Karagan Lewaya, Murray Road and Talgasmandiya, had got severely damaged or disturbed due to human intervention (Annex 1.3A and 1.3B). Some of the major reasons for the degradation of sand dunes are:

- (a) long-term and temporary leasing of sand dune areas from the government for economic or construction activities;
- (b) unauthorised constructions; and
- (c) removal of sand to meet social or even the commercial needs.

Some parts of the back dunes located in the study area particularly near Karagan lewaya and Mirijjavila extend towards the Main-Road and it is evident that these have been subject to damage due to human intervention. There has been a heavy demand for the land located closer to the Main Road, due to two main reasons viz:

- (a) There is a tendency for people to settle very close to the coastal areas or urban centres, mainly due to the availability of infrastructure facilities, and
- (b) Virtually all the land covered by the dunes is owned by the Government and long-term lease or temporary occupation licenses could be obtained from the Government by paying only a nominal fee.

Thus many people took the opportunity to occupy the land closer to the edge of the back dunes and engage in grading the dunes for house/building construction. This encourages encroachment on sand dunes in the study area.

From the field investigations carried out on sand dunes it was found that the removal of sand and grading activities pertaining to dune area for housing construction were the key factors responsible for dune degradation. There is no doubt that this situation could have been avoided if proper design criteria and conformity certificate systems for building construction was effectively applied and enforced by the authorities concerned.

The field surveys also indicated that the continuity of the sand dune has been broken at several points. A good example of this is the cutting down all three levels of sand dunes in front of Karagam Lewaya to provide a passage (now popularly called Moda Ela) for flood control purposes. This has affected the continuity of the dunes. In certain other instances such as near Thalgasmandiya, the growth of back dunes appears to have been greatly disturbed by the existence of the salterns. The damages visible in the back-dunes are comparatively much greater than in the fore dunes.

4.3 Unauthorised constructions and Trampling

The other main causes of sand dune degradation are unauthorised constructions taking place in the dune areas, and human activities such as trampling and the network of footpaths, which can be seen along and across the dunes (Annex 1.3A & 1.3B).

Since most of the land area associated with the dune system is owned by the Government, and people tend to consider them as common property and carry out unauthorised construction in the back dune areas. In the absence of a proper dune protection line, this has emerged as a critical issue especially in locations such as Mirijjawila, Ratupasgodella, Murray road and Galwala areas. Although the dunes and the adjacent land area falls within the jurisdiction of the legally defined coastal zone, the people who are engaged in unauthorised construction do not adhere to the set-back standards specified by the Coast Conservation Department for this coastal segment. Once they commence their construction activities closer to the dunes the toe area of the dune have to be graded to make adequate space for the construction. As a result the dune system is made unstable.

At some of the meetings and discussions held most, of the offenders have pleaded their ignorance of the laws in question.

The network of foot-paths which has been established along and across the dune system is another aspect which leads to loss of dune stability. A number of footpaths across the dune system towards the beach can be seen in many sections of the dune system. As a result of using these footpaths to gain access to the beach (generally for legitimate purposes such as fishing recreation), the vegetation communities have been damaged. When there is no vegetation in these specific locations, the ability of the dune system to retain the material (sand) gets affected resulting in an unstable position.

4.4 Dumping of Solid Waste

Dumping of solid waste within the dune system is an another critical issue, which prevails in the study area (Annex 1.4A & 1.4B). The urban waste generated from households, commercial establishments and market places are indiscriminately dumped closer to the dune system. Dumping of solid waste is a critical problem and has a great impact on the maintenance or otherwise of the aesthetic quality of the dunes. This phenomenon can be seen at a number of places such as Murray Road, Karagam Lewaya and Ratupasgodella where large heaps of solid waste could be observed rotting and emanating unbearable odors. Beside the solid waste generated by the households, a considerable amount of waste in the form of plastic and other non-biodegradable materials are dumped usually by the travellers using the beach front and the dune areas for recreational purposes.

As a result of waste concentration in dune areas, a number of negative impacts could be envisaged. This includes the risk of health hazards, declining ground water quality and loss of bio-diversity in the dune areas.

