SRI LANKA'S FIFTH NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY

2014




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BIODIVERSITY SECRETARIAT

Biodiversity Secretariat
Ministry of Environment & Renewable Energy

Sri Lanka's Fifth National Report to the Convention on Biological Diversity 2014

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Convention on Biological Diversity 2014

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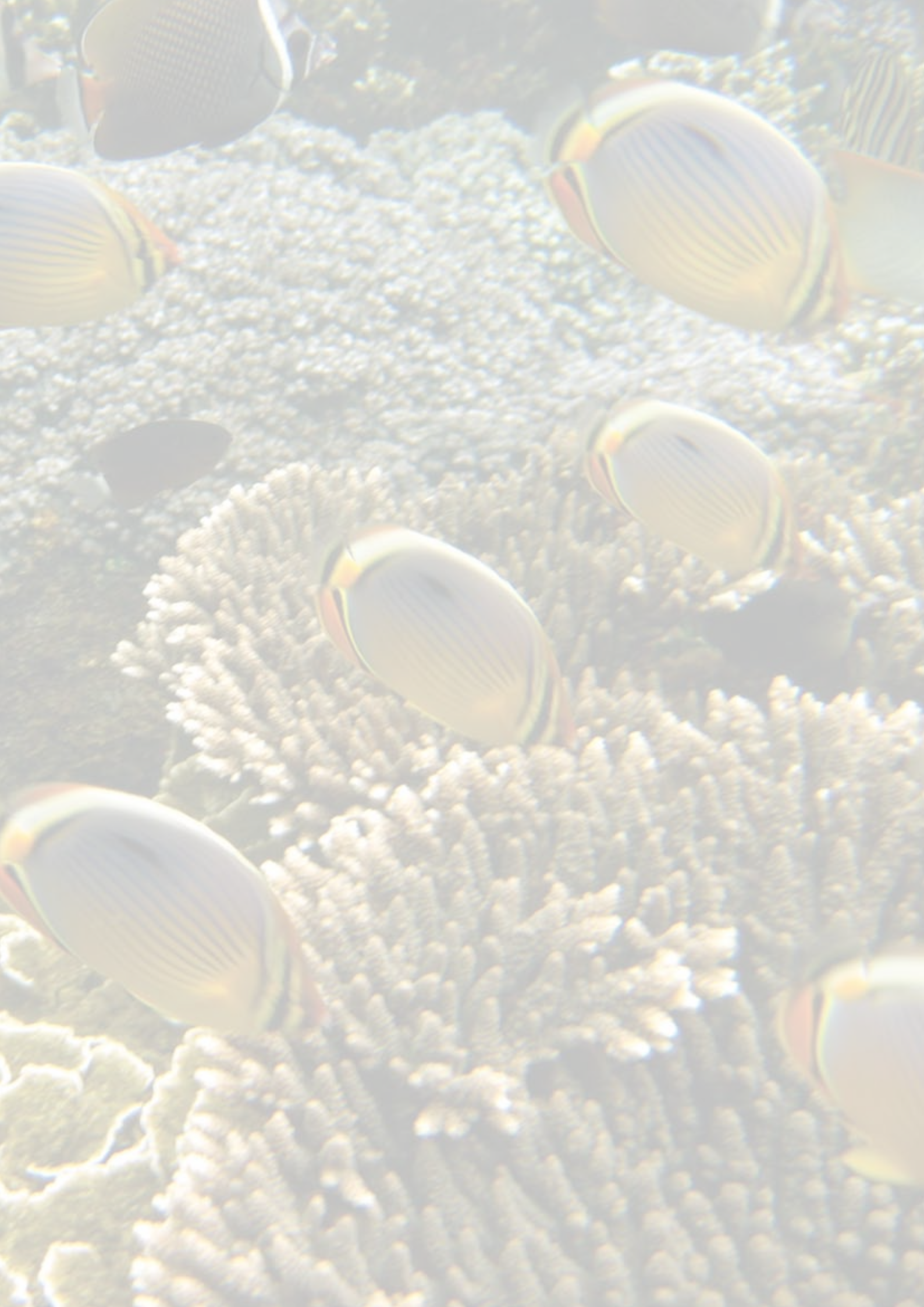

Contents

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
Aus AID	Australian Agency for International Development
CARP	Council for Agricultural Research Policy
CB	Central Bank
CBD	Convention on Biological Diversity
CCA	Coast Conservation Act
CCD	Coast Conservation Department
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CWR	Crop Wild Relatives
CZMP	Coastal Zone Management Plan
DAPH	Department of Animal Production & Health
DAPH	Department of Animal Production and Health
DAU	Department of Ayurveda
DEA	Department of Export Agriculture
DEA	Department of Export Agriculture
NARESA	Natural Resources, Energy and Science Authority of Sri Lanka
DNBG	Department of National Botanic Gardens
DNZG	Department of National Zoological Gardens
DoA	Department of Agriculture
DoEA	Department of Export Agriculture
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EIMS	Environmental Information Management System
EN	Endangered species
EPA	Environmental Protection Area
FAO	Food and Agriculture Organization of United Nations
FCRDI	Field Crop Research and Development Institute
FD	Forest Department
FFPO	Fauna and Flora Protection Ordinance
FFPO	Fauna and Flora Protection Ordinance
FNR	Fifth National Report
FO	Forest Ordinance
FO	Forest Ordinance
FR	Forest Reserves
FSMP	Forestry Sector Master Plan
GEF	Global Environment Facility
GIS	Geographical Information System
GOSL	Government of Sri Lanka
HORDI	Horticultural Research and Development Institute

IUCN	International Union for Conservation of Nature and Natural Resources
IWMI	International Water Management Institute
KDN	Kanneliya-Dediyagala-Nakiyadeniya Forest Complex
MAB	UNESCO Man and Biosphere Programme
MEPA	Marine Environment Protection Authority
MoERE	Ministry of Environment and Renewable Energy
NAQDA	National Aquaculture Development Authority
NARA	National Aquatic Resources Research and Development Agency
NCR	National Conservation Review
NCR	National Conservation Review
NGO	Non Governmental Organization
NHWAA	National Heritage and Wilderness Areas Act
NSC	National Steering Committee
NSF	The National Science Foundation
NTFP	Non Timber Forest Products
NTFP	Non Timber Forest Products
NWP	National Wetland Policy
OSF	Other State Forest
PA	Protected Area
PGRC	Plant Genetic Resource Centre
RRDI	Rice Research and Development Institute
UNCCD	UN Convention to Combat Désertification
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
VRI	Veterinary Research Institute
WCMC	World Conservation and Monitoring Center
WCP	Wetland Conservation Project

LIST OF TABLES

LIST OF BOXES

LIST OF FIGURES

R.H.M.P Abeykoon
Director, Biodiversity Secretariat Secretary, Ministry of Environment & Renewable Energy

ACKNOWLEDGEMENTS

The Article 26 of the Convention on Biological Diversity (CBD) states that the objective of national reporting is to provide information on measures taken for the implementation of the Convention and the effectiveness of these measures. This Fifth National Report to Convention on Biological Diversity is an outcome of the consultative process involving a range of stakeholders including representatives of relevant institutions and experts. Preparation of this report would never have been possible without active participation of renowned individuals in relevant institutions and experts dealing with biodiversity conservation.

On behalf of the Ministry of Environment and Renewable Energy, I would like to extend my special thanks to the distinguished individuals and experts in the National Steering Committee (NSC), and Technical Working Group (TWG), the relevant Ministries, institutions, agencies, as well as the representatives of the NGOs, CBOs and the private sector who took time out of their busy schedules to participate in workshops and meet with our consultants to provide data and information for developing this report.

I am grateful to Mr. B.M.U.D Basnayake, Secretary, Ministry of Environment and Renewable Energy who took a personal interest and provided guidance throughout the process and ensured that planners and policy makers at the highest level participated in the consultative process. In addition, he also provided a valuable contribution to the process as the chairmen of the National Steering Committee for Biodiversity Conservation. The guidance for the entire report preparation process provided by Mr. N.K.G.K. Nammawatta, Additional Secretary (Natural Resources) is greatly appreciated.

My sincere appreciation is extended to Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) for providing funding for preparation of the Fifth National Report. I am also thankful to all the consultants, Mr. H.M.Bandaratillake, Lead Consultant and other consultants namely Dr. Jinie Dela (Part I), Prof. Udith Jayasinghe (Part II), and Mr. W.T.B. Dissanayake (Part III). My special thanks are extended to the staff of the Biodiversity Secretariat of the Ministry of Environment and Renewable Energy, particularly to Mr. Sujith Rathnayake, Ms. Champika Kariyawasam, Environment Management Officers and Ms. Saranga Jayasundara, Programme Assistant.

Finally, the Ministry of Environment and Renewable Energy would like to extend sincere thanks to all those persons who made this activity possible. Without these efforts the task involved would have not been successful.

R.H.M.P Abeykoon

Susil Premajayantha MP
Minister of Environment and Renewable Energy

MESSAGE

Sri Lanka is endowed with a wide variety of ecosystems and habitats and many species of flora and fauna. It is one of the most biologically diverse countries in Asia. Despite its small size of 6.57 million hectares, Sri Lanka has a varied climate and topography, which has resulted in rich biodiversity, distributed within a wide range of ecosystems. In fact conservation of these resources has been an integral part of Sri Lanka's ancient civilization as stated in ancient chronicles such as the Mahawamsa *(The great historical chronicle of Ceylon (Sri Lanka) composed in the late 5th or early 6th century).* King Devanampiyatissa established one of the world's earliest wildlife sanctuaries during 247 to 207 BC in the period of advent of Buddhism to the country, a philosophy that respects all forms of life.

The Fifth National Report to the Convention on Biological Diversity (CBD) provided a unique opportunity to assess the progress made on the implementation of the Convention on Biological Diversity (CBD) and related conventions. While the country has made a significant progress towards implementation of our biodiversity conservation programs, the problems such as the institutional and capacity issues, the lack of human and financial resources etc, were also identified from the process of Fifth National Report. The report not only provides an opportunity to share experiences with in Sri Lanka, it also provides us a great opportunity to share our experiences with the rest of the world.

The Convention on Biological Diversity (CBD) and other related conventions have greatly influenced the policies, action plans and programmes in Sri Lanka. Therefore, the need for conserving the country's biodiversity and sensitive ecosystems is recognized in national planning, and is reflected in the key national policies such as *Mahinda Chintana* (the framework for national policy), National Environmental Policy and Strategies, the Action Plan for the Haritha (Green) Lanka Programme etc. The required institutional and policy framework, large number of supporting legislation have been developed as a mechanism for maintaining of biodiversity conservation in to sectoral and cross sectoral strategies, plans and programs in Sri Lanka.

I am happy to note that Fifth National Report has been prepared following a consultative process involving a very wide range of stakeholders, and wish to thank all those who were involved in this task. The financial support provided by the Global Environment Facility through UNDP, Sri Lanka is also gratefully acknowledged. The Government of Sri Lanka remains committed to promoting the conservation and sustainable use of county's biodiversity for the benefit of present and future generations.

Susil Premajayantha MP

B.M.U.D Basnayake
Secretary, Ministry of Environment & Renewable Energy

FOREWORD

Sri Lanka has signed the Convention on Biological Diversity (CBD) in June 1992, and ratified in March 1994. Sri Lanka prepared a comprehensive Biodiversity Conservation Action Plan (BCAP) in order to fulfill the obligations under Article 6 of the CBD and Cabinet approval for the Action Plan was granted to it in 1998. The National Biodiversity Conservation Action Plan comprises the concrete actions to be taken to achieve the objectives of the Convention. This document was updated later, with the publication of an Addendum in 2007.

The Article 26 of the Convention on Biological Diversity requires parties to the Convention, at intervals determined by the Conference of the Parties (COP), prepare and present to the COP, reports on measures which the country has taken for the implementation of the provisions of the Convention, and their effectiveness in meeting the objectives of the Convention. In order to fulfill this obligation, Sri Lanka has submitted its national reports periodically to the Conference of Parties (COP).

Accordingly, Sri Lanka's Fifth National Report was prepared by the Ministry of Environment and Renewable Energy, and I am glad to present the report to the Secretariat of the Convention on Biological Diversity. The report preparation process involved wide stakeholder consultations comprising of Government ministries, departments, agencies, NGOs, private sector and other relevant stakeholders. The preparation of Fifth National Report to the CBD not only provided an opportunity to review the national implementation of the Convention, it provided an opening to assess the progress towards the implementation of the Biodiversity Conservation Action Plan (BCAP) and its addendum. Furthermore, it was an opportunity to assess the progress towards meeting the Aichi Biodiversity Targets.

However, the process of preparation of the Fifth National Report provided a great opportunity review the enormous achievements we have made towards the conservation of biodiversity in Sri Lanka, and at the same time it provided an opportunity to identify the institutional and policy weakness in our system which acts as barriers for more effective conservation of biodiversity in the country. The report highlights the progress achieved towards implementation of the BCAP, its addendum and progress towards meeting the Aichi Biodiversity Targets. The report also discusses ecosystem services, threats and issues faced by the biodiversity sector in Sri Lanka.

Preparation of the report to a great extent assisted by the Technical Working Group (TWG), National Steering Committee (NSC) and several individual experts who provided very valuable information. I am thankful to all of them for their valuable inputs. My special appreciation is extended to Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) country office in Colombo, for providing funds which made it possible for the Ministry to prepare the Fifth National Report to the Convention on Biological diversity.

B.M.U.D Basnayake

Executive Summary

This report provides information on (i) An update on biodiversity status, trends, and threats in Sri Lanka and implications for human well-being, (ii) National Biodiversity Strategy and Action Plan (NBSAP), its implementation, and the mainstreaming of biodiversity, and (iii) Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals.

1. Sri Lanka's Biodiversity Status, Trends, and Threats and Implications for human well-being

Sri Lanka is one of the most biologically diverse countries in Asia. Despite its small size of 6,524,540 hectares, Sri Lanka has a varied climate and topography, which has resulted in rich biodiversity, distributed within a wide range of ecosystems. Its distinctive biological diversity is defined by the ecosystems, species and genes that occur in the island's diverse array of forests, wetlands, coastal and marine and agricultural systems. Sri Lanka's biodiversity is considered to be the richest per unit area in the Asian region with regard to mammals, reptiles, amphibians, fish and flowering plants; overtaking several mega diversity countries such as Malaysia, Indonesia and India[1] . The global importance of the island's biodiversity has placed Sri Lanka together with the Western Ghats of India among the 34 biodiversity hotspots in the world[2] .

The extent of forest ecosystems in Sri Lanka in the year 1999 and 2010 are shown in Figure 1. Being an island nation with a long coastline around the country, Sri Lanka has a very wide range of coastal and marine ecosystems ranging from, salt marshes, sand dunes and beaches, mud flats, sea grass beds, lagoons and estuaries and coral reefs. The total area under coastal and marine ecosystems at present is approximately 265,712 ha (Figure 2). About 15,670 ha of land area of the country is under mangroves.

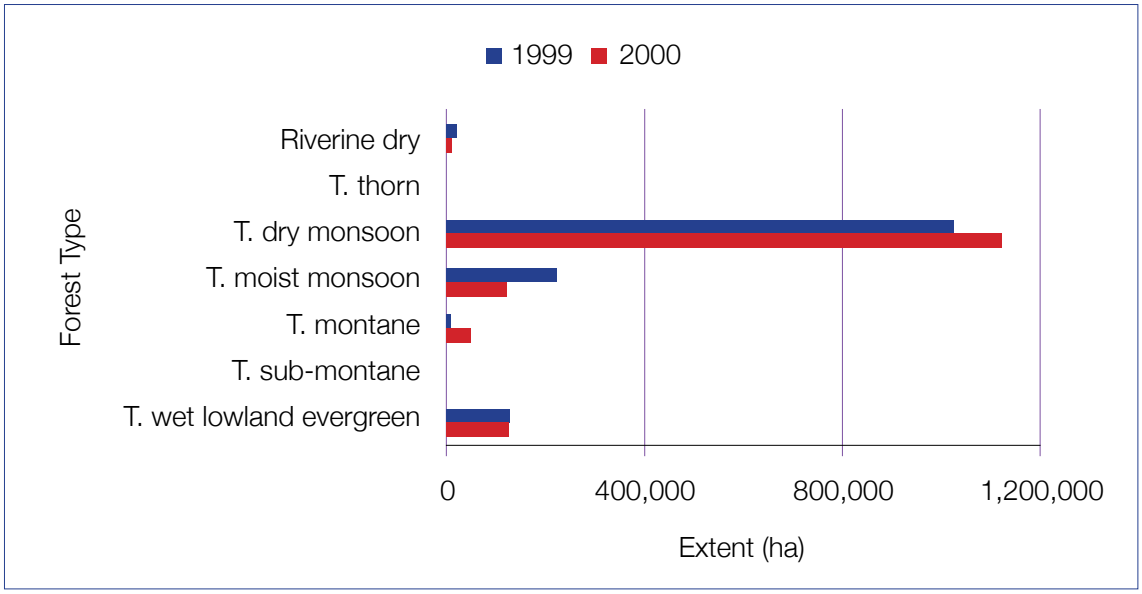

Figure 1: Forest Ecosystems in 1999 & 2010

1 NARESA 1991, Natural Resources of Sri Lanka: Conditions and Trends. Natural Resources, Energy and Science Authority of Sri Lanka, Sri Lanka

2 Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. & Kent, J. 2000. Biodiversity hotspots for conservation priorities.Nature 403, 853–858

National and global Importance of Sri Lanka's biodiversity:

Sri Lanka's exceptionally rich biological diversity provides a multitude of ecosystem goods and services to 20 million of her inhabitants.

Hence, the need for conserving the country's biodiversity is recognized in national planning, and is highlighted in several policies, legislations and programs in the country. The Mahinda Chintana, national policy framework for Sri Lanka, Haritha (Green) Lanka Action Plan, Biodiversity Conservation Action Plan (BCAP) for Sri Lanka and the National Physical Planning Policy and Plan[3] (NPPD & MUDSAD (2006) are prominent among them.

Climate change will no doubt be a threat to Sri Lanka's biodiversity. It is unlikely that all impacts of climate change on biodiversity are preventable. However, it is recognized that genetically diverse populations of species, and species rich ecosystems, have much greater potential to adapt to climate change. Conservation of biodiversity and maintenance of ecosystem structure and function may, therefore, be one of the most practical climate change adaptation strategies that Sri Lanka can adopt to conserve the country's natural heritage[4] . Sri Lanka's exceptional biodiversity is due to the high ecosystem diversity it supports and the diverse species they harbour (Table 1.1. 1.2 and 1.3). This diverse array of ecosystems in Sri Lanka harbors a wealth of plant and animal species. It is a remarkable centre of endemism as the endemism of both flora and fauna species are very high, and around 28% of Sri Lanka's 3,154 species of indigenous angiosperm flora are endemic to the country. Among the faunal species, highest endemism is seen among amphibians, freshwater fishes and reptiles (GOSL, 2008).

Much of the country's biodiversity is found in its forests, particularly those in the wet and intermediate zones of the southwest. The rich and diverse ecosystems of the country harbor many wild relatives of cultivated species, and the gene pools represented by these wild plants are a resource of considerable potential value that could be used for the genetic improvement of cultivated plants.

The global importance of Sri Lanka's biodiversity is shown by the fact that, despite of the small land area, it has four (04) forests recognized as Natural World Heritage Sites based on their exceptional biodiversity value due to high endemism, four (04) Biosphere Reserves within the UNESCO's World Network based on their exceptional biodiversity value due to high endemism. Furthermore, six (06) Ramsar sites have been identified showing the importance of wetlands in Sri Lanka.