4.5 New Developments

There are a number of project proposals put forward both by the government and private developers for Hambantota coastal zone some of which pose serious threats to the long term sustainability of the sand dunes. According to CCD sources, there are five major development projects to be sited within the coastal zone. These projects are as follows;

1. Development of a commercial Harbour at Mirijjawila
2. Wind power generation project along the coastal belt from Walawa river mouth to Yala sanctuary
3. LPG terminal and gas storage complex at Kuda Mirijjawila
4. Fisheries harbour project at Hambantota town
5. Oil refinery at Mirijjawila
6. Garnet extraction project for export purposes

Although the above project proposals are yet in their conceptual stages, it is important to identify the issues that could be envisaged since the government has given priority to the economic and social development of the Southern province. According to the conceptual designs provided by the project proponents, it is clearly indicated that all or some components of the projects involve the use of dune areas considered under this conservation plan. Hence it is imperative that serious attention be paid to the possible impacts that would surface in the process of implementation of these projects.

In view of the details provided in the initial project proposals, a number of environmental and social impacts in regard to sand dunes could be envisaged in the following areas:

1. Coastal and dune erosion due to construction of proposed maritime structures
2. Loss of dune stability and the reduction of the aesthetic value of the dune system
3. Disruption to surface drainage water system
4. Degradation of fauna and flora associated with the dune system
5. User conflicts over the utilisation of space
6. Displacement of human settlements that are located close to the dune system.
7. Threat of increased extraction of sand from the dunes to meet the increased demand for sand from the construction sectors

Taking into consideration the potential negative impacts on the dune system, it is important to formulate management strategies that will promote the conservation of the dune ecosystem and are still compatible with the development needs of the area. Thus it is important that under this conservation plan attention is paid to the formulation of management strategies to ensure the physical and legal protection of the dunes, promote

public education and awareness and adoption of new technical intervention in dune management.

4.6 Lack of public awareness and education

In terms of coastal resource management, public awareness and education is of prime concern. Lack of public awareness and education is one of the major causes that has led to degradation of coastal dunes in Hambantota. Human interventions such as construction of structures, encroachments, grading and the removal of vegetation and sand have contributed towards the degradation of sand dunes in the area. If a proper understanding on the natural functions of the dunes and their ecological and economic significance were prevalent among the public the damage that has been caused to the dunes perhaps would not have occurred.

Apart from the general public, the government officials who handle the subject of coastal land, irrigation and housing construction must have an adequate awareness and an understanding of the environmental value of the dune system. In the event of inadequate concern and understanding, most of the government officials tend to treat sand dunes either as marginal land or a resource that has no economic value. This is clearly evident in the areas of land distribution, flood control activities and infrastructure development.

CHAPTER 5 OBJECTIVE, POLICIES AND ACTION FOR CONSERVATION

Issue 1: Dunes vulnerability and degradation

Objective 1: Ensure safety of the people and the property by protecting and maintaining the dune system as a natural barrier against erosion and coastal floods

Policy: Co-ordinate with, and assist local authorities, non-governmental organisations and coastal communities in protecting and maintaining sand dunes as a natural barrier against erosion and coastal floods

Action:

1. Restore the damaged portions of the sand dune by mobilising communities and adopting environmentally sound and financially viable methods
2. Declare the portions of the dune system located in front of low-lying areas as critical zone
3. Establish a dune protection fund with external and internal assistance
4. Prohibit removal and extraction of sand from the beaches and dunes
5. Enforce legal action against violators

Objective 2 Conserve biological diversity of the dunes to enhance the environmental quality of the coastal zone

Policy: Prevent human activities which lead to reduced biological diversity of the dune system

Action:

- 1 Prohibit removal and destruction of plants, trees and any other type of vegetation and animal species from the dune system
- 2 Promote and launch a programme directed towards replacing casurina plantation with native dune vegetation for selected areas
- 3 Stop further expansion of casurina plantation within the dune system

- 4 Initiate research on planting indigenous species as undergrowth vegetation in casurina planted areas

Objective 3 Ensure sustainable dune management by establishing participatory management network among land owners who occupy land adjacent to dune system

Policy: Encourage and recognise sharing of management responsibility between land owners who occupy dune lands and government institution

Action:

1. Formulate dune management group among dune dwellers
2. Develop guidelines to maintain dune areas to prevent further degradation
3. Provide suitable plants to replant dune areas

Issue 2: Dumping of Solid Waste

Objective: Minimise coastal pollution within the limits of dune system and related environs

Policy: Prevent dumping of solid waste and any types of dredge material within the dune system

Action:

1. Relocate existing dumping sites located at Murray road and in front of Karagam Levaya
2. Assist local authority to establish new dumping site in a suitable location
3. Relocate the slaughterhouse located on the beach front near Murray road
4. Launch dune-cleaning campaign with the participation of all stakeholders
5. Display sign-boards indicating importance of keeping dune system as a clean environment

Issue 3: Encroachment

Objective: Curtail all types of encroachments in dune conservation areas

Policy: Prohibit encroachments towards sand dune areas beyond Dune Protection Line (DPL) established by the Coast Conservation Department.