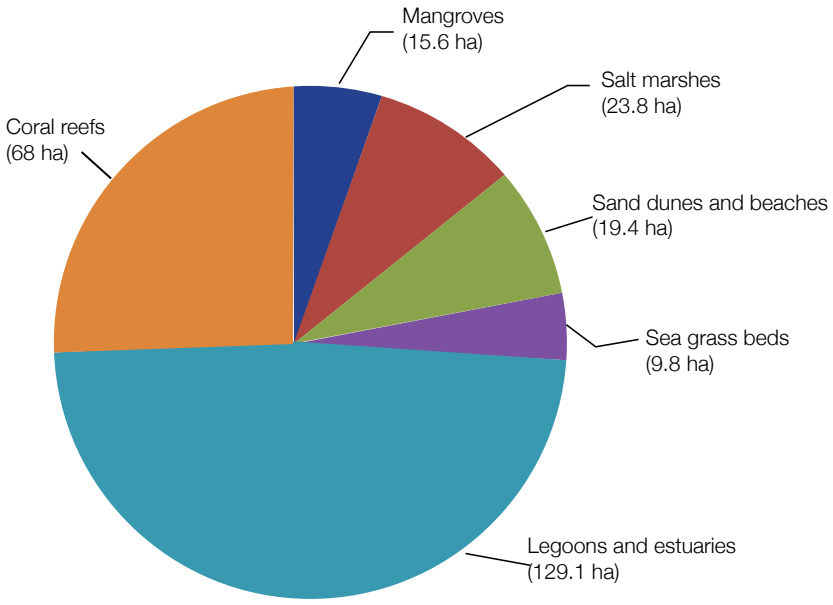

Figure 2: Coastal and Marine Ecosystems Sri Lanka (Extent in ha 000')

3 Ministry of Environment, 2010, Sector Vulnerability Profile: Biodiversity and Ecosystem Services.
4 Ministry of Environment, 2010 Op. Cit

Role of biodiversity for provision of ecosystem services:

Rainforests, wetlands, coastal, marine, and agricultural systems provide a range of important ecosystem services, as well as many more localized goods and services to people of Sri Lanka, such as watershed protection, preventing flooding and soil erosion, preserving biodiversity, ecotourism, regulating rainfall, limiting prevalence of disease, providing livelihoods for local people etc. Please refer to BOX 3 for details. This report describes contribution of ecosystem services to tourism, agriculture (rice and fruit production), major and minor export agriculture, floriculture, livestock production, fisheries, energy, water, health and bio-prospecting, bio-mimicry and natural product development sectors (Refer to section 1.2.5).

Ecotourism has been recognized as a high priority area capable of effectively driving the economic development of Sri Lanka. Accordingly there is target of 2.5 million tourists to be achieved in 2016, thus tourism becoming one of the major foreign exchange earners for the country. Tourism became the 5th largest foreign exchange earner in 2012 and contributed 5.2% to the total country foreign exchange earnings while generating employment for 162,869 people. (SLTDA, 2012).

Sri Lanka's exceptional biodiversity found in forests, wildlife reserves and coastal and marine reserves, as well as the number of sites of global interests such as Biosphere Reserves, World Heritage Sites and Ramsar sites offer significant potential for Sri Lanka to attract foreign nature tourists. **Around 25% of tourists arriving in Sri Lanka are visiting one or more of the National Parks and Elephant Transit Home at Udawalawe, operated by the DWLC.** Furthermore, the data shows that a significant increase of revenue has been achieved from 2010 to 2012 from foreign visitors visited forest reserves, wildlife parks, national botanic gardens and the national zoological gardens (Figure 1.1).

1. 2 Current status, major changes and trends of biodiversity in Sri Lanka

The Protected Areas (PAs) managed by the FD and the DWLC has increased about 84% from 2008 to 2010. The moratorium on logging in all natural forests in Sri Lanka which came into force in 1990 is still in operation. Since the moratorium prevents commercial timber extraction from all natural forests in the country, this has made a significant positive contribution to conservation of forest biodiversity in the country (FAO, 2001). **The extent of PAs under the FD and DWLC have significantly increased over the years with more valuable wet zone forests are included in the PAs network** based on the biodiversity assessments made through the National Conservation Review (NCR). (IUCN/WCMC/FAO(1997). In addition, Eight (08) Environmental Protection Areas (EPAs) have been gazetted by the CEA under the National Environmental Act of 1980. **The total protected area coverage in Sri Lanka at present (2010) is around 1.84 million ha representing about 28% of the total land area of the country**. Besides, the Knuckles Conservation Forest, Horton Plains National Park and the Peak Wilderness Protected Area were accepted by UNESCO as a serial natural world heritage site termed the Central Highlands world Heritage site in 2010. (Table 1.6)

The total forest cover in Si Lanka has depleted from 31.2 % of the island in 1999 to 29.7% in 2010, the actual **forest cover depletion is estimated at about 0.23% of forest area or 4,445 ha annually.**[5] This is a positive feature when compared with the annual deforestation rate of around 40,000 ha during the period 1956 and 1992 (MALF, 1995).

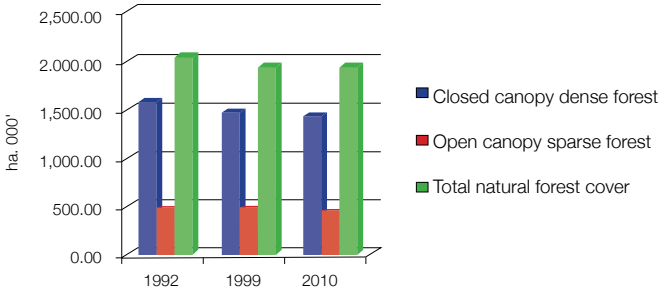

Figure 3: Forest Cover depletion from 1992-2010

Source : Legg and Jewell (1995)[36] and † Forest Department Forest cover data for 1999 and 2010

5 Source: Forest Department Data provided for this report.

However, this alarming rate of deforestation in the past has attributed to several significant changes in forest management including enforcing a logging ban in all natural forests in the country, boundary marking of most forest and wildlife reserves to halt encroachments, preparation and implementation of management plans for forest and wildlife reserves which is now a legal requirement and encouraging community participation in forest and protected area management. Similarly, significant positive steps have been taken in the non-forest tree resource sector ie, the massive national tree planting campaign (Deyata Sevena) that is currently underway, the community forestry programme implemented by the FD with financial assistance from Australian Aid.

Likewise, several positive features have occurred for conservation of wetlands in the past few years, but wetlands continue to be lost, degraded and their resource exploited beyond sustainable levels (BOX 9). **Some of the key positive trends in the wetland sector are;** establishment of a special Wetland Unit at the CEA to oversee the interests of wetlands and to implement the National Wetlands Policy of 2006; banning of converting rice fields into other uses in the Western Province; preparation of management plans for the Bolgoda Wetlands and Thalangama Wetlands (pending). establishment of a special Wetland Unit at the CEA to oversee the interests of wetlands and to implement the National Wetlands Policy of 2006, banning of converting rice fields into other uses in the Western Province, preparation of management plans for the Bolgoda Wetlands and Thalangama Wetlands (pending).

The loss of quality in most coastal and marine systems has continued since the last reporting period. **Some significant positive trends in the coastal and marine sector are;** increasing the coastal zone to cover 100 m of riparian land on either side of the 2 km water (Coast Conservation Amendment Act No 49 of 2011); the regulation of Illegal sand mining on the southwest coast; Coast conservation Act (CCA) amendment No 49 of 2011 which paves the way for more positive coastal zone management activities, and as a result coral mining for lime production has been stopped.

The agriculture sector includes rice, plantation crops, fruit crops, vegetables, root crops and field crops, minor export crops and livestock. **In recent years there has been a positive trend to conserve and use the germplasm of indigenous crops and their wild relatives** for varietal improvement in rice, vegetables, other field crops and minor export crops. Since year 2010, Sri Lanka has banned several non-conventional pesticides which are likely to be hazardous to human health and the environment by means of indiscriminate use and excessive environmental load. These measures are expected to improve ecosystem health of agricultural systems.[6]

1.3 Major threats to biodiversity in the country

The major threats to biodiversity in Sri Lanka are provided in table 1.10. Sri Lanka's unique biodiversity is currently under serious threat due to increasing population pressure on ecosystems which leads to degradation, fragmentation and loss of habitats. The major causes for these effects are unplanned development activities, sedimentation due to unplanned developments, illegal encroachments, pollution, over exploitation of species, spread of alien and invasive species, climate change and natural disasters etc. As a result of these reasons, most of the remaining habitats of endemic species in terrestrial, freshwater, coastal and marine ecosystems are under serious threat.

1.4 Possible future changes in biodiversity and their impacts

Habitat loss and fragmentation, degradation, spread of invasive alien species, pollution; over exploitation and climate change are now the most serious threats driving species loss in Sri Lanka. All most all the ecosystems in the country face some form of threats which ultimately result in habitat loss, degradation, change in species composition and loss of ecosystem services. Some of these may cause heavy expenditure to the government in terms of flood relief activities and to overcome health hazards etc.

6 Discussions with the Registrar of Pesticides, 2014

A positive factor in this regard is that rate of **deforestation has been significantly reduced during the last two decades.** Despite of threats, and issues, the other ecosystems such as wetlands, coastal and marine, agriculture are being managed satisfactorily causing minimum damage. *Mahinda Chintana* Policy Framework, *Haritha* (Green) Lanka Action Plan, BCAP, National Environmental Policy and other sectoral policies, **legislation, strategies and programs together will contribute positively to improve the conservation of biodiversity in the country.**

2 The National Biodiversity Strategy and Action Plan, its implementation, and the mainstreaming of biodiversity

The overall national goal of biodiversity conservation, as stated in the Biodiversity Conservation Action Plan (BCAP), is to 'conserve the biological diversity of Sri Lanka, while fostering its sustainable use for the benefit of the present and future generations'.

2.1 The Biodiversity Targets Set by Sri Lanka

The formulation of 'Biodiversity Conservation Action Plan' (BCAP), which was undertaken in response to Article 6 of the Convention of Biological Diversity (CBD) in early 1996, was finalized in 1997. It was followed by the preparation of an 'Addendum' to the BCAP in 2003. The BCAP which was approved by the cabinet of ministers in 1998 was published in 1999. Sri Lanka is yet to develop measurable targets to update the BCAP to incorporate national targets in line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020. Therefore, two documents, BCAP and Addendum to the BCAP serve as the key strategic action plans as of today showing the pathways to achieve the key objectives governing biodiversity conservation in Sri Lanka.

The BCAP sets out the range of activities needed for addressing biodiversity conservation as a coordinated, holistic exercise, and urges that it is of critical importance for the ecological and economic sustenance of the nation, and brings together all activity areas that need to be addressed within a single framework, all activity areas that need to be addressed. In the BCAP, the ecosystem diversity of Sri Lanka was categorized into four broad thematic areas: (1) Forests; (2) Wetlands; (3) Coastal and Marine systems, and (4) Agricultural systems. Thereafter, several specific objectives and a number of recommended actions were included under each thematic area Table 1).

Table 1: Specific objectives and recommended actions listed under BCAP thematic area

Objectives & Actions	Thematic Areas				Total
	Forest	Wetlands	Coastal / Marine	Agricultural Systems	
Specific Objectives	7	3	5	3	18
Recommended Actions	24	16	28	6	74

In addition to the 4 thematic areas, the BCAP identified specified objectives, recommended actions, and main implementing institutions for eight Cross-Cutting areas. These are: (1) Priority actions for selected bioregions, (2) Ex-situ conservation, (3) Research, (4) Education and awareness, (5) Biodiversity information, (6) Legal measures, (7) Institutional support, and (8) Valuation of biodiversity.

The BCAP comprised of 74 Recommended Actions to achieve 18 specific objectives listed under 4 thematic areas (Table1) and another 73 recommended actions to achieve 22 specific objectives listed under 7 cross-cutting areas.

There has not been a systematic approach to upgrade the BCAP by including measurable national targets developed in line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020.

2.2 Updating the National Biodiversity Strategy and Action Plan to Incorporate Targets and to Serve as an Effective Instrument for Mainstreaming Biodiversity

The Addendum' to the BCAP was prepared with the objective of updating the BCAP to serve as an effective instrument. After following a lengthy process for preparation of the Addendum, 31 recommendations were made as final which fall into a "high priority category". However, there has not been a systematic mechanism in place to upgrade the BCAP by including measurable targets, especially to incorporate those Aichi Biodiversity targets to NBSAP.

2.3 Actions Taken to Implement the Convention since Submission of the Fourth National Report and their Outcomes

The key actions taken since Fourth National Report, major outcomes achieved and obstacles encountered through implementation of 74 recommended actions of BCAP (Table 1), under the thematic areas of Forests, Wetlands, Coastal and Marine systems, and Agricultural systems and 31 priority recommendations of the Addendum are provided in this report (Tables 2.4, 2.5, 2.6, 2.7 and 2.8).

2.4 Effectiveness of Mainstreaming Biodiversity into Relevant Sectoral and Cross Sectoral Strategies, Plans and Programs

Sri Lanka is committed to contributing towards achieving the objectives of the CBD, BCAP including its Addendum. In recent times, the major positive steps have been taken to mainstream biodiversity conservation in to relevant sectoral and cross sectoral plans, strategies and programs. These include development of relevant policy frameworks, legislations, strategies and action plans that drive the country in achieving the targets of conservation of biodiversity is being fulfilled.

Overall, there are more than 30 state institutions and 15 laws directly involved in conservation and sustainable use of biological diversity in Sri Lanka (Table 2.9). The strategy for conservation and sustainable utilization of biodiversity evolved from various initiatives framed and formulated largely by the Ministry of Environment and Renewal Energy (MoERE), focal point for biodiversity conservation in Sri Lanka and complemented by other related Ministries/Departments and affiliated agencies dealing with Forestry, Wildlife, Environment, Agriculture, Export Agriculture, Fisheries & Aquatic Resources, Botanic and Zoological Gardens etc.

As national level capacity building is a primary requirement for mainstreaming biodiversity into relevant sectoral and cross sectoral plans and programs, large number of projects and programmes have been implemented for this purpose after ratifying the CBD. Another key area in this regard is mobilizing stakeholders at multiple levels in support of biodiversity conservation. Over the years, this has been done through public awareness and extension programs.

2.5 Progress of implementation of the National Biodiversity Strategy and Action Plan

In general, the level of implementation of recommended actions of BCAP shows satisfactory (including partially achieved) results in thematic areas of Forests and Coastal and Marine systems. This achievement is over 70%. However, the level of implementation of recommended actions in Wetlands and Agricultural systems show less than 40% success (Figure 2.5). According to the results of the analysis carried out by the Technical Working Group, the progress of implementation of 31 priority recommendations in the Addendum shows satisfactorily results only in 19.4% of the recommended actions (Figure 2.6).

3. Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals (MDGs)

3.1 Progress towards achieving the 2020 Aichi Biodiversity Targets

This section analyses the progress made towards each of the 2020 targets of the Strategic Plan for Biodiversity 2011-2020 by using the information from part I and part II of this report. The Aichi Biodiversity targets cross-cut all sectors of the national economy that affect ecology and human well- being. The policies, programmes and projects of different ministries/Departments which are directly or indirectly related to biodiversity conservation are vital for achieving progress towards Aichi Biodiversity targets. Although there is no updated common action plan for biodiversity conservation, many actions have been achieved or are ongoing in different sectors which are in line with Aichi Biodiversity targets.

An analysis of the progress presented in this report is based on the stakeholder discussions held in the Technical Working Group workshops. A summary of the progress on Strategic Plan 2010-2020 and Aichi Biodiversity Targets is presented in Table 3.1 of this report. The table presented below (Table 2) is a summary of the progress of achieving Aichi Biodiversity Targets based on Strategic Goals.

Table 2: The Progress of Achieving Aichi Biodiversity Targets

Strategic Goal	Improving		Little or no overall change		Deteriorating		Insufficient or no comparable data	
	T	%	T	%	T	%	T	%
A	4	100	-	-	-	-	-	-
B	6	100	-	-	-	-	-	-
C	3	100	-	-	-	-	-	-
D	2	67	1	33	-	-	-	-
E	4	100	-	-	-	-	-	-
Total	19	93.4	1	6.6	-	-	-	-

T – Number of Aichi Targets; % - Percentage of Achievement

Based on above analysis, Strategic Goals A *(Address the underline causes of biodiversity loss by mainstreaming biodiversity across government and society)*, B *(Reduce the direct pressures on biodiversity and promote sustainable use)*, C *(Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity)* and E *(Enhance implementation through participatory planning, knowledge management and capacity building)* show relatively the best progress by achieving all the targets (100%) in the "improving" ranking. Similarly, Strategic Goals D *(Enhance the benefits to all from biodiversity and ecosystem services)* shows the next performance by achieving only 02 targets (67%) in the

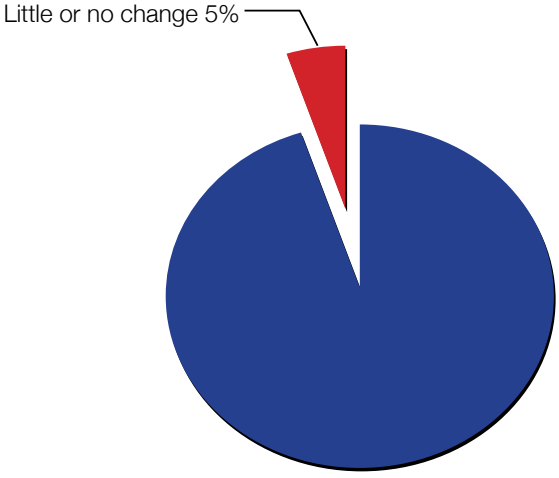

Figure 4: Progress of Achieving of Aichi Biodiversity Targets

"improving" category, and the other target does not show a significant improvement. However, none of the actions related to Aichi target are deteriorating. Overall, out of 20 actions related to Aichi Biodiversity Targets, 19 are improving (93.4%) and little or no overall change in 01 target (6.6%). Therefore, it can be stated that the achievement of Aichi Biodiversity Targets shows a good progress (Figure 4).

3.2 Achievement of the relevant 2015 Targets of the Millennium Development Goals (MDGs)

"Mahinda Chinthana, Vision for a new Sri Lanka" has provided high priority for achieving MDGs and shown its determination to meet the set targets within the stipulated time frame. Among the eight Goals of MDGs, the most relevant goal for biodiversity is Goal 7 which focuses on ensuring environmental sustainability. However, attempts are being made to mainstream biodiversity into not only for the 7th MDG, but also across other MDGs, as achieving the targets of the MDGs will directly or indirectly impinge on the status and use of biodiversity.

The Department of Census and Statistics (DCS) as the authority on official statistics in Sri Lanka published a mid-term review in 2010 in which MDG indicators for Sri Lanka have been identified. With regard to Goal 7, it has identified eight indicators to be measured for the purpose of achieving environmental sustainability. Table 3.2 of this report indicates the assessment of progress in relation to the 4 targets and 8 indicators listed under Goal 7.

3.3 Lessons learned from the implementation of CBD in Sri Lanka

There are several areas in need for improvements and effectiveness. The lessons learnt from the implementation of the Convention should form a very important part of the process of formulating the new NBSAP. This report presents seven (07) key lessons learned and issues to be addressed in the formulation of the next NBSAP.