Action:

1. Establish Dune Protection Line (DPL) based on a land survey and considering the setback standards stipulated in the Revised Coastal Zone Management Plan of 1997 to minimise further encroachments
2. Educate the public regarding importance of maintaining dune protection line
3. Exclude the dune/land areas from the DPL towards High Water Mark (HWM) when allocating crown land for development projects and dwelling purposes
4. Prohibit further expansion of structures which are already located within the DPL

Issue 4: Lack of public awareness and education

Objective: Enhance public awareness and education on social, economic and environmental significance of the Sand dunes in conservation area

Policy: Promote education and awareness among all stakeholders on conservation of sand dunes in the conservation area

Action:

1. Formulate dune protection societies in the following schools with a view to educate and enhance interest on conservation of sand dunes in the conservation area
 - Mirijjawila M.V
 - St. Mary's College
 - Sahira College

2. Establish demonstration dune vegetation nursery plots with the assistance of Dune Protection Societies
3. Establish sand dune information centre at recreational area set up by Rajapaksa Foundation
4. Prepare and distribute printed materials on environmental significance of sand dunes

Issue 5: New developments

Objective: Minimize environmental impacts of new development on sand dune systems located in the conservation area

Policy:

1. Direct new developments compatible with the overall objectives of the management of sand dunes within the conservation area
2. Discourage siting of non water dependent activities within the dune area

Action:

1. Formulate siting criteria for new development closer to the dune system
2. Prohibit exploration/extraction of commercially valuable mineral sand from critical segments of the sand dunes
3. Requires Environmental Impact Assessment mandatory for siting of new development in the dune areas and extraction of mineral sand from the dune systems
4. Enhance co-ordination and make aware the officials of the project approving agencies such as BOI, BII, CTB, CCD,
5. Cease allocation of crown land located between the main road and the sea for non water dependent development projects within the dune areas

Issue 6: Trampling and Unauthorised constructions

Objective: Minimize negative impacts due to unauthorized construction and trampling in dune areas

Policy:

1. Prohibit all types of constructions beyond the DPL towards HWM other than the coast protection structures
2. Promote and provide adequate access to the beach at suitable locations through the dunes by means of elevated dune walkover structures.

Action:

1. CCD and Local Authority should not allow construction of structures beyond DPL towards HWM
2. Develop guide lines for water dependent activities which are envisaged to be sited within the dune areas
3. Enforce legal action against violators
4. Implement community monitoring system to curtail unauthorised construction activities within the dune systems
5. Construct elevated dune walkovers to provide access to the beach on pilot basis
6. Restore the dune areas already damage/degraded due to trampling using indigenous vegetation

CHAPTER - 6 LEGAL AND INSTITUTIONAL FRAMEWORK FOR SAND DUNE CONSERVATION

6.1 Legal Framework

In terms of sand dune conservation and protection, there is no single agency at the local level, which has the responsibility for dune management. In accordance with the Coast Conservation Act, powers and responsibility of dune management brought under the purview of Coast Conservation Department. However, the past experience and the management interventions initiated by the CCD produced little or no outcome in the past. This situation has appeared due to number of inadequacies and limitations prevailed within the management framework. These limitations and drawbacks are as follows;

1. Narrow definition of the “coastal zone”. According to the Coast Conservation Act, the management boundary is confined only up to 300 meters from the high watermark towards land area where as sand dunes are extending more than the above limits. Thus, the CCD has no legal authority to manage the dunes that extend beyond the Coastal Zone³.
2. Lack of attention rendered on site specific management
3. Centralised nature of institutional mechanism used in managing dunes
4. Lack of public involvement in planning and management

With the realisation of limitations and drawbacks prevailed within the system in managing sand dunes, CCD has changed its strategies through its Revised CZM Plan of 1997 by introducing Special Area Management concept. This approach allows paying careful attention on site specific ecosystems and enabling to stimulate community participation at the community level.

The sand dunes in Hambantota reviewed under this plan, have been identified by the Revised CZMP 1997, as one of the dune areas where special management interventions are required. Thus the legal and policy acceptance for the management of the Hambantota dunes are available.