Some of the key recommendations provide timelines for implementation of biodiversity targets and actions; capacity improvement; details on the necessary resources to implement biodiversity conservation policies; legislation; and programmes; to improve coordination among key implementing institutions; improve cross sectoral integration of biodiversity concerns into the plans, policies and programmes of development sectors; formulate an effective mechanism for the collection, analysis and sharing of biodiversity information; enhance the research capacity in the field of biodiversity; integrate biodiversity values and ecosystems services into development planning and resource allocation; introduce cohesive and comprehensive monitoring mechanisms for biodiversity monitoring.

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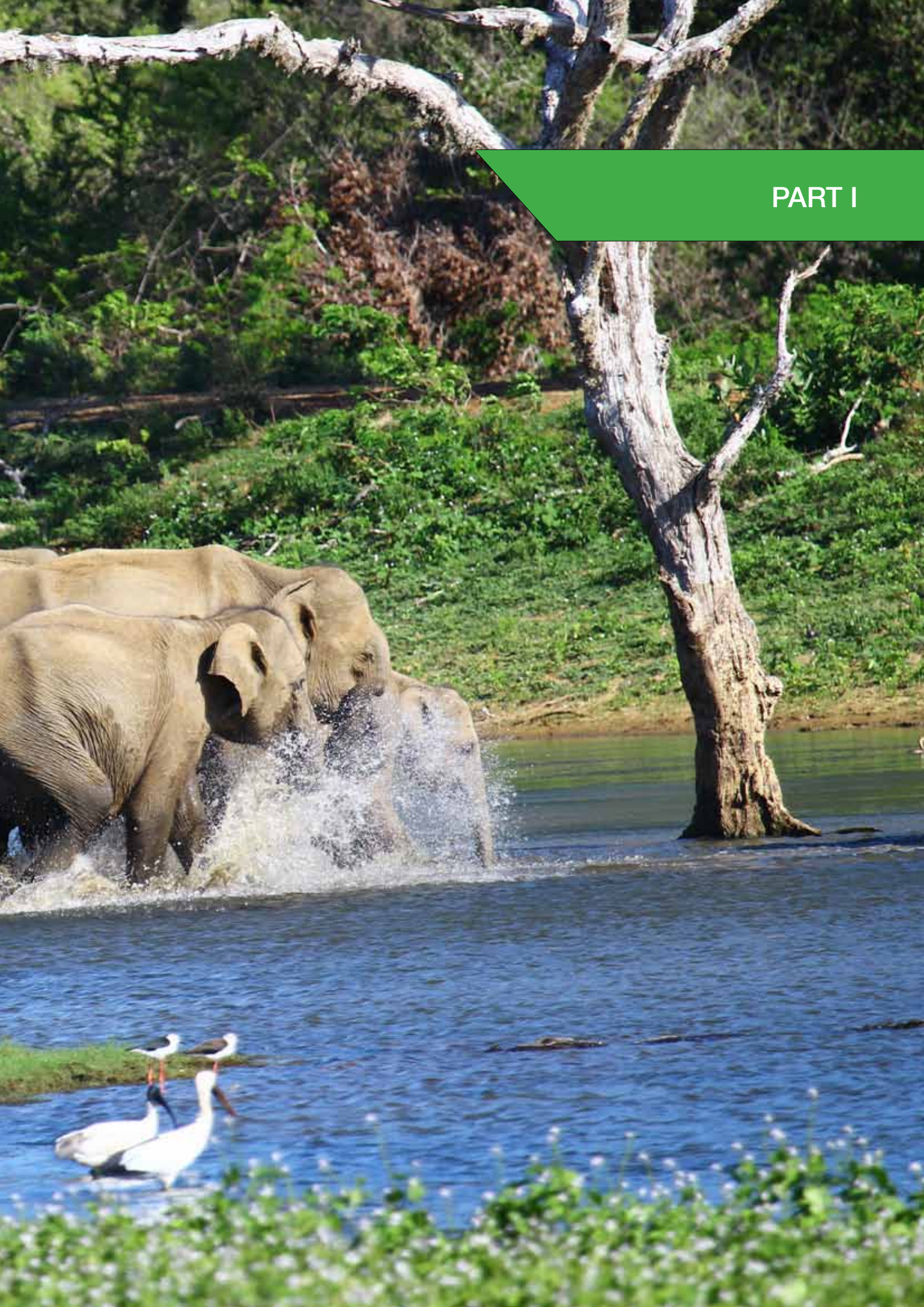

PART I

An update on biodiversity status, trends, and threats and implications for human well-being

1.1 INTRODUCTION

1.1.1 Sri Lanka's exceptional biodiversity: ecosystems, species and genes

Sri Lanka's rich and distinctive biological diversity[7] is defined by the ecosystems, species and genes that occur in the island's diverse array of forests, wetlands, and coastal and marine and agricultural systems, within a mere 6,524,540 ha[8] land area. Despite this small size, Sri Lanka is considered to be the richest per unit land area among countries of the Asian region with regard to average number of mammal, reptile, amphibian, fish and flowering plant species per 10,000 km2, and is second only to Malaysia with regard to the density of bird species (NARESA 1991). Likewise, among Asian countries, Sri Lanka is second only to Taiwan in terms of the number of pteridophyte species per 10,000 km2 (Ranil et al., 2012). The remarkably high percentage of endemic and relict species among the fauna and flora of Sri Lanka represent unique complements of the earth's biodiversity, and is of global significance. The biota in wet zone forests of the country is of particular importance in this regard as shown by the recognition of several wet zone forests as World Heritage Sites and Man and Biosphere Reserves. International recognition of the importance of the island's biodiversity, and the considerable threats it faces, have placed Sri Lanka (together with the Western Ghats of India) among the 34 biodiversity hotspots in the world (Myers, et al, 2000). Further, the ever-wet southwest Sri Lanka, with an exceptional number of endemics among the fauna and flora, of which most are considered threatened with extinction (BDS/MoE & DNBG, 2012), is termed a "hot spot within a hot spot" (Pethiyagoda, 2005).

At the national level, the island's biodiversity provides vital supporting, regulating, provisioning, and cultural ecosystem services to promote human wellbeing. It is the source of freshwater for domestic and industrial uses and energy production. Ecosystems and species provide socio-economically vital resources for: timber, agriculture and livestock production; fishery; tourism; the practice of traditional medicine; important manufacturing industries and external trade. Components of biodiversity help continuation of cultural beliefs and practices and the conduct of religious activities that shape the country's national identify. Sri Lanka's biodiversity also has potential meet future global needs for food and improving human health and well-being. Sri Lanka's

7 Biological diversity, or biodiversity as it is commonly known, "includes all plants, animals, microorganisms, the ecosystems of which they are a part, and the diversity within species, between species, and of ecosystems."

8 The land area of Sri Lanka is taken as 6,524,540 ha in this report to coincide with the land area used for mapping of forest cover in 2010.

forests are considered important for mitigating the impacts of global climate change as recognized by the REDD+ programme now in operation in the country. A positive aspect is that the need for conserving Sri Lanka's biodiversity and ecosystems is recognized in national planning, and is reflected in the Mahinda Chintana--the framework for national development (DoNP & MoFP, 2010), the Action Plan for the Haritha (Green) Lanka Programme (NCSD & PS, 2009), and the National Physical Planning Policy and Plan (NPPD & MUDSAD (2006)..Despite this trend, and the many national efforts for biodiversity conservation, the island's biodiversity continues to be lost. Since the last reporting period, alien invasive species and climate change have become more pronounced. Some aspects of biodiversity loss are already being felt. This is of concern, as biodiversity loss can have considerable and wide ranging socio-economic and ecological implications on the country with inevitable negative impacts on national food security, rural livelihoods, human nutrition & health, and overall economic development: particularly in the fields of tourism and external trade.

1.1.2 What this report contains

The background data on the island's geo-evolutionary past, and the factors that influence the island's rich and unique biodiversity (i.e. location in the Indian Ocean; marked variations in climate, altitude and soils within the country, and a rich cultural and agricultural heritage shaped by centuries of farming) were provided in detail in the Fourth National Report. Similarly, descriptions of the different types of ecosystems (forests, grasslands, wetlands, coastal and marine systems and agricultural systems) and the characteristic species they contain were also provided in it. Hence this report concentrates on providing: (a) updates on ecosystems and species since the last report; (b) the current importance of species, forests, wetlands, coastal and marine systems and agricultural systems in terms of ecosystem services and optional biodiversity value; (c) threats the island's biodiversity faces; (d) major changes that have taken place in the status and trends of biodiversity in Sri Lanka since the Fourth National Report, (e) the impacts and implications of such changes nationally, and (f) future changes in the island's biodiversity that are most likely.

1.2 National and global importance of Sri Lanka's biodiversity

1.2.1 Insight into the earth's evolutionary past

There is evidence of Sri Lanka's long association with the Indian subcontinent among many groups of fauna, such as the island's molluscs, dragonflies, reptiles and mammals despite high levels of endemism in these groups (GoSL, 2008). For example, *Semnopethicus vetulus* (the purple-faced langur) *Macaca sinica* (the toque macaque) and Paradoxurus aereus (Golden Palm Civet) are

endemic to Sri Lanka, but show close affinities to sister taxa in India (Groves and Meijaard, 2005). Likewise, Angiosperms show close affinities with India at the Family level, though about 96 genera are non-peninsular (Abeywickrema, 1956).

Even so, Sri Lanka which now occurs within the Indo-Malayan Realm,[9] has many native species that show close affinities with other more distant Realms such as the Palearctic, the Australian and the Afro-tropical due to its past association with various land masses during the earth's geo-evolutionary history (GOSL, 2008). For example, 58 species from the family Dipterocarpaceae (which is pan-tropic), the genera ***Hortonia*** (Family Monimiaceae), and ***Schumacharia*** (Family Dilleniaceae) are examples of angiosperm genera with Gondwanic origins (GOSL, 2008). Three members of the Family Ericaceae are of Himalayan lineage and considered to be of Lauracean origin (ibid). Likewise, the rare occurrence of genera such as ***Cinnamomum, Litsea, Michelia, Symplocos,*** and ***Celtis*** are thought to suggest Lauracean relationships (Jayasuriya, et al, 1993).

Semnopithecus vetulus the endemic purple faced langur

© Wildlife Conservation Society, Galle

Among the fauna, about 90% of the bee genera in Sri Lanka show close affinities with those of the Afro-tropical (Ethiopian) Region, 18 genera are shared with the Palaearctic Region, 18 are shared with the Australian Region, while only one genera shares affinities with bees of the Indo-Malayan Region (Karunaratne and Edirisinghe, 2006). Sri Lanka's land snail fauna which is distinctively South Asian in composition also have several Gondwana relict taxa (Naggs and Raheem, 2000). Hence Sri Lanka's biodiversity is of global significance in understanding the changes that have taken place in the earth's geo-evolutionary past.

1.2.2 Exceptional diversity, endemism and relict species

Sri Lanka's exceptional biodiversity is possible due to the high ecosystem diversity it supports on land and in the coastal seas (Table 1.1), and the wealth of plant and animal species they harbour (Tables 1.2 and 1.3). This includes many species that are yet to be discovered. Of note is the remarkably high percentage of endemic and geographically relict species that are found in the island's forests and wetlands.

9 Zoogeographic terms follow Udvardy, 1975.

Table 1.1: Ecosystem diversity in Sri Lanka: status and trends

Ecosystems	Previous data (ha)	Present (ha)
Forest and related ecosystems	***(1999 data, FD)***	***(2010 survey, FD)†***
▫ tropical wet lowland evergreen forest (includes lowland and mid elevation rain forests)	124,340.8	123,302
▫ tropical sub-montane forest	65,792.3	28,513
▫ tropical montane forest	3,099.5	44,758
▫ tropical moist monsoon forest	221,977.0	117,885
▫ tropical dry monsoon (mixed evergreen) forest†	1,027,544.1	1,121,392
▫ tropical thorn forest (A	NA	NA
▫ riverine dry forest	18,352.1	2,425
▫ grasslands (wet pathana, dry pathana, savannah, etc)	>75,000	68,043 (savannah only)
Inland wetland ecosystems	(4th NR	NA
▫ flood plains	NA	NA
▫ lentic waters (tanks/reservoirs and ponds)	179,790	*169,941
▫ swamps	NA	NA
▫ wet villu grasslands	NA	*12,500
▫ Overall water bodies	NA	‡ 488,181
Coastal and marine ecosystems	(4th NR)	
▫ mangroves	6,080	†15,669
▫ salt marshes	23,800	NA
▫ sand dunes and beaches	19,394	NA
▫ mud flats	9,754	NA
▫ sea grass beds	NA	NA
▫ lagoons and estuaries	158,017	NA
▫ coral reefs	NA	68,000
Agricultural ecosystems	(4th NR)	
▫ paddy lands	525,000	ˣ845,444.00
▫ fruit cultivations	97,000	‡135,567
▫ small crop holdings or other field crops (pulses, sesame etc)	128,000	‡146,544.69
▫ vegetable cultivations *(excluding root and tuber crops for 2012)*	110,000	‡89,980
▫ crop plantations (major export crops)	772,000	‡703682.8
▫ minor export crops	NA	††106,232
▫ home gardens (cultivated, includes fruit cultivations in home gardens)	367,800	‡1,684,165.60
▫ chena lands (slash and burn cultivation)	NA	‡227,710.28

Source: The data for this table are from the following sources except where specifically mentioned:

*Forest Department 2010 survey data; ‡ AgStats, 2013; ˣ paddy land extent is Asweddumized land area from the DOA for 2012/13; †† Data from Department of Export Agriculture, 2014; *IUCN and CEA, 2006; *MOE, 2010, **MoENR, 2003.*

Note: The discrepancies between areas given for montane and sub-montane forests in the 1999 and 2010 forest assessments are reportedly due to differences in criteria for separation of these forest types. Accordingly, the area under both montane and sub-montane forests has changed from 68,892 ha in 1999 to 73,271 ha in 2010.

The unique endemic and relict lyre-head lizard species *(Lyriocephalus scutatus)* from an endemic genus

While association with Peninsular India and its mega biodiversity for millions of years has resulted in a high species diversity in Sri Lanka (GoSL, 2008), the island's separation in the Miocene about 20 million years ago (Deraniyagala, 1992) has resulted in a remarkable endemism (Bossuyt et al., 2004). This is underscored by the fact that 28% of Sri Lanka's 3,154 species of indigenous angiosperm flora are endemic to the country, including 14 endemic genera distributed in 186 families (BDS/ MoE & DNBG, 2012). For example, all 58 species of Dipterocarps found in Sri Lanka are endemic (ibid). Similarly, the genus Syzygium (Myrtaceae) has 30 indigenous species, of which 25 are endemic, while 26 of the 33 species of Memecylon (Melastomataceae) are endemic (ibid). The lower plant groups are insufficiently identified, but a high biodiversity and endemism is revealed from past studies (GoSL, 2008). Among aquatic plants, the family Araceae harbors the highest number of endemics including 10 species of the genus *Cryptocoryne* and seven species of *Lagenandra* (Yakandawela, 2012).

Endemism is also high among the indigenous vertebrates (Table 1.2), which without the migrant birds, is about 42%. Highest endemism in vertebrates is seen among amphibians, freshwater fishes and reptiles (Table 1.2). Most invertebrate groups in the island have been incompletely surveyed, but a high diversity is documented among butterflies, dragonflies, bees, spiders and land snails (Table 1.2).

Table 1.2: Species diversity among selected groups of Sri Lanka's fauna and flora in terrestrial and freshwater habitats

Taxonomic group	Number of species		Number of endemic species and % endemism
	4th NR	Present	Present
Land snails	246	253	205 (81)
Dragonflies	120	118	47 (39.8)
Bees	148	130	NA
Ants	NA	194	33 (17)
Carabid beetles	525	NA	NA
Butterflies	243	245	26 (10.6)
Spiders	501	510	257 (51)
Freshwater crabs	51	51	50 (98)
Freshwater fish	82	91	50 (54.9)
Amphibians	106 +	111	95 (85.6)
Reptiles (terrestrial)	183	193	124 (58.8)
Birds (including migrants)	482 (220 residents)	453, with 240 residents	27 (11.3) definitive and 8 Proposed
Mammals	91	95	21 (22.1)
Angiosperms	3,771	3,154	894 (28.3)
Pteridophytes (Ferns only)	348	336	49 (14.6)
Mosses ‡	560	560	63+
Liverworts*	303	222	NA
Lichens*	661	661	NA

NA= data not available; All data are from BDS/MoE &DNBG (2012) except otherwise mentioned
Data source for present status: BDS/MoE &DNBG, 2012 except IUCN and MoENR, 2007 for mosses and MoENR 2006 for Liverworts and Lichens

The endemic Chirita walkari

The endemic jungle fowl
Galloperdix bicalcarata
© Ruchira Somaweera

Biodiversity is also high among marine species such as corals, echinoderms, molluscs and palargic fishes (Table 1.3). Fringing coral reefs with high biodiversity such as those in the southwest and eastern coasts of Sri Lanka and offshore reefs such as the Bar Reef are of high tourism value, while echinoderms such as sea cucumber, molluscs such as squid and cuttlefish, crustaceans such as lobster, crabs, prawns and shrimps, and a host of marine fishes are of major importance in the food fishery in terms of national nutrition and export value.

Table 1.3: Species diversity among selected groups of fauna in coastal and marine systems

Taxonomic group	Number of species		Source of present data
	4th NR Report	Present	
Hard coral species	183	208	Rajasuriya, 2012
Soft corals	NA	35	Krishnaraja, 2012
Echinoderms	213	NA	---
Echinoderms (Echinoidea)	NA	55	Jayakody, 2012
Echinoderms (Crinoidea, Ophuroidea and Holothuroidea)	NA	135	Fernando, 2012a
Marine mollusks	228	NA	---
Marine shelled bivalves and gastropods	NA	756	Fernando, 2012b
Marine crustaceans	NA	742	Weerakkody, 2012
Sharks	61	64	Dalpathadu, 2012
Skates and Rays	31	33	Dalpathadu, 2012
Marine reptiles	18*	18	---
Marine mammals	28	30	Weerakoon, 2012
Marine and brackish water bony fishes	NA	916	Dalpathadu, 2012

1.2.3 Ecosystems of global importance as World Heritage Sites, Ramsar sites and Biosphere reserves

The global recognition of Sri Lanka's unique biodiversity is demonstrated by the fact that in a land area less than 65,250 sq km., the country has four forests recognized as Natural World Heritage Sites (WHS) because of their exceptional biodiversity value due to high endemism, and four Biosphere Reserves (with Core Zones recognized as making significant contribution to national and global biodiversity) within the UNESCO World Network of Biosphere Reserves. Sri Lanka also has six Ramsar wetlands (namely: Bundala National Park, Annaiwilundawa Tanks Sanctuary, Maduganga, Vankalai Sanctuary, Kumana Wetland Cluster and the Wilpattu Ramsar Wetland Cluster)[10] indicating global importance of the island's wetlands. The Bundala Ramsar site harbours a large number of migrant waterbirds, and four marine turtle species come ashore to its beaches. Thus biodiversity loss in Sri Lanka will contribute significantly to the loss and degradation of the earth's ecosystem services that underlie human well-being in addition to the national impacts of biodiversity loss. Examples of the value of Sri Lanka's biodiversity at the national and global levels are given in BOXES 1.2 and 1.3.

10 http://www.ramsar.org/cda/en/ramsar-pubs-notes-annotated-ramsar-16173/main/ramsar/1-30-168%5E16173_4000_0

1.2.4 Role of biodiversity for provision of ecosystem services

A summary of ecosystem services rendered by forests, wetlands, coastal and marine systems and agricultural systems in Sri Lanka from assessments done during the 2013/14 Periodic Review of the Sinharaja, Kanneliya-Dediyagala-Nakiyadeniya, Hurulu and Bundala Biosphere Reserves (NSF, 2014 a,b,c,d), preparation of the 2012 Red List, and preparation of the National Directory of Wetlands (2006) are presented here, with inputs from expert workshops held for preparation of this report (BOX 1.1). In addition, the examples provided in BOXES 1.2 & 1.3 also demonstrate the many supporting, regulatory, provisioning and cultural services that are offered by various ecosystems in Sri Lanka. Furthermore, contribution of biodiversity and related ecosystem services to human well-being and socio-economic development are also highlighted in this section of the report.

BOX 1.1: Summary of ecosystem services offered by Sri Lanka's forests, wetlands, coastal and marine systems, and agricultural systems

Service Type ***Supporting services*** *(that help maintain the conditions for life on earth and habitats for species):*

- Forests, wetlands, coastal and marine systems provide habitat for Sri Lanka's many indigenous faunal and floral species, including a large number of migrants, marine mammals and five marine turtles. The biologically rich wet zone forests and their rivers and streams are especially important repositories of endemic, relict, rare and/or threatened fauna and flora.
- Grasslands and thorn scrub forests of the dry zone provide the main habitats for large charismatic species such as the elephant, deer, bear and leopard, which are major tourist attractions.
- Wet zone forests form important watersheds for almost all of the island's 103 major rivers which originate from the forests of the lowland wet zone and the central mountains. (See BOXES 1.2 and 1.3 which show how Sri Lanka's Biosphere Reserves and World Heritage Sites play a crucial role in this regard.).
- Cloud forests of the montane zone trap moisture through fog interception. Examples are forests of the Central Highlands World Heritage Site (BOX 1.2).
- Forests in the dry zone provide watersheds for 'reservoir tanks' that are important for irrigated agriculture and have a strong cultural dimension. Good examples are tanks associated with forests of the Kaudulla National Park and the Minneriya National Park. These tanks also provide habitats for aquatic birds and other wetland fauna and flora.
- Mycorhizae and plants that act as biofertilisers, provide nutrients to ecosystems and for tree growth.
- Forests, wetlands and traditional agricultural systems provide habitats for natural enemies of agricultural pests and plants that yield products for pest control ***(e.g. Dipterocarpus glandulosus resins),*** thus playing a vital role to increase agricultural production.
- Bees, butterflies and birds are important pollinators that promote agricultural production.
- Forests, wetlands, coastal and marine systems and agricultural lands (e.g. crop plantations such as coconut and rubber), and trees in home gardens and urban parks, facilitate nutrient cycling, primary production, seed dispersal, production of O2, and provision of habitats for crops and their wild relatives.
- Myriads of tiny phytoplankton in coastal ecosystems and coastal seas, absorb CO2, and release O2 into the atmosphere helping to make life, as we know, possible on earth.

Service Type ***Regulatory services*** *(i.e. benefits from regulation of ecosystem processes):*

- Forests, crop plantations (cocoa, coconut and rubber), trees in home gardens and urban parks, wetlands, coastal and marine systems and agricultural lands help air quality maintenance, climate and water regulation, and storm protection.
- Forests and wetlands are important for water retention in the soil, flood and soil erosion control, and water purification. Marshes ***(e.g. Bundala, Muthurajawela, Bellanwila-Attidiya)*** are particularly useful in absorbing pollutants and purifying ground water.
- Coral reefs, sand dunes and mangroves help control coastal erosion and provide storm protection, thus protecting coastal lands and saving millions of rupees spent for disaster mitigation. For example, the sand dunes of Bundala BR are believed to have acted as a barrier to preclude destruction of the area by the tsunami waves in December 2004. In contrast, coastal lands where the fringing coral reefs had been destroyed for the lime industry suffered badly. This connection is now understood by local people.
- Forests in the dry zone, riparian forests and mangroves in the coastal zone act as barricades for wind currents, and control the impact of storms that would damage adjacent residential areas and cropping lands.
- Sri Lanka's forests block large amounts of C in forest trees, and thereby contribute to mitigate global climate change (due to their C sink capacity). For example, the biomass availability in terms of timber (and carbon storage) in Sri Lanka's forests varies between forest types. The average allowable cut in productive biodiversity rich natural forests of the Wet Zone is around 40 cubic m/ha in a 30 year felling cycle whiles the less diverse Dry Zone forests in terms of tree species have an estimated volume increment of 0.45-0.5 cubic m /ha/annum (FAO and FD, 2009). As such, the carbon sequestration in Hurulu Biosphere Reserve in the dry zone is at the rate of 1 t C yr-1 ha-1, while carbon sequestration in the lowland tropical rainforest Kanneliya-Dediyagala-Nakiyadeniya Complex is at the rate of 2.9 t C yr-1 ha-1 (NSF, 2014 b & c). Coconut, rubber, and mangroves (as well as other perennial woody species) also help in C sequestration.
- Coastal ecosystems surrounding the island and coastal seas contain myriads of tiny phytoplankton which play a critical role in absorption of CO_2 to mitigate the effect of global warming and help maintain the O_2 in the atmosphere to make life possible on earth.

Service Type ***Provisioning services***

- Forests and wetlands provide water for human consumption and other domestic uses necessary for human well-being. Many rural communities continue to use water from forest streams-often piped privately to their homes, as well as irrigation tanks and canals. The most important forest product used by villagers near wet zone forests is water for domestic use.
- Forests and wetlands (e.g. waterfalls in forests and man-made large reservoirs) provide freshwater for hydro-electricity which is a major source of clean and cheap energy in the country. An example are the forests surrounding the Labugama-Kalatuwawa Reservoir that supplies piped water to a large segment of the population in the Western Province of Sri Lanka.
- Many wet zone forests are also the sites of micro- and mini-hydropower plants which provide electricity for people (see BOX 1.3). For examples, the KDN-forest complex supports 3 mini hydro-electric power projects, while the Gin Ganga and Nilwala Ganga irrigation projects (i.e. these rivers originate from the KDN) provide water for 3300 ha and 12,000 ha respectively (NSF, 2014b). The Sinharaja BR supports 5 mini-hydroelectricity plants in the TZ, while the SBR supports the upper watersheds of the Gin Ganga and the Kalu Ganga which provide piped water to a large segment of the country's population (NSF, 2014 a). *[note: proliferation of mini-hydropower plants also have some environmental impacts)*

- Forests and wetlands also provide water and electricity for many industries including the textile and garment industry that are main foreign exchange earners.
- Rivers, tanks and canals are used for transportation of goods and for recreational purposes.
- Rainfed agriculture is lucrative in the fertile lands near forests which help maintain the water balance in the soil in the adjacent lands by controlling run-off.
- Forests and wetlands provide a large number of natural resources such as mineral resources (e.g. sand, clay, gravel, limestone, metal quarrying and quartz). ***However, their removal should be sustainable with minimum damage to the environment.***
- Forests and wetlands are reservoirs of crop germplasm and wild relatives of crops. For example, the KDN Biosphere Reserve and the adjacent Sinharaja World Heritage Site and Biosphere Reserve contain germplasm of cardomum, wild pepper spp., several cinnamon species ***(Cinnamomum spp.)*** and wild banana ***(Musa acuminata)***.
- Forests, wetlands, coral reefs and mangrove ecosystems contain a large number of products for subsistence and commercial use, such as:
  - Ornamental plants (e.g. orchids, pitcher plants, aquatic ornamental plants such as ***Cryptocryne*** spp, ***Aponogeton*** sp. etc.) and animals such as the black ruby barb (***Pethia nigrofasciata***), cherry barb (***Puntius titteya***) and Bandula barb (***Pethia bandula***) with export value.
  - Food items (e.g. kitul products [jaggery, treacle, local beverages], carbohydrates [flour from Caryota urens (kitul), and beraliya (***Doona venulosa***) fruits, fruits of Goraka (***Garcinia*** sp.), wild relatives of cinnamon, cardamom and pepper; many species of yams, leafy vegetables and edible mushrooms; crustaceans and fish from lagoons, estuaries and coastal and marine systems and inland wetlands).
  - Medicinal plants and products for various minor ailments and osteopathic medication. Though most rural people rely more on western medication now, traditional medication still plays an important role in some rural areas such as the Hurulu Biosphere Reserve. Many rural traditional medicine practitioners continue to obtain raw material from adjacent forests, grasslands and wetland marshes (e.g. of medicinal plants from wetlands: Lunuwarana [***Crateva adansonii***] and ***Neeramulliya*** [***Hygrophila schulli***]).
  - Oils and resins for lighting (e.g. ***Dipterocarpus glandulosus*** resins).
  - Insect repellent plant products and plants.
  - Roof thatching for wattle and daub huts - although this use has declined greatly with development and socio-economic advancement of local people in rural areas near forests resulting in permanent housing.
  - Raw materials for traditional craft based industries. For example, Divi Kaduru (***Paginatha dichotoma*** - wood is used to produce traditional masks for sale and use in ritualistic cures, Pandanus leaves are used for mats, etc. However, some traditional craft based industries, such as the rattan and bamboo industry, have declined during the past decades due to diminution of the raw material within forests from over-exploitation in the past.
- Coastal and marine ecosystems such as coral reefs, sea grass beds and mangroves are vital to maintain the traditional as well as commercial fishery which provides fish and crustaceans for consumption. While enhancing the national economy, this supports local livelihood and nutrition to the nation as much of the protein requirements of the country are met with from fish.
- Lagoons are used for salt production which supplies the entire nation. (***These salterns are also home to many water-birds that have adapted to this environment. For example, the two lagoons in the Bundala National Park used for salt production provide habitats for many wetland bird species***).

- Traditional agricultural systems provide habitats for a range of traditional varieties and locally adapted land races of crops and wild relatives of crops with desirable genetic traits for crop enhancement. They are now being investigated for beneficial traits to be used when breeding improved high yielding varieties of rice, vegetables, fruits, spices, and other field crops.
- Traditional farming systems contain locally adapted livestock that are being used to breed locally adapted high yielding varieties.

Service Type Cultural services *(i.e. non-resource benefits obtained from ecosystems)*

- Forests, wetlands, coastal and marine systems provide a valuable base for tourism which has been identified by the government as a major foreign exchange earner in the future and for increasing livelihoods of local people in popular tourist areas. As yet the potential for ecotourism has not been followed-up fully (see next section). The potential for agro-tourism in traditional agricultural lands is now being explored. The aesthetic value of biodiversity is central to expand nature based tourism in the country.

The elephants at Minneriya National Park are a major tourist attraction

- Some stretches of coastal waters are used for adventure tourism, while tanks, artificial lakes and rivers and waterfalls are used for boating and recreation (e.g. Lake Gregory is used for sea plane landings, white-water rafting is popular at Kitulgala, and bird watching is popular in the Bundala wetlands).
- Local people have indigenous knowledge on the use of various Non-Timber Forest Products (NTFPS) from forests, wetlands and coastal and marine systems. This is part of the cultural heritage of the country.
- Some crop wild species are used for cultural purposes. For example wild Piper spp. (thippili, mala bulath and rata bulath) are sometimes cultivated by rural people for use in ceremonial functions.
- Forests such as the Peak Wilderness Protected Area (Part of the Central Highlands WHS) are of paramount religious importance-especially for Buddhists, and many forests in the country have Buddhist monasteries and hermitages that are regularly visited by a large number of people to provide alms.
- Many forests also harbour sites of archeological importance. Examples are: the grasslands of the Horton Plains National Park which contains prehistoric evidence of the earliest agriculture in South Asia, and the Bundala Biosphere Reserve may contain the oldest pre-historic human remains in Sri Lanka.
- Wetlands provide popular flowers (e.g. from Nelumbo nucifera or lotus, Nymphaea nouchali or water lily and Nymphaea pubescens or Egyptian lotus) for Buddhist religious ceremonies.
- The aesthetic value of biodiversity plays a key role in the pursuit of peace and tranquility that is required for religious retreats and meditation.

BOX 1.2: Case study: The Central Highlands World Heritage Site

The Central Highlands World Heritage site (CHWHS) consists of the Knuckles Conservation Forest (KCF), the Peak Wilderness Protected Area (PWPA) and the Horton Plains National Park (HPNP). The vegetation types in the CHWHS are varied. The HPNP consists of gently undulating wet pathana grasslands and patches of cloud forest. The KCF has wet montane grasslands, montane rainforest, and patches of very low stature montane forest with stunted trees ranging in height from "pygmy" to "elfin" forest. The PWPA contains the largest block of sub-montane and montane rainforest in Sri Lanka. Overall, these forests show exceptional endemism among the flora. The PWPA contains 555 woody plant species, of which about 50% are endemic. The KCF harbours 1033 species of flowering plants of which 160 are endemic. About 50% of the woody plant species at the HPNP are endemic.

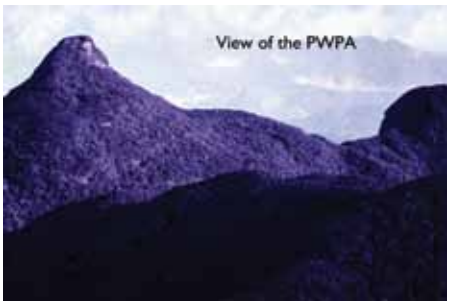

Photo: S Balasubramanium © UoP Department of Botany

These wet montane forests of the Sri Lanka's central highlands also contain unique faunal elements. Examples of relict endemic species in the CHWHS are Ceratophora tennentii (from an endemic genus) - confined to the higher elevations of the KCF - while close relatives are found in the central massif which contains the PWPA and HPNP, and in the Rakwana hills. The HPNP provides the main refuge for the characteristic and endemic bear monkey (Semnopithecus vetulus monticola) and the very rare Horton Plains slender loris (Loris tardigradus nycticeboides). The endemic Cerotopora stoddarti, Calotes nigrilabris and Cophotis ceylonica are 'mountaintop isolates' (Bahir and Surasinghe, 2005), for which the CHWHS provides critically important habitats. Overall, the three forests provide habitats for 48% of the country's endemic vertebrate species. They are also well known for point endemics found no where else. Examples are Stemenoporus affinis, an extremely rare species of dipterocarp, which is limited only to the KCF (Green and Jayasuriya, 1996); fish species such as Garra phillipsi, Dawkinsia srilankensis and Systomus martenstyni, amphibians such as Nannophrys marmorata from an endemic genus, and the skink Chalcidoceps thwaitesii from an endemic monotypic genus, are found only in the Knuckles forests.

The CHWHS is also of cultural importance. The PWPA is of religious and cultural significance to all major religious in the island, and contains a world famous Buddhist Shrine, containing the sacred foot print of Lord Buddha, which is visited by about two million pilgrims annually. The HPNP has valuable palaeo-ecological evidence of global importance as the site where first agriculture emerged in South Asia between 17,000-16,000 years BP. The HPNP and KCF are also currently popular tourist destinations as they offer prime scenic sites such as the famous Baker's Falls at HPNP, and spectacular landscapes in the KCF featuring several magnificent peaks.

Another very significant feature is that the PWPA covers the headwaters of the Kelani and Kalu Ganga (rivers), the Walawe Ganga arises from the HPNP, and the entire drainage system of the KCF belongs to the Mahaweli Ganga system. These forests thus serve the critical ecosystem function of protecting the headwaters of major rivers, controlling floods, controlling soil erosion and enabling fog interception.

Source: GoSL, 2008

BOX 1.3: Case study of the four UNESCO MAB Reserves in Sri Lanka

Sri Lanka has four Biosphere Reserves within the UNESCO World Network of Biosphere Reserves. They occur in three different climatic zones, so that the biodiversity within their Core Zones are representative of the lowland wet zone and sub-montane rainforests, dry mixed evergreen forests, and coastal/wetland/dry thorn forests.

The Sinharaja Forest occurs within a Biosphere Reserve and is a World Heritage Site. It is one of the last viable remnants of the mid-Miocene tropical rainforests of Sri Lanka (Dela, 2003). Its lowland and sub-montane rainforests contain exceptionally high levels of biodiversity and endemism. It is one of the richest forests for woody plant species in Sri Lanka, and the second richest for faunal species (IUCN/WCMC/FAO 1997). It supports about 359 species of vertebrates including 46 species of fish, 52 amphibians, 95 species of terrestrial reptiles, 125 birds, 41 species of mammals, at least 119 species of butterflies, and 331 species of Angiosperm flora of which over 50% are endemic (NSF, 2014a). Many Sinharaja species, particularly the flora, show affinities to the flora of Gondwanaland and the Deccan Plate comprising India and Sri Lanka (Ashton and Gunatilleke, 1987).

The Kanneliya-Dediyagala-Nakiyadeniya Biosphere Reserve complex is representative of the lowland rainforest biome within the biologically rich southwest of Sri Lanka. The three forests have 238, 188, 234 species of woody plants respectively (IUCN/WCMC/FAO 1997) of which 155 (65%), 124 (66%), and 132 (56%) are endemic. Likewise 60, 47 and 62 species of fauna are found respectively in these forests of which 25 (42%), 17 (36%) and 31(50%) are endemic (IUCN/WCMC/FAO, 1997). The Sinharaja and KDN BRs are part of eight units of contiguous forests in which at least 79% of the island's woody plant diversity are represented (IUCN/WCMC/FAO, 1997). The rainforests of the SBR and KDN are also of great value as watersheds for some major rivers, and are important sources of water for local people while supporting several min-hydropower plants that generate electricity.

The Hurulu Biosphere Reserve represents Tropical Dry Mixed Evergreen Forests characterized by evergreen, deciduous and semi deciduous tree species. The reserve also has open forests, grasslands, villu grasslands (i.e. seasonally flooded grasslands), riverine forests, scrublands and forest plantations. As this region is in the dry zone and receives rains mainly during October to February, agriculture depends on irrigation from waters stored and released from ancient tanks. Several irrigation tanks in the reserve provide habitats for birds, crocodiles and fish species, while the villu grasslands provide prime habitats for many large charismatic mammals such as elephants, deer, bear, sambur and leopard. Among the evergreen, deciduous and semi-deciduous species in the forest, there are valuable and rare timber species such as Chloroxylon swietenia (satinwood), and Diospyros ebenum (ebony).

The Bundala Biosphere Reserve and Ramsar site has very diverse vegetation types that show natural succession from low, creeping plants that colonize the beach and sand dunes to climax forest, referred to variously as Thorn, Dry Semi-Evergreen and Dry-Mixed Evergreen Forest in the least disturbed areas. In addition there are riverine forest, anomalous mesquite scrublands and six wetland types: salt marsh, mangrove, brackish water lagoons, sandy and rocky sea shore, seasonal water holes and tanks, and saltern (Bambaradeniya et al, 2001). Notably it has a 20 km stretch of beach where 4 species of marine turtles come ashore to nest. These diverse habitats contain 185 species of woody plants, 52 species of brackish-water and freshwater fish, 230 species of birds, and 31 species of mammals including the elephant. It is an extremely important habitat for migrant water-birds and is a premier bird watching site in Sri Lanka as it is located at the southern tip of the flyway from Northern Europe, Russia and China (NSF, 2014d).