³ Coastal Zone defines as the area lying within a limit of three hundred meters landward of the Mean High Water Line and a limit of two kilometers seaward of the Mean Low Water Line.

In view of the conservation needs, most of the management strategies spelt out in this plan could be implemented direct using the legal and policy provisions given both by CC Act and the Revised CZM Plan 1997. However, when considering the importance of managing land adjacent to the dunes, the other legislation such as Crown Land Ordinance can be used to control development activities, which lead to negative impacts on sand dunes in the area. It is also important to introduce new legal provisions under the proposed Coast Conservation and Coastal Resource Management Act to repeal the existing provisions that are available under other legislation viz.: GSMB Act which imposes certain difficulties in achieving conservation objectives.

6.2 Institutional Framework

The scale of the management strategy proposed under this plan for conservation of sand dunes in Hambantota is somewhat lower than what has been adopted in other Special Area Management sites. Thus, the institutional framework proposed in this plan for managing dunes is a less complicated and direct one.

The overall institutional framework for managing dunes comprises Central government, Local government and Non governmental institutions as well as the communities living in the vicinity of dunes. The relevant institutions/stakeholder groups which are responsible for managing dunes are given in the following table. (Table 6.1)

It may be noted that under the SAM planning process initiated by the HICZMP the groundwork has been laid for a sustainable dune management process by the appointment of a Hambantota Sand Dune Management Co-ordinating Committee (HSDMCC) under the Chairmanship of the Divisional Secretary.

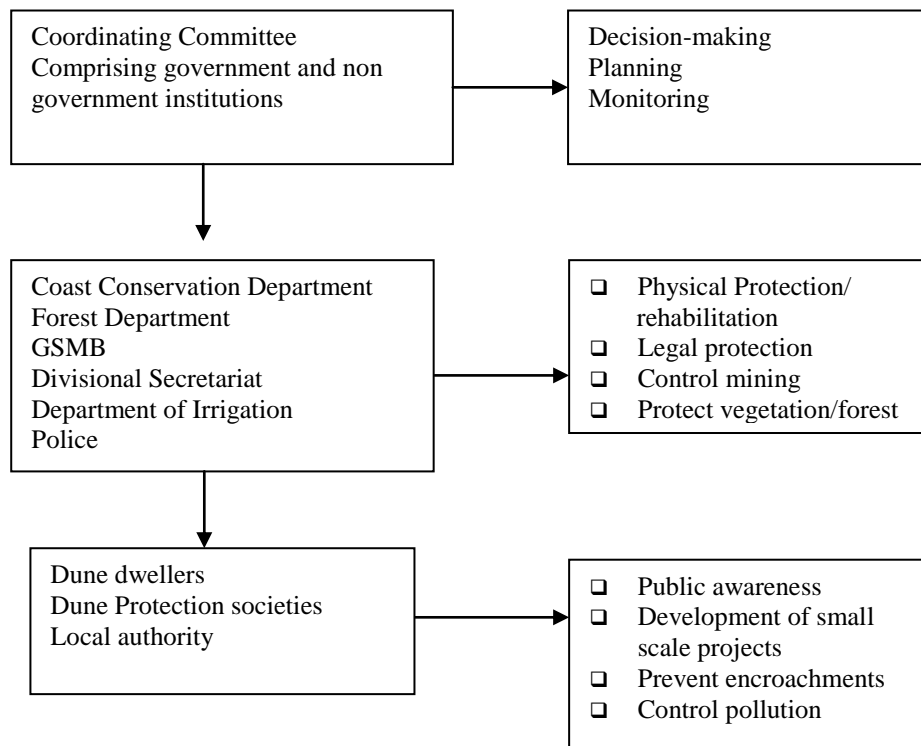
6.3 Management Structure

The relevant stakeholder group as illustrated in Figure 6.1 should share the management responsibilities.

TABLE 6.1 THE RELEVANT INSTITUTIONS RESPONSIBLE FOR DUNE MANAGEMENT

Central Government Institutions	Provincial Govt. Institutions	Local Govt. Institutions	Non-govt: Institutions
Coast Conservation Dept.	Land commissioner	Urban council	Dune dwellers
Divisional secretariat	SDA	DEA	Dune Prot.societies
Forest Department		DFEO	Other NGO's
Urban Develop. Authority			
GSMB			

FIGURE 6.2 THE RELEVANT STAKEHOLDER GROUPS AND THEIR MANAGEMENT RESPONSIBILITIES.



6.3 IMPLEMENTATION SCHEDULE

ISSUE	AGENCIES TO BE INVOLVED IN IMPLEMENTING STRATEGY	PRIORITY LEVEL
Issue1: Dunes vulnerability and degradation		
Strategy 1: Protect and maintain the dune system as a natural barrier against erosion and coastal floods	CCD, DS, CCC, ID PS, police	High priority
<p>Management Actions:</p> <ol style="list-style-type: none"> 1. Restore the damage of the portion of the sand dune by mobilizing communities and adopting environmentally sound and financially viable methods 2. Declare the portion of the dune system located in front of low lying areas as critical zones 3. Establish a protection fund with external and internal assistance 4. Prohibit removal and extraction of sand from the beaches and dunes 5. Enforce legal action against violators 		
Strategy 2: Prevent human activities which lead to reduced biological diversity of the dune system	DS, DF, PS, RU	High priority
<p>Management Actions:</p> <ol style="list-style-type: none"> 1. Prohibit removal and destruction of plants, trees and any other type of vegetation and animal species from the dune system 2. Promote and launch a programme directed towards replacing casurina plantation with native dune vegetation for selected areas 3. Stop further expansion of casurina plantation within the dune system 4. Initiate research on planting indigenous species as undergrowth vegetation in casurina planted areas 		

<p>Strategy 3: Promote sharing of management responsibility between land owners who occupy dune land and government institutions</p>	CCC, Dune dwellers, DS	High priority
<p>Management Actions:</p> <ol style="list-style-type: none"> 1 Formulate dune management group among dune dwellers 3. Develop guidelines to maintain dune areas to prevent further degradation 4. Provide suitable plants to replant dune ares 		
<p>Issue 2: Dumping of Solid Waste</p>	CCD, ED, PS, MFE, UDA	
<p>Strategy: 4 Prevent dumping of solid waste and any dredge material within the dune system</p>		
<p>Management Actions:</p> <ol style="list-style-type: none"> 1. Relocate existing dumping sites located at Murray road and in front of Karagam Levaya 2. Assist local authority to establish new dumping site in a suitable location 3. Relocate the slaughterhouse located on the beach front near Murry road 4. Launch dune-cleaning campaign with the participation of all stakeholders 5. Display sign-boards indicating importance of keeping dune system as a clean environment 		
<p>Issue 3: Encroachment</p>		
<p>Strategy: Prohibit encroachments towards sand dune areas beyond Dune Protection Line (DPL) established by the Coast Conservation Department.</p>		

<p>Management Actions:</p> <ol style="list-style-type: none"> 1. Establish Dune Protection Line (DPL) based on a land survey and considering the setback standards stipulated in the Revised Coastal Zone Management Plan of 1997 to minimise further encroachments 2. Educate the public regarding importance of maintaining dune protection line 3. Exclude the dune/land areas from the DPL towards HWM when allocating crown land for development projects and dwelling purposes 4. Prohibit further expansion of structures which are already located within the DPL 		
<p>Issue 4: Lack of public awareness and education</p>		
<p>Strategy: Promotion of education and awareness among all stakeholders on conservation of sand dunes</p>		
<p>Management Action:</p> <ol style="list-style-type: none"> 1 Formulate dune protection societies in the following schools with a view to educate and enhance interest on conservation of sand dunes in the conservation area <ul style="list-style-type: none"> • Mirijjawila M.V • St. Mary's College • Sahira College 2 Establish demonstration dune vegetation nursery plots with the assistance of Dune Protection Societies 3 Establish sand dune information centre at Rajapaksa Foundation 4 Prepare and distribute printed materials on environmental significance of sand dunes 		
<p>Issue 5: New developments</p>		
<p>Strategy: Direct new developments compatible with the overall objectives of the Management of sand dunes within the conservation area</p>		