All four biosphere reserves are popular tourist destinations due mainly to their natural values and are potential premier ecotourism sites. The BBR also contains a number of extremely valuable pre-historic archaeological sites.

Source: NSF a, b, c, & d (2014)

1.2.4.1 Examples of economically important ecosystem services:

□ Contribution to the tourism sector

Tourism has grown steadily since the cessation of the war in 2009. Sri Lanka reached a record 1,005,605 tourists in 2012, with foreign exchange earnings from tourism increasing substantially from US$ 838.9 million in 2011 to US$ 1038.3 million in 2012. As such tourism became the 5th largest foreign exchange earner in 2012 and contributed 5.2% to the total country foreign exchange earnings while generating employment (direct 67,862 and indirect 95,007) for 162,869 people (SLTDA, 2012).

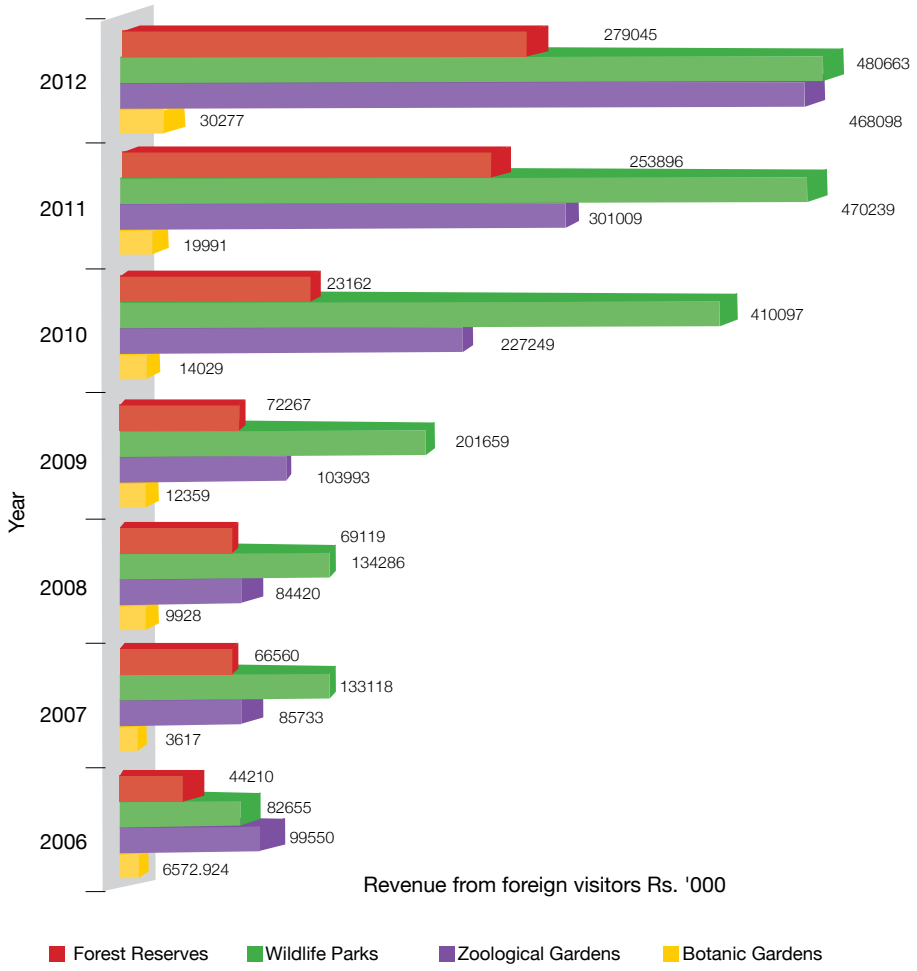

Figure 1.1 Revenue from foreign visitors to Forest Reserves, Wildlife Reserves, National Botanic Gardens and the National Zoological Gardens

(Source : FD unpublished data, 20140 and others SLTDA 2012)

Wildlife tourism has experienced a dramatic and rapid growth in recent years worldwide. Sri Lanka's exceptional biodiversity (**Tables 1.2 and 1.3**) in forests, wetlands and coastal and marine areas and a number of globally important natural sites such as four Biosphere Reserves, two natural World Heritage Sites and six Ramsar sites offer significant attractions to foreign nature tourists. Notably, 74% of tourists visited Sri Lanka for pleasure in 2012 (SLTDA, 2012), of which more than 24% had visited one or more of the 18 National Parks in Sri Lanka or the Elephant Transit Home at Udawalawe operated by the Department of Wildlife Conservation (ibid). **Figure 1.1** shows the increasing foreign visitor revenue from nature related tourism in the country between 2006 and 2012. This indicates the potential for biodiversity centred eco-tourism in the country to help reach the *Mahinda Chintana* target of 2.5 million high spending tourists by 2016 (DoNP and MoF&P, 2010).

Contribution to the agriculture sector

Sri Lanka's traditional farming systems have developed over hundreds of years due to farmers managing production systems to suit local conditions. The 46 agro-ecological regions that are identified in Sri Lanka, based on variations in soil, annual rainfall and altitude (SDoSL, 2007), support a wide range of crops and their wild relatives in a multitude of agricultural systems ranging from traditional rice fields to crop plantations (**Table 1.1**). Sri Lanka has a high diversity of traditional varieties of rice, vegetables and cash crops that are clearly resistant to diseases and insect pests, and are well suited for varied conditions of soil and climate in the island. Sri Lanka also has many wild relatives of rice and other crops in farmer's holdings, forests and wetlands amounting to 410 species (Fonseka and Fonseka, 2010). Of these 289 species are indigenous and 77 are endemic to the island (ibid). This provides a diverse gene pool that can be used in crop breeding programmes to enhance crop production and food security for the nation. A high crop genetic diversity is especially useful to adapt to climate change that is even now being felt in the agricultural sector. Some important examples of the use of biodiversity in the agricultural sector are given below.

– Rice, fruit and vegetable production:

Sri Lanka has now reached self sufficiency in terms of rice production, which is the staple food of the people of Sri Lanka, thus saving considerable foreign exchange for rice imports. This has been made possible partly by the use and popularization of New Improved Varieties (NIV) bred with high yielding properties. However, they lack many of the desirable traits of low yielding traditional rice varieties that are better in taste, nutrition and resilience to pests and disease (BOX 1.4). Characterization of wild rice by the Department of Agriculture (DoA) has also revealed beneficial characters that can be used in future rice breeding efforts. Beneficial traits of traditional rice varieties are already used by the Rice Research and Development Institute (RRDI) to develop new varietal lines, such as LD 183 which is expected to be resistant to drought, and LD 183-187 which is resistant to high salinity; some NIVs such as At 353 and At 354 also have been bred to have high salinity tolerance and BW 361, 363 and 364 are resistant to iron toxicity.[11]

BOX 1.4: Importance of traditional and wild varieties for rice breeding

Currently Sri Lanka has a large number of traditional varieties of rice, and five species of wild rice with characteristics that are important for varietal improvement. For example, *Oryza nivara, Podiwee, Murungakayan* and *O. eichingeri* are resistant to blast; *Dahanala* and *Kalubalawee* are resistant to thrips; *Rathuheeneti, O. eichingeri, Suduhanditan, Balamawee, Sudurusamba, Mawee* and *Hondarawalu* are resistant to the brown plant hopper (BHP); O. granulata is resistant to drought, and O. rufipogon shows high salinity tolerance.

Sources: Data from the PGRC, 2010 and 2014

Similarly research is done at the Horticultural Research and Development Institute (HORDI) of the DoA to infuse desirable traits from traditional varieties of vegetables and fruit into the breeding stock. This is important because Sri Lanka produced around 783,564 MT of fruit in 2012, while fresh fruit exports amounted to about US$ 8806 (DoA, 2013).[12] There is also a concerted move by the DoA to encourage organic home garden vegetable cultivation using traditional varieties that do not require chemical fertilizer or pesticides. An example is the distribution of the "Saba Sri Lanka rasaya" seed pack consisting of traditional vegetable varieties.[13]

11 Amitha Benthota, Rice Research institute Batalagoda, Department of Agriculture, pers com, 2010.
12 Equivalent to Rs ('000) 1,109,803
13 Information Provided by HORDI in 2014.

– Major and minor export agriculture:

Sri Lanka is fortunate to have variety of Minor Export Agricultural crops by way of beverage crops (coffee, vanilla, cocoa), spices (cinnamon, pepper, cloves and clove stems, cardamom, nutmeg and mace), stimulants (betel leaves and arecanut) and essential oils of spices (oils from cinnamon leaf and bark, oils from clove, pepper, cardamom, citronella, nutmeg, lemongrass, mace and vanilla), ginger, ginger oil, and turmeric that are increasingly assuming importance in terms of export earnings.[14]

BOX 1.5: Economic use of genetic diversity among Cinnamon and Piper species

Sri Lanka, with one indigenous species of cinnamon of commerce and seven endemic species of wild cinnamon, is the only supplier of oil from cinnamon leaf and bark. Various wild relatives of Cinnaman are being used to extract essential oils for industry. Among the wild species used are Cinnamomum dubium, C. capparu-coronde, C. rivulorum, C. sinharajense, C. citridorum and C. litseaefolium. Likewise Piper nigrum (black pepper) has high genetic diversity and 12 local selections are recommended for commercial cultivation (Seneviratne, et al, 2012). Also, 12 wild pepper species have been identified and characterized, of which 10 are conserved by the DoEA.

Source: Department of Export Agriculture, 2014

Over the years, there has been a remarkable increase in export earnings from minor export agricultural crops. For example, the value of Export Agricultural Crops has increased from Rs. 2,035.9 million in 1992 to Rs. 35,321.5 million in 2012 (DoEA data, 2014). This is partly due to the efforts of continual crop breeding programmes and varietal improvement by the Department of Export Agriculture (DoEA), using the genetic diversity of minor export crops that are available in the country (BOX 1.5). Some wild relatives of crops are conserved with a view for crop improvement by the Department of Export Agriculture.

Similarly, the principle export crops tea, rubber, coconut that contributed 1%, 0.3% and 0.9% to GDP in 2013[15] are subject to research and varietal improvement by the respective Tea, Rubber and Coconut Research Institutions and through selection by growers. This has resulted in considerable diversification of cash crops from the originally introduced germplasm to produce high-yielding varieties that are resistant to pests and disease and show resilience to adverse climatic conditions.

– Floriculture:

This industry has shown perceptible growth world-wide over the past decades and Sri Lanka expects to become one of the best centres for floriculture in the world. At present, the required technology has been developed nationally using both local and exotic species for varietal improvement and value addition. Floriculture shows immense potential as a foreign exchange earner for Sri Lanka in the future (Table 1.4), due to the wealth of flowering plants (3,145 species) that are available in different ecosystems in the country. For example, orchids are popular in the floriculture industry, and Sri Lanka has 189 species of indigenous orchids with 55 endemic species (Fernando, 2012) offering much potential for value addition. During the period 2009-2010, the National Botanic Gardens has propagated 63,152 orchid plants for display and sale.[16]

14 Information provided by the Department of Export Agriculture in 2014
15 http://www.statistics.gov.lk/national_accounts/Press%20Release/2013%20 ANNUAL.pdf
16 Data from the Department of Botanic Gardens provided in 2014

Table 1.4: Summary of floriculture exports for Sri Lanka by product category from 2009-2013

Product	Value of Floriculture Exports for Sri Lanka in USD $ Million				
	2009	2010	2011	2012	2013
Flowers	40	110	76	30	20
Leaves	510	540	791	505	767
Plants	590	570	753	505	629
TOTAL	1140	1220	1620	1040	1416

Source: Department of National Botanic Gardens, 2014

Some local orchids like ***Phaius wallichi*** (star orchid)***, Dendrobium maccarthiae*** (vesak orchid), ***Rhynchostylis retusa*** (foxtail orchid) and ***Vanda tessellata*** with showy flowers are already important in the floriculture industry (Fernando, 2012), while many others, including indigenous and endemic species such ***Exacum spp***. (binara), and ***Osbeckia octandra*** (heen bowitiya) are believed to have floriculture potential by breeding genetic mutations and through ploidy manipulation.[17]

Trends in consumption within the island for cut flowers and foliage plants have already shown a tremendous growth in the past years. Recognizing the potential for floriculture in generating employment and livelihood opportunities and hence for poverty reduction, the Department of National Botanic Gardens has commenced the 'Suwahas Mal' programme country-wide to develop the floriculture sector through empowerment of lower and middle level nurserymen/growers and to facilitate market linkages. There are also plans to establish 1,500 floriculture villages in the Western, North Western and Central Provinces of the country, which is expected to provide 30,000 jobs in rural and semi-urban areas.[18]

Vanda tessellata
very rare colour form

– The livestock sector:

The livestock sub-sector is increasingly gaining importance with its contribution to the GDP reaching 0.8% in 2012 (DAPH, 2012). Small scale dairy farming has also increased in importance as a means of providing financial stability to farmers, and for enhancing rural nutrition and social security to thousands of rural dwellers in the country (DAPH, 2012). Further, domestic biogass units associated with cattle or pig farming is a successful source of alternate energy for rural people. Sri Lanka has already reached self sufficiency in poultry products, and is trying to reach self sufficiency in milk products, due to the high cost of milk imports which reached Rs million 39,023 in 2012 (CB, 2013).

Although imported high yielding livestock breeds are being used to increase milk yield, the development of the livestock sub-sector is now based on cross-breeding cattle, goat, swine and poultry using local breeds of livestock and imported germplasm of high yielding breeds. The indigenous breeds in the country presently are: Lanka cattle (***batu harak***), white cattle, Lanka buffalo, indigenous goat, the locally produced crossbred ***Kottukachchiya*** goat, indigenous pigs, Jaffna local sheep, local chicken, and the locally cross-bred ***Karandagolla*** chicken. Notably, eggs of the latter breed are more resistant to salmonella poisoning than imported high yielding breeds that are highly susceptible. Local livestock breeds are more resistant to pests and disease than imported breeds, are well adapted to local conditions, and have low nutritional requirements. In comparison, imported breeds are more costly in terms of feed and maintenance (MoL&RCD and DAPH, 2010; DAPH, 2012 ;). Also imported breeds are prone to heat stress and have high water requirements (ibid), so that maintaining the biodiversity of indigenous livestock breeds in traditional

17 Discussions with HORDI/DoA, 22014
18 Data from the Department of Botanic Gardens provided in 2014

farming systems and backyard poultry can also help meet the challenges posed by climate change, through genetic improvement programmes of the Department of Animal Production and Health and the Veterinary Research Institute.[19]

Contribution to the fisheries sector

The food fishery sector contributed 1.8% to GDP in 2012 and 55%[20] to the total animal protein intake among the people of Sri Lanka in 2011 (MFARD, 2013). This sector also contributed 2.2% to Sri Lanka's export earnings in 2012 recording US$ 206 million foreign exchange from a growing export market. Fish production is targeted to reach 878,360 MT by 2016 to improve nutritional status and food security for the nation (MFARD, 2013).

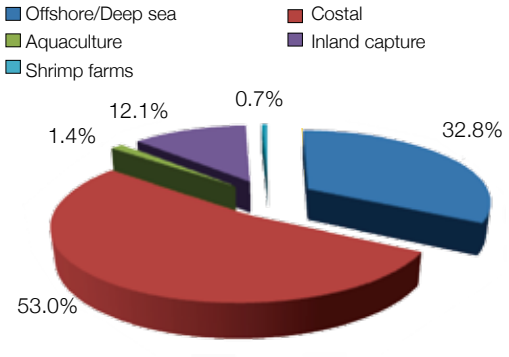

Figure 1.2 : Sri Lanka's fish production in 2012

Sri Lanka has about 1800 species of palargic fish (MoENR, 2002) enabling the harvest of a range of food fish in the marine fishery (Figure 1.3) including seer, carangids, several species of tuna, sharks, skates and mullet. In addition Sri Lanka has 25 species of sea cucumber of which 11 are predominant in the commercial fish catch and sold in the dried form as beche de mer which is exported to Singapore, Taiwan and China (Dassanayake, 2100). This is a particularly lucrative industry as its annual export value is about US$ 7481882.[21] In addition Sri Lanka has a rich diversity of molluscs including squid and cuttlefish that are caught in the fishery. The inland fish catch is dominated by about eight species, including the exotic and naturalized Tilapia, freshwater prawns and cultured shrimps.

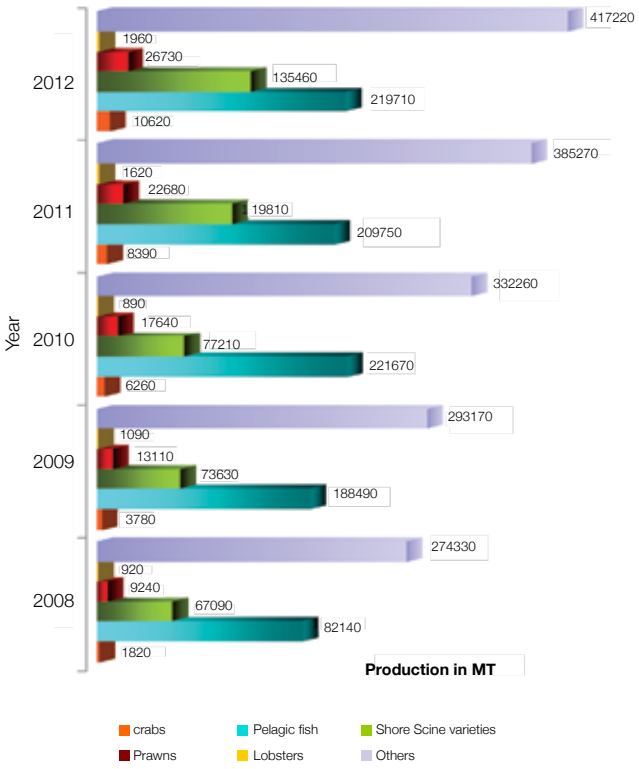

Figure 1.3: Sri Lanka's marine sector fish catch by major commercial groups 2008-2012

Source : MFARD, 2013

Sri Lanka also exports many species of marine and freshwater ornamental fish amounting to an export value of US$ 17540022. In addition sea horses, sea sponges, sea anemones, ornamental crabs and other marine products as well as freshwater aquatic plants are exported as part of the aquarium industry.[21]

19 Discussions with the DAPH and VRI, 2014

20 The Fishery Sector Development Strategy of MFARD states that the fisheries sector contributed 1.3% to the GDP in 2012 and 65-70% of animal protein to people in 2011 (unpublished information provided at the workshop to finalise this report).

21 Unpublished data and information from the Department of Customs for 01/05/2013-30/04/2014

The fishery sector not only earns valuable foreign exchange through the export of marine and aquaculture products, it also provides direct employment for over 262,530 active fishers, contributes 6.5% to the labour force, and fishing and related livelihoods sustain over 2.5 million people (MFARD, 2013). As such, the fishery sector has received much attention in the national development agenda with due recognition in the Mahinda Chintana 10 Year Horizon Development Framework (DoNP & MoFP, 2010) and the Action Plan for the Haritha Lanka Programme (NCSD & Presidential Secretariat, 2009).

However, the fishery industry in Sri Lanka is greatly dependent on biodiversity in coastal and marine systems (Figure 1.2), which is determined by the productivity of feeding and breeding grounds of fish and other species targeted in the food and ornamental fishery such as coral reefs, mangroves, and seagrass beds. The inland fishery is also dependant on pollution free inland waters of wetlands. Thus, reaching the desired fishery targets and sustaining it in the long-term will depend on sustainable fishery management which does not unduly deplete the resource or degrade the coastal and inland ecosystems that provide valuable habitats for resources harvested in the fishery industry.