<p>Management Action:</p> <ol style="list-style-type: none"> 1. Formulate siting criteria for new development closer to the dune system 2. Prohibit exploration/extraction of commercially valuable mineral sand from critical segments of the sand dune 3. Requires Environmental Impact Assessment mandatory for siting of new development in the dune areas and extraction of mineral sand from the dune systems 4. Enhance co-ordination and make aware the officials of the project approving agencies such as BOI, BII, CTB, and CCD 5. Cease allocation of crown land located between the dunes and the highway for non water dependent development projects 		
<p>Issue 6: Trampling and Unauthorised constructions</p>		
<p>Strategy: Prohibit all types of constructions beyond the DPL and provide adequate access to the beach at suitable locations through the dunes by means of elevated dune walkover structures.</p>		
<p>Management Action :</p> <ol style="list-style-type: none"> 1. CCD and Local Authority should not allow construction of structures beyond DPL towards HWM 2. Develop guide lines for water dependent activities which are envisaged to be sited within the dune areas 3. Enforce legal action against violators 4. Implement community monitoring system to curtail unauthorised construction activities within the dune systems 5. Construct elevated dune walkovers to provide access to the beach on pilot basis 6. Restore the dune areas already damage/degraded due to trampling using indigenous vegetation 		

REFERENCES

- A Canada-Ceylon Colombo Plan Project. 1960: Resources of the Walawe Ganga Basin. The Government Press, Ceylon.
- Balendran, V.S., 1968 Unpublished Geological Map of the Hambantota sheet (1:63,360), Geological Survey Department, Colombo 2.
- Carter, R.W.G., 1988: Coastal environment: an introduction to the physical, ecological and cultural systems of coastline.
- Central Bank of Sri Lanka, 1995: Economic and Social Statistics of Sri Lanka.
- CCD, 1997: Revised Coastal Zone Management Plan of Sri Lanka.
- Cooray, P.G. 1984: An Introduction to the Geology of Sri Lanka. 2nd Revised Edition, Ceylon National Museum Publication, Colombo.
- Department of Census and Statistics, 1994: Demographic survey 1994 Sri Lanka. Report on Demographic characteristics of the population.
- Fernando, S.N.U., 1968: The Natural Vegetation of Ceylon. Lake House, Colombo, Sri Lanka.
- Geological Survey Department, 1982: Geological Map of Sri Lanka. Compiled by the Geological Survey Department, Colombo.
- Hapuarachchi, D.J.A.C., 1989: Journal of the Geological Society of Sri Lanka, 2, 5-9.
- Katupotha, J., 1992: Geomorphic Surfaces of the River Basins along the Western and Southern Parts of Sri Lanka. NARESA, 1992 Unpublished Report).
- Korale, R.B.M., 1989: Population Trends in the Coastal Areas of Sri Lanka. Sector paper prepared for USAID Coastal Resources Management Project.
- Department of Irrigation, 1977: Soil Map of Sri Lanka. Compiled by Department of Irrigation, Sri Lanka.
- Thambyapillai, G., 1960: Climatic regions of Ceylon-1: according to the Köppen classification. Tropical Agriculturist, VCXVI, 147-177.

ANNEX 1 - Photographs



1.1A & 1.1B Creeping *Spiniifex littorus* and *Ipomea asarifolia* on sand dunes



1.1C & 1.1D Shrubs *Euphorbia nerifolia* and *Scaevola sericea* on sand dunes



1.2A



1.2B

1.2A & 1.2B Land surveying and identification of dune vegetation.



1.3A



1.3B

1.3A & 134B Dune encroachment (Talgasmandiya & Hambantota west).



1.4C & 1.4D Dumping of solid waste on sand dunes

ANNEX 2: CHARACTERISTICS OF THE SURVEYED CROSS-SECTIONS - HAMBANTOTA SAND DUNES

CROSS SECTION NOS	SURVEY DATE	LOCATION	HEIGHT AND DISTANCE OF THE BEGINNING POINT	HEIGHT AND DISTANCE OF THE HIGHEST POINT	HEIGHT AND DISTANCE OF THE END POINT	GEOMORPHOLOGY
1	10.10.1998	Talgasmandiya	1.83 (0)	9.89 (94.0)	2.95 (169.8)	Dune starts from the main road. The starting point is 1.83m high. Within 31m from this to the height point, the dune rises by 7.84m. Undulating shape can be seen between 31 and 114 m of the section. The valleys of the crests are not deep. From 114m mark to the end of the dune (124m), the slope is concave in shape. The edge of the dune is 4.2m high, and the beach is 45m wide.
2	10.10.1998	Talgasmandiya	1.67 (0)	9.29 (48.2)	2.18 (116.9)	The starting point of the section 2 is 1.67m high from the msl. The highest point of the section is 9.29m (48.2m distance from the road) and shape is convex. Between 48m and 85m marks the height decreases to 5.08m and the shape is concave. Again the dune rises to 5.74m in height within a distance of 92.2m and falls again to 3.42m at the end of the edge. From this point
3	11.10.1998	Talgasmandiya	2.02 (0)	9.47 (27.3)	2.09 (117.1)	The starting point of the section 3 is 2.02m high. The slope of the dune is very steep within 15m from the main road (7.72m rise within 15.0m distance,). Between the starting point and the 27.0m point, the shape of the dune is concave. From 27.0m to 100.0m, the height decreases to 5.24 and undulating morphology can be seen on the surface. Once again, the end of the section shows a convex shape towards the sea.