Contribution to the Energy Sector

In 2012 the largest share of the total primary energy supply was met with by petroleum (45.3%), biomass (43.5%), major hydro-power (5.7%), coal (4.0%), and New Renewable Energy (1.6%) comprising mini-hydro (with individual total installed capacity limited to ≤10 MW), biomass, solar and wind powered plants. Much of the biomass for primary energy comprises fuelwood from forests, plantations and home gardens. The waters for major hydro-power generation depend on ecosystem services of wetlands and forests. Thus components of biodiversity play a major role in energy generation in the country.

The power sub-sector (within the energy sector), is critically important for national development and its expansion to provide electricity for all is a major objective of the government as articulated in the National Physical Planning Policy & Plan (NPPD & MUDSAD, 2006) as well as the Mahinda Chintana (DoNP & MoFP (--). As yet electricity has been provided to 85.3% of households in the country (CB, 2013), with 94% grid electrification at the end of 2012 (SLSEA, 2012). The power sub-sector is also critically important for the success of many industries including the textile and garment industry which earned Rs. 508.6 billion in 2012 for the country (CB, 2013).

At present hydro-electricity from 17 major power stations plays an important role in power generation. Sri Lanka's two major hydro-power complexes centre around the waters of the Kelani river (from five power stations of the Laxapana complex) and the Mahaweli river (from eight power stations of the Mahaweli complex). The efficiency of these systems are dependent on a good flow of clear clean water which needs the protection afforded to the head waters and tributaries of these rivers by forests of the central highlands (BOX 1.2).

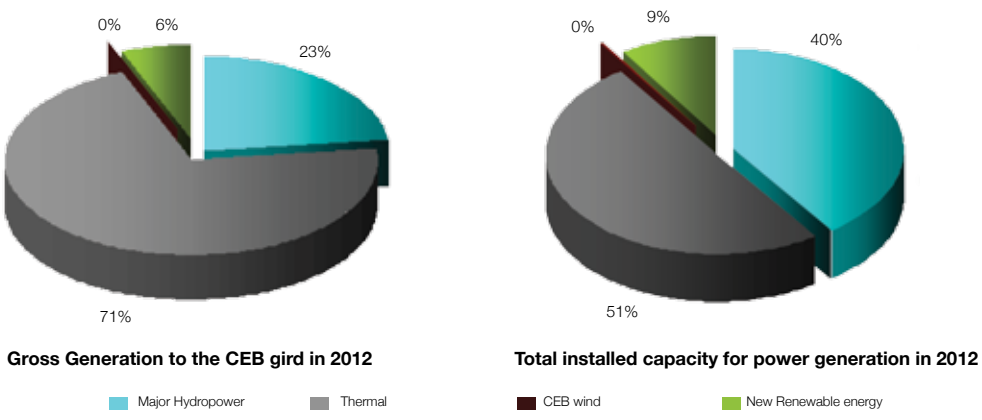

Figure 1.4: Percentage contribution of major hydropower to power generation and installed capacity

Source : SLSEA, 2012

Currently 17 major hydro-electricity plants have a total installed capacity of 1,357.4 MW and generate 2726.7 GWh of electricity. There are privately owned mini-hydro power plants or small power producing plants with a totaled installed capacity of 227.3 MW, adding 564.7 GWh of hydro-power (SLSEA, 2012). Most of these mini-hydropower plants are located in or near forests, and require a permit from the Forest Department after an EIA process.

In the past, Sri Lanka relied mainly on the economically feasible and environment friendly hydro-power for the requirements of the power sector until major-hydropower reached saturation level around 1996. Currently, the installed capacity of major-hydropower is 40% of installed power generation capacity, while thermal power producers comprise >50%. However, actual contribution from major hydro-power to gross power generation is only 23% (SLSEA, 2012). The shortfall is increasingly met by thermal power which now exceeds 70% of power generation (Figure 1.4). Maintaining the contribution from hydro-power at full capacity is thus important to limit the reliance on the more expensive and polluting coal-fired power. However, the major hydro-power reservoirs in the Luxapana and Mahaweli systems used for power generation are located in the montane and sub-montane wet zone where poor land use and soil erosion have led to heavy siltation of reserviours used for hydro-power generation, reducing their power generation capacity (MoENR, 2002). Further, mini-hydro-power plants which are now increasingly important to increase the share of hydro-power (SLSEA, 2012) are directly dependant on good quality forests and wetlands to maintain the required water flows.

Contribution to the water sector

Sri Lanka's range of natural inland wetlands comprise numerous rivers and streams, riverine floodplains/villus, small isolated freshwater bodies, freshwater springs, seasonal ponds, freshwater marshes (permanent and seasonal) and swamps.. In addition there are man-made wetlands such as tanks and reservoirs. They provide water for humans and inland animals alike.

Sri Lanka's inland waters are the only source of water for drinking and other domestic requirements, irrigated agriculture and industrial use for a population of over 20 million. Currently around 88.7% Sri Lanka's population has access to safe drinking water, as opposed to 84.8% in 2006/2007.[22] Even so, a large majority of the rural populations continue to rely heavily on sources of water such as unprotected wells, tanks and reservoirs, and water from forests for their drinking, culinary, washing, bathing and/or laundering purposes. In the dry and intermediate zones, the water collected in numerous tanks and reservoirs is vital for paddy cultivation and domestic use. Water is an important resource for industry - particularly in the textile industry which, together with the garment industry, is Sri Lanka's second foreign exchange earner (SLTDA, 2012). Thus forests which act as watersheds for rivers and reservoirs, together with other natural and manmade inland wetlands, play a pivotal role in providing surface water for the nation. For example, one of the most important uses of forests for rural populations near Wet Zone forests is the provision of domestic water (NSF, 2014 a and b).

Contribution to the health sector

Traditional medicinal systems in Sri Lanka such as *Ayurveda, Unani, Siddha* and *Desheeya chikitsa* use plants or plant products from over 1,400 species of medicinal plants, out of which *Ayurveda* uses about 387 plant species and Unani uses 234 (Department of Ayurveda, 1979). About 50 species are heavily used in preparation of drugs (Sugathadasa et al., 2008). Of all plant species used in Sri Lanka for medicine, about 15% have common and widespread uses in traditional healthcare systems (De Silva, 1998). Although access to hospitals with western medication has reduced the reliance on traditional medication even among rural populations, most communities living around medicinal plant rich

BOX 1.6: Practice of Ayurveda in Sri Lanka

The indigenous system of medicine termed Ayurveda is currently practised by a large number of licensed private practitioners for their livelihood, and some of them have a degree from an Ayurveda University. This number, registered with the Department of Ayurveda has grown to 20,441, among which 1,968 are degree holders, 5,005 are diploma holders and 5,296 are practitioners through generational experience. A further 8,172 are specialized in some form of traditional medication such as snake bites, fractures, dislocations, eye diseases, etc.

Source: Department of Ayurveda, 2014

22 The 2012/2013 Household Income and Expenditure Survey by the Central Bank of Sri Lanka

areas throughout the country make use of more than 620 plant species through the oral tradition (Sugathadasa and Jeewandara, 2012).

One area of indigenous medical practice which continues to be very popular in recent years is traditional orthopedics. A large number of such practitioners still operate around places such as Ritigala, where the necessary herbal material is still available in forests. Traditional medicine is also proving to be popular with foreign tourists and a few hotels are committed entirely to provide ayurvedic health care, indicating potential for expansion of Medical Tourism in the future.

Apart from the advanced system of Ayurvedic health care dispended by traditional village physicians, rural communities also practise a parallel curative system based on supernatural beliefs and superstitions. These cures include traditional exorcising ceremonies and rituals to appease demons, gods and lesser spirits. There are also simple village practices to ward off the "evil eye" and "evil mouth" that are attributed to be the cause of many ailments. Charms (mantara) and simple curative practices (kem) are also popular among village people to ward off various illnesses, and to protect crops and livestock from pests and disease.[23] Many of these practices require plant material from forests and home gardens.

Potential for bio-prospecting, natural product development and bio-mimicry

Due to exceptional species diversity with remarkable endemism in Sri Lanka, there is immense potential for bio-prospecting and natural value added product development locally. Surprisingly, however, the optional value of biodiversity from bio-prospecting has not been explored adequately by developing the local pharmaceutical and cosmetic industry in the country despite high potential for discovering bioactive compounds for cosmetic and medicinal purposes. For example, the resin rich wood of Gyrinops walla has high commercial value in the cosmetic industry, and one kilogram of solidified resin (raw material) within the stem fetches about Rs 75,00,000/- while the softer resin is priced at Rs 3.5 million per 300-400 g. The raw material is exported in bulk, but local industries have not explored the immense potential for producing the value added products which will bring in a much higher revenue. Further, coral reef ecosystems with their high biodiversity are believed to be rich in chemical compounds due to the presence of chemicals used for defence by sessile organisms (Meliane, 2004). Sri Lanka though an island with a rich coastal and marine biodiversity tends to export sea anemones, sponges and nudibranchs in bulk form for the aquarium industry, but has high potential for bio-prospecting and natural product development in the future.[24]

Coscinium fenestratum – a commonly used medicinal plant found in wet zone rainforests of Sri Lanka

There are many local herbal medicines reported to have antimicrobial, hepatoprotective, antioxidant, anticancer, anti-diabetic properties and traditional medicine practitioners use herbal remedies to cure or control diseases such as rheumatism, diarrhea, diabetic, blood pressure, dysentery, fever, etc (Department of Ayurveda, 2014). It is also known that some of the traditional varieties of rice and other crops that have medicinal value, making the relevant genes a valuable bio-resource. Examples of other species with potential in the pharmaceutical industry are ***Coscinium fenestratum*** (weniwel geta) and ***Munronia pinnata*** (bin-kohomba). Other species such as ***Kokoona zeylanica*** (Kokun) and ***Hortonia floribunda*** (from an endemic genus) hold potential for exploration in the local cosmetic industry. While value added product development using modern by local industries can immensely benefit the Sri Lankan economy, this vast potential is still to be explored. Conversely, local species such as ***Salacia reticulate*** (kotala himbutu) and ***Garcina zeylanica*** are used in value added medicinal and diet products for which patents are held elsewhere, often with little benefit to Sri Lanka.

The knowledge of the uses of plant material as indigenous cures in folklore or traditional systems of medicine in Sri Lanka can prove invaluable to find the curative agents in plants for use in modern medicines to support development of the local pharmaceutical industry. Sri Lanka's rich

23 Discussions with communities during the periodic reviews of Sinharaja and Bundala Biosphere Reserves by the National Science Foundation

24 Data provided by the Department of Customs in 2014 and Mr Samantha Gunasekera, Pers. Com. 2014.

species diversity also holds immense optional value for the development of nano-technology. Thus Sri Lanka is well placed to use modern technology to produce value added crops as well as natural products for medicinal and cosmetic uses, by establishing centres for genomic studies of biodiversity to identify, isolate and patent the relevant genes. To pursue this approach, biosafety measures are necessary to ensure that products and derivatives are safe, and this is now being put into place in Sri Lanka. There is also potential to set up bio-villages that can more effectively use the natural products that reside in Sri Lanka's biodiversity.

1.3 Current status, major changes and trends of biodiversity in Sri Lanka

Indicators used to gauge major national changes and trends in:

- Coverage of protected areas
- Closed canopy natural forest cover
- Conservation status of threatened species
- Impacts of pollution and alien invasive species in different ecosystems
- Pressures on forests, wetlands, coral reefs and other coastal systems
- Management and harvesting of coastal and marine resources sustainably
- Reducing impacts of unsustainable fishery on threatened ecosystems and species
- Management of agricultural systems to become more environment friendly
- Trends for conservation and use of indigenous genetic diversity in agriculture and livestock production

1.3.1 Trends in Protected Areas (PAs)

The areas managed and protected by the Forest Department and the Department of Wildlife Conservation have increased from 2008 to present (**Table 1.5**). The moratorium on logging in all natural forests which came into force in 1990 is continuing. Hence, commercial timber extraction is prohibited from all natural forests in Sri Lanka. The extent of Conservation Forests set aside for strict conservation has increased over the years with more valuable wet zone forests being added to the Protected Area Network based on the biodiversity assessments made through the National Conservation Review (NCR).[25] Fifteen mangrove sites have also been protected by the Forest Department along the southwest and north-west coast. There has also been a perceptible increase in the Protected Area extent under the Department of Wildlife Conservation. However, management of all Protected Areas do not always meet the required standards, particularly the forest reserves that are not set aside for strict conservation and the wildlife sanctuaries, due to limitations of staff and other resources in the agencies responsible for conservation of these areas. This is compounded in recent years by poor coordination between agencies concerned directly with development and conservation. Eight (08) Environmental Protection Areas have been gazetted by the CEA under the National Environmental Act. They are Gregory's Lake, Thalangama Lake, Bolgoda, Walauwatte–Wathurana, Muthurajawela (buffer zone), private lands within the Knuckles Conservation Forest boundary, Hantane and Maragala. Although they do not have strict legal protection, only identified development activities are allowed in them by the CEA as specified in the National Environmental Act. The CEA, however, does not have adequate mandate to monitor these areas to see that developers adhere to the conditions that need to be followed during development.

25 This assessment of natural forests >200 ha (1992 – 1996) occurred in all parts of the country except in areas inaccessible due to the war prevailing at that time (IUCN/WCMC/FAO (1997).

Table 1.5: Number and extent of protected areas administered by the Forest Department and the Department of Wildlife Conservation

Protected Area category	Area under each category (ha)	
Forests under the Forest Department (FD)*	4th NR (ha)	2010 (ha)
National Heritage Wilderness Area (also a World Heritage Area) [N=1]	11,187	11,427
Conservation Forests* [2008 = 33, now N=75]	76,227	118,758.7
Other Reserved Forests [now N=371]	NA	1,044,008.5
Forest Plantations	72,350 (in 2001)	75,556.7 (in 2014)
Mangroves (now N=15)	2,163	1153.1
Forests under the Department of Wildlife Conservation (DWLC)*		
National Parks (2008=14, now = 22)	495,984	535,182
Nature Reserves (2008=4, now = 5)	32,581	64,585
Sanctuaries (2008=63, now =65)	262,156	376,943
Strict Natural Reserves (3)	31,573	31,574
Jungle Corridors (Kaudulla- Minneriya) (1)	10,360	8,777

*Data source: FD and DWLC unpublished data * Some areas are declared under both FD and DWLC, all areas under the DWLC are not forests as sanctuaries contain private non- forest lands*

The extent (proposed and implemented) as Biosphere Reserves has increased (Table 1.6) with the identification of Transition Zones for the Sinharaja and Hurulu Biosphere Reserves where people live and lead normal lives and demonstrate sustainable livelihoods that do not degrade the adjacent biodiversity rich Core Zones.

Table 1.6: Changes in international Protected Areas and Ramsar Sites

International Protected Area Category	Number of PAs and area covered in 2008	Number of PAs and area covered in 2014
Natural World Heritage Sits (IUCN category X PA)	**N=1, 8864 ha** The Sinharaja World Heritage site	**N=2, 118,884** New: The Central Highlands Serial World Heritage Site with 3 forests
Biosphere Reserves Recognised by UNESCO (IUCN category IX PA)	**N=4, Extent 81363.7 ha** Sinharaja, Kanneliya-Dediyagala-Nakiyadeniya, Hurulu and Bundala BRs	**N=4, extent 143106.3** Same reserves, increased area
Ramsar sites	**N-3; 8,377 ha**	**N=6, 198,027 ha**

The Knuckles Conservation Forest, Horton Plains National Park and the Peak Wilderness Protected Area were accepted by UNESCO as a serial Natural World Heritage Site termed the Central Highlands World Heritage Site in 2010. This brought the total area under this category to 118,884 ha together with the Sinharaja World Heritage Site declared earlier (**Table 1.6).**

1.3.2 Trends in forest systems

1.3.2.1 Natural forests:

The main forest types in the country are the lowland, sub-montane and montane tropical rainforests (the latter are also called cloud forests) of the wet zone; moist monsoon forests of the intermediate zone; and the dry zone monsoon (mixed evergreen) forests, tropical thorn forests and dry riverine forests in the dry zone.

Overall, the total natural forest cover in the country has decreased from 31.2 % of the island in 1999 to 29.6% in 2010 (when savannah grasslands are considered this rises to 29.7%). The total forest loss is estimated as 48,900 ha from 1999-2010 which is approximately a loss of 0.23% of forest area, or 4,445 ha of forest loss, annually.[26] This is a positive trend when compared with 40,000 ha of natural forest loss annually between 1956 and 1992 (MALF, 1995), and the predictions made in 1995 for a reduction of the 23.9% closed canopy natural forest cover in 1992 to about 17% in 2020 under a 'business as usual scenario (MALF, 1995).

Table 1.7: Comparison of forest cover in Sri Lanka in 1992, 1999 and 2010

Forest category	Total forest area (ha) 1992 *	Total forest area (ha) 1999†	Total forest area (ha) 2010††
Total extent of "closed canopy" dense forest	1,582,757	1,470,636.2	1,438,275
Open canopy sparse forest	463,842	471,583.2	429,485
Total natural forest cover *(Including mangroves and savannah)*	**2,046,599**	**1,942,219.5**	**1,951,473**

Source: Legg and Jewell (1995) and Forest Department Forest cover data for 1999† and 2010††;*

Table 1.1 shows that there are 227,710 ha of chena (slash and burn) lands in the country at present, located within previously forested areas. While the traditional slash and burn cultivation where farmers clear new areas of forest each year has now been largely halted by better management of forests and wildlife parks, the continued use of the same chena plots prevent forest regeneration, making them permanent agricultural lands (DOA, 2014).[27] However, there is a trend for the reduction of extractive forest use especially from wet zone forests (BOX 1.7).

26 Source: Forest Department data provided for this report.
27 Source: Discussions with the Department of Agriculture Extension Division during report preparation.

BOX 1.7: Trends in extractive use of forest resources in the Sinharaja Biosphere Reserve

A survey around the Sinharaja forest during 2007 found that many people collected forest products, although 90% stated that forest use had declined (de Mel, 2008). In contrast, a survey in 2013 showed that only 15% of households got some income from forest products, but did not depended on this for their main income. Several forest extractions continued on a small scale, mainly for domestic use. This included hunting (mostly as crop pests in agricultural holdings); obtaining timber, poles, sticks, medicinal plants such as weniwel *(Coscinium fenestratum)*, bee honey, reeds, rattan, wild cardamom, gum, bamboo, dorana oil *(Dipterocarpus glandulosus)*, and *beraliya (Doona venulosa)* fruit as a food item. Tapping kitul *(Caryota urens)* for sap to produce treacle and a candy like sweeter termed jaggery, and collection of food items (except for *beraliya*), firewood, arecanut, and walle patte ranged from small to middle scale.; Though food items and firewood involved sale, they were mainly for domestic use. Hunting and collection of sticks were solely for domestic use. *Dorana* oil, *walle patte* and arecanut fruits were collected only for sale. However, all forest collections had decreased during the past 10 years, except collection of arecanut fruit which was increasing. *Walle patta* tree trunks being cut on a small scale by outsiders is of recent origin due to an emerging market. The drop in forest use is mainly due to people moving towards cultivating cash crops and the resultant socio-economic advancement. This trend is widely prevalent near other forests of the wet zone.