4	27.09.1998	Kachcheri Complex	19.92 (0)	--	1.25 (250.0)	The height of the starting point of section 4 is 19.92m. Within 185m it decreases to 9.49m with convex slope. From this point (185m), the height further decreases to 1.93 (238m distance) indicating two terraces with steep slopes and concave morphology. The beach is 12m wide at the end of the section.
5	27.09.1998	Murray Road	10.45 (0)	10.75 (52.0)	2.11 (168.0)	Starting point of the line is 10.45m high. Within 12.0m the height increases by 0.3m. From this level within 16.0m the height decreases up to 8.8m and again the height rises up to 10.75m (at the point 52.0m). Micro relief of the area indicates that a small basin. From 52.0m to 970m the height of the dune decreases by 9.15m. From this level, the beach is flat (about 2.0m high and 72.0m wide).
6	27.09.1998	Murray Road	3.38 (0)	8.31 (91.0)	2.22 (179.0)	Starting point of the line is 3.38m. Within 71.0m, the height increases by 2.24m. Undulating shape of the dune indicates three crests and the highest point is 8.13m. The edge of the dune has a steep slope. The beach is 44.0m wide and the height is vary between 3.47m and 2.22m within this distance.
7	26.09.1998	Hambantota West	1.66 (0)	12.36 (217.5)	1.95 (296.5)	Dune edge begins at 36.0m point from the main road (2.2m high). The dune has two crests. The first is 9.1m high (65.0m from the main road) and the second is 12.36m high (217.5m from the main road). Between these two crests, a basin has formed with a minimum height of 3.57m. From the second crest towards the sea the height decreases about 10.4m (within 79.0m).
8	26.09.1998	Karagan	2.00 (0)	7.66 (110.0)	1.44 (182.0)	Starting point of the line is 2.0m (edge of the main road). The foot of the dune is 43.0m from the main road (2.77m high). Within 29.0m, concave and convex shapes can be seen. Between 72.0m and 151.0m the dune is turtle back in shape (highest point is 7.66m high). The seaside of the dune has a steep slope.

9	26.09.1998	Ratupasgodella	7.18 (0)	15.26 (23.0)	1.14 (86.0)	Height of the starting point is 7.18m. Within 40m, the height decreases slowly and from that point on, the slope indicates a convex shape. At the end of the dune the height is 2.72m and the beach is 10m wide.
10	26.09.1998	Mirijjawila	7.81 (0)	12.85 (89.5)	2.32 (200.0)	The beginning point of the dune (road) is 7.8m high. It extends with a concave shape within 33m and the highest point is 15.3m. From this level the height decreases up to 5.8m within 82m. The width of the beach in this line is 80m.
11	26.09.1998	Mirijjawila	5.00 (0)	13.21(100.0)	3.19 (185.0)	Between the main road and the dune, 58m wide marshy land is located. The foot of the dune is 3.1m high and within 31.5m the dune rises up to 12.85m. Within another 144m the height decreases up to 6.0m. Again undulating shape of the dune extends 60m and the width of the beach is 25m.
12	26.09.1998	Sisilasagama	2.96 (0)	6.09 (235.0)	4.17 (244.0)	The height of the starting point is 2.96m. From this point the height of the dune increases up to 13.21m within 100m. From this point to the beach, it has 144m in length and generally shows concave shape.
13	07.11.1998	Godawaya	3.62 (0)		3.33 (270.2)	The surveyed line started at the lagoon edge (3.6m in high from the MSL and the height increases gradually up to 6.1 towards the sea within 235.0m. From this level, within 25m the height decreases (4.9m) and edge of the beach shows a steep slope.