Some of the main drivers of deforestation and forest degradation in forest systems are slash and burn cultivation, illegal encroachments - which in the wet zone is mainly for tea and cash crops and has reduced significantly; illegal felling of timber – which also has reduced considerably; forest fires that are often human induced; over-grazing by cattle causing damage to forest vegetation;[28] and development activities without adequate coordination between agencies responsible for development and forest conservation (FD/GoSL, 2012). Conflicts arise as state land for development is limited, and the option of using other lands is similarly limited (ibid).

Table 1.8: Threats identified for major forest types during the 2012 Red listing exercise

Threats	Dry Zone forests / grasslands	Lowland rain forests	Montane forests	Threats	Dry Zone forests / grasslands	Low land rain forests	Montane forests
Habitat destruction	☐	☐	☐	Chena cultivation	☐		
Forest fragmentation	☐	☐		Encroachments		☐	
Forest degradation	☐			Vegetable gardens			☐
Conversion to other uses	☐			Over exploitation of resources	☐	☐	
Firewood collection			☐	Selective timber logging	☐		
Cutting /clearing undergrowth				Invasive spp.	☐		☐
Forest fires in grasslands	☐			Clearing for development	☐		
Cattle grazing	☐			Gem mining			☐
Die-back	☐		☐				

Source: Perera, 2012; Wijesundara, 2012; Kathriaaaarachchi, 2012.

28 Edirisinghe, EAPN (2014). Presentation on Forest Cover of Sri Lanka, Forest Department, March 20114.

The assessment of the status of lowland wet zone forests, montane forests and dry zone forests during Species Red listing in 2012 **(Table 1.8)** indicate that despite many advances in the conservation of the country's forests and wildlife, there are many threats that need to be addressed in the future to conserve forest quality to ensure uninterrupted ecosystem services and to provide habitats for forest living fauna.

□ Positive trends

Stemming the rate of national forest loss is and degradation (BOX 1.8) is attributed to a significant effort for better forest management which includes enforcing the ban on logging in all natural forests of the country since 1990, boundary marking of most forest and wildlife reserves to halt encroachments, halting logging of natural forests, preparation and implementation of management plans for forest and wildlife reserves (which became legal requirements under the Forest Ordinance Amendment Act No. 65 of 2009 and the Fauna and Flora Ordinance Amendment Act No 22 of 2009), and the trend to encourage community participation in forest and protected area management by both the Forest Department and the Department of Wildlife Conservation. The Forest Department has also started many programmes to engage local people in community forestry to reduce the threat of encroachment for growing cash crops and tea in the wet zone and for slash and burn (chena) cultivation in the dry zone (FD/GOSL, 2012). Further, the demand for wood and wood products are mainly met from non-forest lands and private woodlots, encouraged by programmes of the Forest Department to reduce pressure on natural forests for timber. As such, positive changes in forest quality have been observed in several previously logged rainforests as well as some dry zone forests (BOX 1.8 and Jayasuriya & Abayawardana, 2008).

1.3.2.2 Forest Plantations:

With the shift in emphasis of forest policy from production to protection, and the moratorium on logging in natural forests for timber, forest plantations have become particularly important for timber and wood products and to relieve pressure on natural forests. There are 75,556.7 ha of forest plantations at present. The trend to move away from the past practice of planting exotic species such as teak, *Pinus* and *Eucalyptus* and the move towards indigenous species is beneficial. Further, 80% of forest plantations are set aside for environmental protection and habitat management, especially in water catchments and environmentally sensitive areas, while some are declared as wildlife sanctuaries (FAO and FD, 2009). Notably, about 2,000 ha of *Eucalyptus* plantations at high altitudes are reserved for environmental protection, adding to the permanent carbon stocks in natural forests (FD/GOSL, 2012).

1.3.2.3 Grasslands:

Sri Lanka has many different types of grasslands in the various major climatic zones. With the exception of savannah forests, the specific extents of other grasslands types (dry *pathana* of the intermediate montane zone, wet *pathana* grasslands of the montane zone, and the *talawa* and damana grasslands of the wet and dry lowlands respectively) are not known. However, most of these grasslands are under threat with regard to loss of extent and habitat quality. For example, the savannah woodlands of Nilgala, which are rich in medicinal plant species, are being reduced, while the damana grasslands of Ampara are lost to establish human settlements (Perera, 2012). However, some areas where forest plantations have been harvested and abandoned have converted to grasslands. This can be seen in the Hurulu Biosphere Reserve which now provides better grassland habitats for elephants (NSF, 2014c).

1.3.3 Trends in non-forest tree resources

In addition to forests, a wide range of non-forest tree resources are available in home gardens and tea (shade trees), rubber and coconut plantations that yield timber and fuelwood (CB, 2011). Trees from such non-forest areas reduce the pressure on natural forests to provide timber, fuelwood and Non Timber Forest Products (NTFP). Increasing tree cover in home gardens is, therefore, of major interest as exemplified by the massive national tree planting campaign *(Deyata Sevena)* currently underway, as well as a number of programmes implemented by the Forest Department. In terms of carbon potential, the FAO (FAO/FRA, 2006) estimated the wood supply from non-forest timber resources in Sri Lanka to be 1.5 million m^3 in 2005, with a projected rise to 1.6 million m^3 by 2010. Home gardens have considerable carbon potential, with average stocking density of trees in home

gardens varying from 54-419 stems/ha (FAO and FD, 2009), in addition to providing a range of economically valuable tree species for food and timber. However, the rising human populations and the resultant escalating demand for land has led increasingly to fragmenting and degrading of home gardens and plantations for conversion for commercial housing, division between family members for housing, and resultant felling of large trees (Dela, et al, 2012, and information from HORDI, 2014)

1.3.4 Trends in wetlands

The broad wetland types in Sri Lanka are given in Table 1.1. No recent surveys have been carried out to determine the extent, but water bodies cover around 488,181.25 ha or 7.5% of the island's land area (DoA, 2013). Several positive features have occurred for conservation of wetlands in the past few years, but wetlands continue to be lost and degraded, and their resource are exploited beyond sustainable levels. The most serious problems in wetlands are summarized in BOX 1.8. Wetlands in Sri Lanka face compound threats that are mainly of anthropogenic origin. Consequently most aquatic ecosystems have deteriorated over the past few years.

BOX 1.8: Analysis of threats to wetlands

Wetland deterioration from siltation due to poor land use in areas adjacent to wetlands, reclamation, clearing of wetland vegetation, water pollution (with agrochemicals, industrial wastes, sewage and solid waste), dams that regulate water flow in rivers that lead to gradual disappearance of lowland wetlands, poorly planned irrigation structures, and illegal sand and gem mining in rivers have been identified as major issues that cause loss of wetland biodiversity. Water pollution affects fauna that are dependent on wetlands for survival (e.g. indigenous fish and amphibians which include a large number of endemics, piscivorous birds, and wetland associated aquatic mammals, etc). Wetlands are also threatened due to over exploitation of ornamental plants and ornamental fish with export potential.

Another major threat faced by wetlands is the spread of invasive plants and animals. There are more than 10 species of invasive plants and 12 species of invasive flora spreading in wetlands of Sri Lanka. Among these are four species of fauna and two species of flora (water hyacinth and giant mimosa) that are listed among the 100 worst invasive plants in the world. Some invasive species such as the apple snail have affected wetlands such as rice fields. In addition to these anthropogenic threats, wetlands are also affected by natural phenomena such as prolonged drought which severely affects these natural ecosystems and the species found in irrigation tanks, large reservoirs and lagoons.

Source: IUCN and CEA, 2006 and MoE, 2010b

In addition to the threats that have been prevalent for many years, new threats, such as dumping of e-waste into wetlands and dredging to clean-up wetlands and building up the banks without environmental considerations have emerged. The latter creates problems for some sensitive wetland flora.[29] Many water bodies are being used for water sports, boating and sea plane landing but no charge is made for the use of wetlands to enable addressing problems that may arise as a result. Further inland sand mining has a major impact on wetlands, but the license can be provided by the Geological Survey and Mines Bureau without the concurrence of the Central Environmental Authority (CEA) in charge of wetland conservation. In addition, the eight gazetted EPAs under the NEA (among which are several wetlands) are not supported by regulations to ensure their protection (MoE, 2010b).

□ Positive trends

Some progress has been made in terms of managing wetlands in the country. Among these is the establishment of a special Wetland Unit in the Natural Resources Division of the CEA to oversee the interests of wetlands and to implement the National Wetlands Policy of 2006 (which is now due for revision). However, this unit is severely hampered as it lacks formal authority or mandate to enforce conservation action in wetlands as per the Wetlands Policy. Management plans have been prepared for the Bolgoda Wetlands and are pending for the Thalangama Wetlands, and awareness activities on wetlands are carried out by the CEA. Other positive actions have been the ban on converting rice fields into other uses in the Western Province which is overseen by the Department of Agrarian Services.

29 Discussions with the Natural Resource Management division of the CEA, 2014

1.3.5 Trends in coastal and marine systems

Table 1.1 indicates the main types of coastal and marine ecosystems that are present in Sri Lanka. The extent of each of these ecosystems is now being mapped. While no major changes are expected in areas covered by these systems, loss of quality in most coastal systems has continued since the last reporting period.

1.3.5.1 Coral reefs:

At present the most extensive coral growth is seen in the Gulf of Mannar and fringing coral reefs found in the northern, eastern, and southern coastal waters (Rajasuriya, 2012), and offshore patches of coral between Chillaw and Colombo, located at 10-20 km from the shoreline and at an average depth of about 20 m (ibid). Sri Lanka has a rich coral fauna with 208 species from 71 genera **(Table 1.3)**. Of these, two species of hard coral (*Podabacea sp.* and *Echinopora robusta*) have not been reported from elsewhere to date, while the rare *Blastomussa merleti* has only been collected at Unawatuna (Rajasuriya, 2012). Coral reefs have been affected mostly due to climate change, commencing with the major bleaching event in 1998. The recovery has been variable between reefs, as well as within a single reef, as seen in the Bar Reef (Rajasuriya 2005, 2008). Coral bleaching has since been seen regularly in recent years, especially in reefs of the north and east (Rajasuriya, 2012). The 2004 Tsunami has caused extensive damage to coral reefs, particularly in the eastern and southern coasts. In addition, destructive fishing methods such as use of moxy nets to capture ornamental fish living in coral reefs and blast fishing (for the food fishery) are widely prevalent, invasive species such as the Crown of Thorns Star Fish are proliferating in some locations (e.g. Pigeon island), and there is a recent trend for development of hotels on the coast with inappropriate designs (e.g. water bungalows) that can affect coral reefs and other coastal systems.[30] While some coral reefs are recovering from the bleaching event and the tsunami, coral composition has changed, with the replacement of staghorn coral by plate coral, and some reefs, such as Weligama and Polhena, have not recovered at all.

□ Positive trends

A positive feature is that coral mining for lime production has stopped after the 2004 tsunami as people realized the value of coral reefs to minimize coastal damage from events such as tsunamis and sea erosion. This, coupled with the government ban on using lime based paint for government buildings and the strict enforcement of the Coast Conservation Act, particularly with regard to transportation of coral to lime kilns, has halted the rampant coral mining that exited in the past (CCD, 2004). For example during 2007 there have been only 5 offences for coral extraction, one in 2008 and none thereafter.[31] However, blast fishing using dynamite and walking on coral by tourists continue to be of concern in some areas.

1.3.5.2 Mangroves and salt marshes:

There are about five kinds of mangroves of which the riverine and fringing mangroves are the most common (Jayatissa, 2012). The large scale clearing of mangroves for aquaculture has stopped due to the white spot disease that affected most prawn farms, but clearing of mangroves and salt marshes for establishment of tourism facilities and salterns is occurring in some parts of the coast. At the same time, people are more aware of the importance of mangroves after the 2004 tsunami and mangrove vegetation is making a good recovery in the southern and eastern coastal areas.

1.3.5.3. Seagrass beds:

Sea grass beds continue to be affected due to the use of push nets and dragnets, pollution, and sedimentation from land based activities and clearing of mangroves. For example, the seagrass beds of the Puttalam and Negombo lagoons were severely damaged due to the use of push nets and drag nets, which perceptibly affected the shrimp fishery in these lagoons.[32] The fishers in these areas now understand the importance of seagrass beds as the shrimp are emerging where the seagrass is recovering. However complete recovery and regeneration of these ecosystems is expected to take about 2-4 years.

30 Discussions with the Coast Conservation Department, 2014
31 CCD, unpublished data provided in 2014.
32 Discussions with NARA, 2014

1.3.5.4 Lagoons and estuaries:

These systems continue to be under threat from pollution, sedimentation from land based activities, sand mining, and in some cases such as the Malala and Embilikala lagoons (at Bundala) due to lowering of salinity caused by the release of irrigation waters. In these two lagoons the shrimp fishery has collapsed completely and is now sustained by the exotic tilapia which is thriving due to lowered salinity. However, water birds that prey on crustaceans are believed to have been affected due to the disruption of the food chain.

1.3.5.5 Sustainability of the coastal and marine biodiversity:

☐ Sustainability of the food fishery

Despite the knowledge gained on obtaining catch and effort data and a better understanding of the fishery resource through the Coastal Resources Management Project, the marine and inland fishery are yet not fully sustainable. For example, the use of multi-gear fishing implements that target several species, the use of moxy nets to catch ornamental fish, the use of synthetic gill nets that are death traps for turtles and dolphins, and the use of push nets and dragnets that are detrimental to many coastal ecosystems and organisms continue with negative long-term impacts on the fishery. The coastal fishery has been over exploited, while the offshore fishery is not fully exploited as yet by local fishermen.

☐ Sustainability of the marine ornamental fishery:

Moxy nets used to harvest ornamental fish from coral reefs damage the habitat of the fishery resource making it unsustainable in the long-term. Some species are also over harvested. Examples being herbivorous reef fish, the Humphead wrasse *(Cheilinus undulatus)* that feeds on juvenile Crown of Thorns Starfish, and other species that are important for the maintenance of the ecological balance of coral reefs (Ranajasuriya, 2012).

☐ Positive action taken to conserve coastal and marine biodiversity[33]

– Several positive actions have been taken since the last reporting period. Chiefly, the enactment of the Coast Conservation Amendment Act No 49 of 2011 which has increased the coastal zone to cover 100 m of riparian land on either side of the 2 km water source perpendicular to a river mouth in the coastal zone. This area is also meant to be a no build zone for new projects.

– The Coast conservation Act (CCA) amendment No 49 of 2011 also paves the way for more positive coastal zone management. It vests powers in the Coast Conservation Department to veto or stop any damaging development activity that occurs in the coastal zone to declare: (a) affected areas in the coast in which no development, dumping of waste or damaging activity can be carried out, (b) beach parks for preservation of scenic beauty and biodiversity, and (c) conservation areas for the protection of the coastal and aquatic eco-systems, where no development activity will be permitted (i.e. permitted activities will only be research and study). Further, all mining activities in the Coastal Zone will need the concurrence of the CCD.

– The revised Coastal Zone and Coastal Resources Management Plan is currently being prepared in accordance with the requirements of the CCA.

– The Coastal Zone Management Plan (CZMP) of 2004 identified a total of 57 sites as needing special area management; of these 26 sites were beset by multiple resource use conflicts and were proposed as Special Area Management (SAM) sites. A further 23 sites which are geographically smaller and had lesser user conflicts, were identified as potential APC (Areas of Particular Concern) sites, while the SAM process was ongoing at a further 8 sites. As management of these sites did not take place, the revised CZMP will address the problem of SAM site management. The CCD will have ownership of the sites, but could delegate the planning and implementation of the SAM process to other agencies - in the state or private sector. All work at each site will be overseen by a Special Area Management Committee which will be co-chaired by the CCD and the implementing agency.

33 Discussions with the Coast Conservation Department, 2014

– Pollution of coastal waters is of concern, and this has resulted in the monitoring of waters at 5 coastal sites: Mt Lavinia, Hikkaduwa, Unawatuna, Polhena, Nilaweli and Arugambay. The CEA is setting standards for bathing in coastal waters. As sewage pollution is a problem, collaboration with the Local authorities is being sought to address it.

– Coastal erosion has been stemmed due to establishment of coast protection structures along vulnerable areas of the coastline.

– Illegal sand mining on the southwest coast has been regulated to a great extent, but recently this has increased on the eastern coast.

– Four marine protected areas are managed by the Department of Wildlife Conservation (Hikkaduwa National Park, Marine sanctuaries at Rumassala, Pigeon island, and Bar Reef). Likewise, there are two fisheries management areas at Great and Little Bases and Polhena set up under the Fisheries and Aquatic Resources Act (FARA) to regulate the fishery in them.

1.3.6 Trends in agricultural systems and livestock breeding

1.3.6.1 Agricultural systems

The agricultural landscape of the country consists mainly of rice paddies, plantation crops (tea, rubber, coconut and sugarcane, and about 25 minor export crops); fruit crops; vegetables, root and tuber crops; other field crops consisting of about 100 species used as food such as chilli, onion, cereals, grain legumes, condiments and oilseeds, and home gardens.

At present agriculture contributes 11.1% to the country's GDP and 33% to the labour force (CB, 2013). In addition, livestock rearing is a major employment opportunity for the rural poor and often serves to cushion them against crop failure while enabling a market based income. Hence, biodiversity among agricultural crops is a positive factor to increase production in this sector.

Due to a long history of agriculture, Sri Lanka has a wide range of cultivated species. The 46 agro-ecological regions in Sri Lanka are based on variations in soil, annual rainfall and altitude (SDoSL, 2007) and they support a wide range of land races or traditional varieties that are well suited for local climatic conditions. The traditional rice varieties and wild relatives of rice show resistant to diseases and insect pests (BOX 1.4). It is now known that among the vegetables and fruits there are about 10 species of wild Vigna--out of 16 species present in the country (Liyanage, 2010); 12 species of wild okra, 16 wild relatives of cucurbits, seven wild relatives of orange and related crops, and seven wild species of *Passiflora* and parent species of the cultivated banana *(M. acuminata and M. balbisiana)*.

□ Positive trends

In recent years there has been a more definite positive trend to conserve and use the germplasm of indigenous crops and their wild relatives for varietal improvement of rice, vegetables, other field crops and minor export crops. **Table 1.9** shows that collections of crop germplasm are increasing at the Plant Genetic Resources Centre (PGRC) of the Department of Agriculture (DoA).

All crop research and development institutes under the Department of Agriculture (e.g. the Horticultural Crops Research and Development Institute (HORDI); the Rice Research and Development Institute (RRDI), and the Field Crop Research and Development Institute (FCRDI) and the PGRC are engaged in research to characterize and investigate the properties of traditional crop varieties and wild relatives of crops for varietal improvement.[34] For example, the PGRC is engaged in gene tagging in the wild relative of Okra with regard to the trait for resistance to the yellow vein mosaic virus.[35] Likewise the Department of Export Agriculture is engaged in crop enhancement using genetic diversity of minor export crops. As such these institutions maintain working collections of crops (including traditional varieties) and their wild relatives.