ANNEX 3: DETAILS OF THE VEGETATION IN EACH SURVEYED SECTIONS - HAMBANTOTA SAND DUNES

SERIAL NO	SAMPLE HEIGHT & DISTANCE (in metres)	TYPES OF THE VEGETATION IN SAMPLE 1	SAMPLE HEIGHT & DISTANCE (in metres)	TYPES OF THE VEGETATION IN SAMPLE 2	SAMPLE HEIGHT & DISTANCE (in metres)	TYPES OF THE VEGETATION IN SAMPLE 3
1	2.00 (3.00)	<i>Dichrostachys cinerea</i> (Andara) <i>Azadirachta indica</i> (Kohomba) <i>Euphorbia nerifolia</i> (Pathok) <i>Borassus flabellifer</i> (Tal)	7.50 (75.00)	<i>Carissa spinarum</i> <i>Cucumis melo</i> Var. <i>agrestis</i> Crateva religiosa Cissus quadrangularis	8.00 (112.00)	<i>Euphorbia nerifolia</i> Calotropis gigantea <i>Ochlandra stridula</i> (Ranawara)
2	3.00 (2.00)	<i>Euphorbia nerifolia</i> <i>Crateva religiosa</i> (Lunuwarana) <i>Tephrosia purpurea</i> (Katupila) <i>Cucumis mel</i> Var. <i>agrestis</i> (Gon Kekiri)	9.00 (45.00)	<i>Crateva religiosa</i> <i>Spinifex littorus</i> <i>Tephrosia purpurea</i>	3.40 (108.00)	<i>Ipomoea asarifolia</i> <i>Spinifex littorus</i>
3	2.80 (2.50)	<i>Cissus quadrangularis</i> (Heeressa) Euphorbia nerifolia <i>Cucumis melo</i> Var. <i>agrestis</i>	6.25 (75.00)	<i>Cyperus rotundus</i> (Kalanduru) <i>Spinifex littorus</i>	5.10 (106.0)	<i>Spinifex littorus</i> <i>Ipomoea asarifolia</i> <i>Cyperus rotundus</i>
4		<i>Tephrosia purpurea</i> <i>Euphorbia nerifolia</i> <i>Euphorbia nerifolia</i>		<i>Spinifex littorus</i> <i>Ipomoea asarifolia</i>		<i>Tephrosia purpurea</i> <i>Desmodium triquetrum</i>
5	--	<i>Spinifex littorus</i> (Maharawana) <i>Euphorbia nerifolia</i> <i>Dichrostachys cineria</i>	10.70 (50.00)	<i>Ipomoea asarifolia</i> <i>Spinifex littorus</i>	2.00 (92.00)	<i>Ipomoea asarifolia</i> <i>Spinifex littorus</i>
6	6.50 (78.00)	Euphorbia nerifolia Calotropis gigantea (Wara) Moringa oleifera (Nuga) <i>Borassus flabellifer</i>	6.60 (107.00)		5.20 (128.00)	

7	3.70 (134.00)	<i>Euphorbia nerifolia</i> <i>Calotropis gigantea</i> <i>Spinifix littorus</i>	12.20 (218.00)	<i>Ipomoea asarifolia</i> <i>Spinifix littorus</i>	4.70 (246.00)	<i>Spinifix littorus</i> <i>Dichrostachys cineria</i>
8	6.85 (84.00)	<i>Euphorbia tircalli</i> (Nawahandi) <i>Casuarina quaiasetifolia</i> (Kasa)	7.60 (125.00)	<i>Casuarina quaiasetifolia</i>	6.50 (162.00)	<i>Spinifix littorus</i> <i>Ipomoea asarifolia</i>
9	--	Desmodium triquetrum (Baloliya) Azadirachta indica <i>Tephrosia purpurea</i>	6.59 (40.00)	<i>Spinifix littorus</i> <i>Euphorbia nerifolia</i>	3.45 (64.00)	
10	9.75 (3.75)	<i>Euphorbia nerifolia</i> Azadirachta indica <i>Tephrosia purpurea</i> Hinguru	7.70 (67.00)	<i>Casuarina equisetifolia</i> Podisignomaran <i>Spinifix littorus</i>	5.80 (113.00)	<i>Euphorbia nerifolia</i> <i>Casuarina equisetifolia</i>
11	12.70 (87.00)	<i>Borassus flabellifer</i> (214) <i>Euphorbia nerifolia</i>	8.70 (132.00)	<i>Casuarina equisetifolia</i>	6.70 (275.00)	<i>Spinifix littorus</i>
12	4.20	<i>Euphorbia nerifolia</i>	12.20 (102.00)	<i>Cerbera manghas</i>	4.80 (240.00)	<i>Spinifix littorus</i> <i>Euphorbia nerifolia</i>