The PRGC and other research institutions of the DoA also give out seeds of traditional varieties to farmers for on-field propagation. As a result, there are many farmers in the island who are now cultivating traditional rice varieties as this fetches a higher price in the market due to their better

34 Discussions with the research institutions of the DOA, 2014
35 Discussions with the PGRC, 2014.

taste and nutritional value than the new improved varieties. The DoA is also seeking to popularize the use of organic fertilizer with traditional varieties of vegetables for home garden growers. Concurrently, the DoA has also banned several pesticides in Sri Lanka from 2012, namely Carbaril, Chlorophyriphos, Carbofuran and Propanil and the weedicide Glyphosate, due to their propensity to contaminate soil and water and toxicity when applied in large quantities. Four other pesticides were banned since 2010. These measures are expected to improve ecosystem services of agricultural systems.[36]

Table 1.9: Trends in germplasm collection status by crop group at the PGRC

Crop Group	Number of accessions at the PGRC in the 4th National Report	In 2014
Rice and related species	4467	4584
Other cereals and related species	1534	1674
Grain legumes	1,904	2095
Vegetables (legumes, cucurbits, brassics, allium, leafy vegetables etc)	2488	2824
Solanacious vegetables and condiments	1150	1254
Fruit crops	163	161
Root and tuber crops*	150	179
Oil crops	401	434
Medicinal plants	27	27
Fibre crops	63	66
Mustard and related spices	124	128

*Source of 2014 data: unpublished data provided by the PGRC in April 2014. *Root and tuber crops are not maintained in-vitro.*

The means of conserving wild relatives of crops - mainly ***Oryza*** spp. and ***Vigna*** spp. have been addressed through a project for conservation of crop wild relatives, and 22 locations have been identified for ***in-situ*** conservation of crop wild relatives in addition to the protected areas where they occur. The most important areas outside PAs in this regard are the Manikdena Archaeological Reserve and arboretum, Waulpane Forest, and Thumbathanna Forest (Liyanage, 2010).

Among the export crops, the research institutes for plantation crops (i.e. tea, rubber, coconut and sugarcane) maintain live field collections of varieties, cultivars and clones within their purview. The Department of Export Agriculture (DEA) maintains germplasm of species relevant for crop enhancement as per their mandate, while research institutions for minor export crops are also engaged in breeding new varieties with higher yield and beneficial traits. Among the spices, several wild relatives of ***Cinnamomum*** and 12 wild species of Piper have been characterized. CRS 40 ***(Sri Gemunu)*** and CRS 317 ***(Sri Wijaya)*** have been bred by the Cinnamon Research Station.[37] Best performing local selections of black pepper have been selected for commercial cultivation (Seneviratne, et al., 2012), and other types of crops are being investigated for beneficial traits and for products such as essential oils, oleoresins and piperine of commercial value.

1.3.6.2 Livestock sector

Livestock is an important component of the agricultural sector today as seen from the increasing population of livestock in the country over the years. At present there are about 1,265,039 cattle, 473,911 buffalos, 408,787 goats,[38] 88,789 pigs and 15.72 million chickens country wide (DAPH, 2012). Most of the livestock comprise high yielding breeds imported to increase livestock production.[39] However, Sri Lanka also has several local breeds that are well adapted to the local environment and harsh conditions, need less intensive management but are relatively low yielding.

36 Discussions with the Registrar of Pesticides, 2014
37 Information from the Department of Export Agriculture, 2014
38 Unpublished data from the Department of Animal Production and Health, for 2013 provided in 2014
39 Cattle (Friesian, Ayrshire, Jersey of European origin and Sahiwal, Zebu or Bos indicus), buffaloes (Murrah, Nili-Ravi), sheep (Red Madras Bannur), goats (Saanen, Jamnapari) and swine (Landrance, Large white, Duroc) have been imported from time to time.

They are now used for cross-breeding with imported varieties to improve yields and maintain adaptability to local conditions.

Positive actions

The Department of Animal Production and Health (DAPH), and its research centre the Veterinary Research Institute (VRI) do not have organized programmes for livestock germplasm conservation, but are using germplasm of indigenous and local breeds in their breeding programmes. Cattle breeding programmes are made available to cattle farmers island-wide to upgrade local breeds through artificial insemination programmes, whereby local cattle are provided imported high yielding germplasm. This has served to propagate the beneficial traits of locally adapted breeds that need less intensive care and are resistant to disease, while increasing milk production. While this affords some degree of conservation for local livestock breeds, there is some concern that indiscriminate cross-breeding may serve to lose the original germplasm which is only found in small pockets of the country. However, these problems have been identified in the Livestock Breeding Policy of 2010 which deals with the in-situ and ex-situ conservation of indigenous livestock including characterization, inventorying and monitoring (MoL&RCD and DAPH, 2010). Other positive actions are measures to conserve traditional knowledge associated with agriculture and livestock rearing, and this is increasingly important for developing the agriculture sector in the face of climate change.

1.4 Major threats to biodiversity in the country

Table 1.10 provides the result of an analysis of major threats to biodiversity in Sri Lanka using assessments carried out during preparation of various national documents since 2012.

One of the main problems is that there is no proper understanding of long-term ecosystem services of biodiversity outside the conservation agencies, so that only short and medium term financial benefits from bio-resources are considered.[40] This could be due to the absence of any local initiative to carry out valuation of biodiversity taking into consideration the important ecosystem services of forests, wetlands, coastal and marine systems and agricultural systems in a holistic manner as recommended in the BCAP of 1999.

40 Inputs from the Experts' workshop to validate this report

Table 1.10: Summary of main threats to biodiversity in Sri Lanka

Threats /direct drivers of threats	Overall main causes of biodiversity loss in Sri Lanka
Encroachment into forests for agriculture: □ Cash crops in the Wet Zone (WZ): tea and vegetables □ Slash-and-burn - cultivation in the Dry Zone and Intermediate Zone (DZ/IZ) □ Cash crop cultivation in the Dry Zone and Intermediate Zone (DZ/IZ) **Illicit felling of timber** (all zones) Logging is banned in natural forests. **Other localized encroachments into forests, wetlands, coastal and marine systems (all zones)** □ For housing, tourism facilities, village expansion/new villages, urbanization □ For provision of amenities – e.g. electricity □ For development of commercial facilities and access roads □ For prawn farming/aquaculture and salt production involving clearing of coastal ecosystems (mangroves, salt marshes, etc) □ For tourist facilities by an irresponsible segment of the tourist sector – often small scale but affecting very sensitive forest and coastal areas. This includes establishing inappropriate tourist infrastructure that adversely affects the environment **Forest degradation** □ Firewood collection and damage to undergrowth □ Cattle grazing □ Die -back of forest species (natural) □ Over-extraction of minerals **Changes in water regimes and sedimentation due to:** □ Dam construction □ Major and mini-hydro projects that alter water regimes □ Large reservoir projects □ Poorly planned irrigation structures and release of irrigation waters □ Encroachments into river reservations □ Proliferation of agro-wells **Lack of strategic use of land during development resulting in loss of critical forests and important wildlife habitats, and wetlands:** □ Development projects (for transportation networks, service facilities and other infrastructure for urban development). □ Expansion and development of existing settlements, and new settlements. □ Large scale agricultural expansion for commercial purposes. (applicable to all zones, but mainly DZ for new settlements and agricultural expansion)	□ **Habitat loss and fragmentation:** resulting in loss of ecosystem services and habitats for species. □ **Ecosystem degradation: resulting in loss of** ecosystem services and habitats for species

Threats /direct drivers of threats	Overall main causes of biodiversity loss in Sri Lanka
Invasive species (IS). □ Unintentional introduction □ Intentional introduction of IAS □ Proliferation of indigenous IS due to ecosystem changes, climate change, and /or reduced population of species in food chains (all zones in forests, wetlands, coastal and marine systems, agricultural systems)	□ **Spread of Invasive Alien Species (IAS):** increased threat status of species, and degradation of natural and agricultural systems and the resources they provide
Over exploitation of species □ Some NWFPs from forests □ Ornamental fish and ornamental plants □ Other commercially important plants and animals	□ **Over exploitation:** of biological resources: loss and increased threat status of species
Destructive practices during resources extraction □ Destructive removal of minerals and rocks from forests □ Sand mining and removal from rivers and beaches □ Illegal gem mining in forests and wetlands □ Destructive impacts of land based activities that cause sedimentation in coastal ecosystems resulting in loss and degradation of coastal ecosystems and resources (e.g. coral reefs and seagrass beds) □ Poor land use in private lands and stream reservations (all zones) □ Destructive fishing practices - e.g. blast fishing damages coral reefs, use of moxy nets to catch reef fish damages coral reefs, dragnets and push nets damage sea grass beds, nylon gill nets spell death to dolphins and turtles as by-catch	□ **Destructive practices during land use and resource extraction:** resulting in loss of ecosystem services and habitats for species, increased threat status of species and loss of long-term fishery and agricultural productivity
Pollution □ Pollution from agrochemicals (chemical fertilizer, weedicides, pesticides and insecticides) □ Eutrophication in inland waterways due to excess fertilizer □ Pollution from detergents such as soaps and shampoos in inland waters used for bathing □ Pollution of coastal waters with oil from ships and boats and ballast water □ Sewage pollution	□ **Pollution:** resulting in loss of ecosystem services and habitats for species, increased threat status of species, and potential loss of biological resources used by people for commercial and subsistence uses
Increasing human populations and contacts with wildlife □ Human - elephant conflict □ Human – primate conflict: mainly with toque macaques and to a lesser degree with the grey langur and the purple-faced langur.	□ **Human population increase:** greater pressure on land and other natural resources. □ **Human - wildlife conflicts:** increased threat status of targeted species, socio-economic loss to people affected.
Climate change and natural disasters □ Human induced global climate change □ Tsunamis □ Floods □ Droughts □ Coastal erosion □ Natural outbreaks of parasites and pests	• **Climate change and other major natural disasters:** These can result in loss of ecosystem services and habitats for species, increased threat status of species (especially already threatened species), and potential loss of biological resources and coastal lands used by people for commercial and subsistence purposes.

Note: These threats and drivers have been validated at a stakeholder workshop in 2014 for preparation of this report.

Table 1.11 shows changes in threat status of major faunal and floral groups between 2007 and 2012 assessments for Red Listing of indigenous plants and animals.

It is of concern that about 44% of all flowering plants in Sri Lanka and 46% of vertebrate species are threatened with extinction. There has been no reduction of threats to the relevant species groups since the last reporting period, which is explained by the many threats to biodiversity as set out in Table 1.11. While the list of threatened species has grown from 2007 to 2012, this is also partly due to increased number of species in some groups based on new findings and revised taxonomic groupings resulting in splitting of species, particularly among the fishes and herpetofauna. Further spiders were very incompletely assessed in 2007, but are now better known.

Table 1.11: Changing threat status of indigenous fauna, flowering plants and pteridophytes in Sri Lanka

Group	Species in the 2007 Red List of Threatened Fauna and Flora of Sri Lanka		Species in the 2012 Red List of Threatened Fauna and Flora of Sri Lanka	
	Number Assessed (no. of endemics in parenthesis)	Number threatened (no. of endemics in parenthesis)	Number Assessed (no. of endemics in parenthesis)	Number threatened (no. of endemics in parenthesis)
Land snails	246 (204)	33 (32)	253 (205)	179 (162)
Freshwater crabs	51 (51)	37 (37)	51 (50)	46 (45)
Dragonflies	120 (57)	20 (20)	118 (47)	61 (40)
Ants	NA	NA	194 (33)	59 (8)
Bees	NA	NA	130	106
Butterflies	243 (20)	66 (13)	245 (26)	99 (22)
Spiders	7(5)	1 (1)	501 (257)	62 (24)
Freshwater fishes	82 (44)	28 (20)	91 (50)	45 (39)
Amphibians	106 (90)	52 (51)	111 (95)	73 (71)
Reptiles	171 (101)	56 (37)	211 (124)	107 (87)
Birds (residents only)	227 (33)	46 (16)	240 (27)	67 (18)
Mammals	91(16)	41(14)	95 (21)	53 (18)
Total vertebrates	677 (284)	223 (138)	748 (317)	345 (233)
Flowering plants	1099 (553)	675 (412)	3156 (894)	1,385 (594)
Pteridophytes	NA	NA	336 (49)	200 (33)

Source: MoENR and IUCN (2007) and MoE (2012).

1.4.1 Threats to terrestrial wild species

The threat assessment of faunal groups, pteridophytes and flowering plants during preparation of the 2012 National Red List reveal that:

- Among the vertebrates, the percentage of threatened species is highest for amphibians (66%) and mammals (56%). Further, 19 species of amphibians from Sri Lanka are among the amphibian species that became extinct during the past 500 years (Manamendra-Arachchi and Meegaskumbura, 2012).
- Among the terrestrial invertebrate fauna, the highest number of threatened species is among the bees (82%), while 40% of butterflies are also threatened. Both are important pollinators of crops.

- Among freshwater faunal groups such as the freshwater crabs and fishes (with very high endemism), 90% and 50% respectively are threatened with extinction. This appears to be a direct result of the threats to inland aquatic systems and over-harvesting in the ornamental fishery.
- Most of the threatened terrestrial vertebrates and fishes are located within the Wet Zone with a high human population density (IUCN MoENR, 2007).
- Among the 3,156 indigenous angiosperm species assessed, 1,385 species (44%) were found to be threatened, of which 65% are endemic.
- Among the pteridophytes, 60% of known species are threatened with extinction.
- Analysis of the causes of threat have shown that:
  - The most widely felt threats across the faunal groups, pteridophytes and orchids are the loss, fragmentation and/or degradation of natural habitats and the impacts of pollution and alien invasive species (van der Pooten and Coniff, 2012; Dias, et al, 2012; Karunaratene and Edirisinghe, 2012; van der Pooten, 2012; Benjamin, et al, 2012; Bahir and Gabadage, 2012; Ranaawana and Priyadarshana, 2012; Goonatilleke, 2012; Manamendra-Arachchi and Meegaskumbura 2012; Wickramasinghe, 2012; Weerakoon and Gunawardena, 2012; Weerakoon, 2012a &b; Ranil and Pushpakumar, 2012; Fernando, 2012).
- Deforestation, fragmentation and degradation of forest habitats were the most serious threats which affected almost all groups [(i.e. dragonflies (van der Pooten and Coniff, 2012), bees (Dias, et al, 2012); butterflies (van der Pooten, 2012); freshwater crabs (Bahir and Gabadage, 2012), land snails (Ranaawana and Priyadarshana, 2012), freshwater fish (Goonatilleke, 2012);
- amphibians (Manamendra-Arachchi and Meegaskumbura, 2012); reptiles (Wickramasinghe, 2012), birds (Weerakoon and Gunawardena, 2012) and pterodophytes (Ranil and Pushpakumar, 2012).
- Freshwater fish, pterodophytes, orchids and aquatic ornamental plants were the most affected groups by over-exploitation.
- Angiosperms in general were most affected by habitat loss and loss of pollinators (Wijesundara et al, 2012).
- Freshwater fishes were particularly affected by changes in water regimes, including mini-hydro projects, reservoir projects; erosion and sedimentation exacerbated by gem mining; and destructive fishing methods (Goonatilleke, 2012).

1.4.2 Threats to wild relatives of crops

- Most populations are not found in Protected Areas (PAs) and are therefore vulnerable to deforestation, urbanization, expansion of agricultural lands, and land clearing.
- Many species are vulnerable to climate change and landslides.
- Some species are over-extracted as food.

1.5 Impacts of change in biodiversity for ecosystem services supporting socio-economic development and cultural aspects

Section 1.2.4.1 indicated the value of biodiversity for enabling ecosystem services, particularly those of economic value, all of which will be affected by loss of biodiversity in Sri Lanka. This section reiterates some of the negative ramifications of biodiversity loss for ecosystem services that support socio-economic development and cultural aspects at the national left.

1.5.1 Impacts of habitat loss, fragmentation and degradation

This is a widespread threat felt across all ecosystems in Sri Lanka (BDS/MoERE and DNBG, 2012), and is the most serious factor driving species loss in the island.

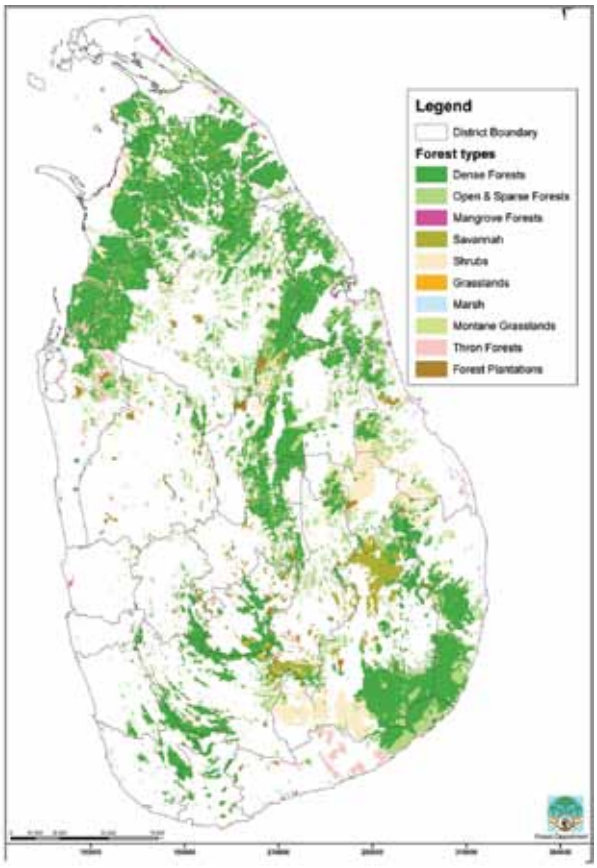

FIGURE 1.5: Forest cover in Sri Lanka in 2010 – by Forest Type

With regard to forests, a positive factor is that through judicious management, the rate of deforestation has been significantly reduced (though not eliminated), and the Mahinda Chintana policy framework has set a target of increasing the forest cover to 35% of the island's land area by 2020. Table 1.12 provides the strategy proposed by the Forest Department to reach this target. As loss and degradation of forests is a key threat to many species (BDS/MOE &DNBG, 2012), increasing the island's forest cover to 35% can be expected to have a beneficial impact on Sri Lanka's biodiversity and forest ecosystem services if this target is reached. However, unless forest degradation is also stemmed, there would be continued negative impacts on many species that are dependent on forests for survival (BDS/MOE &DNBG, 2012).

Table 1.12: Projected forest cover in different categories of forests by 2020

Land use	Strategy	Target area (ha)	Percentage of total land area
Forests	Conservation	1,951,472	29.74 %
Shrubs and grasslands	Restoration	100,000	1.52%
Forest plantations	Convert to mixed species plantations	40,000	0.61 %
Home gardens	Improve cover with multi-purpose trees	210,000	3.20 %
Total		2,301,472	35.07 %

Source: Edirisinghe, EAPN, Forest Department, 2014

Wetlands have received much less attention than forests since the last reporting period. Continued reclamation and degradation, despite support from policies and laws, have had many adverse impacts on wetland ecosystem functions. These include loss of habitats for wetland species, and reduced species richness and carrying capacity of wetlands (Weerakoon and Gunawardena, 2012). This has affected many wetland species of socio--economic importance, particularly in the ornamental and food fishery. Systomus martenstyni is an example of a rare endemic species of

freshwater fish with a limited range (i.e. found only in the Knuckles forests) that is endangered due to wetland degradation and loss (Goonetillele, 2012). Notably, 41% of the island's aquatic flora are nationally threatened (Yakandawala, 2012).

Wetland reclamation has also increased the flood hazard in both urban and rural areas. Already, flood damage entails heavy expenditure by the government in terms of flood relief and compensation (MoE, 2010c). The negative impacts of flooding have already been felt in several urban areas of Sri Lanka where wetlands have been reclaimed and converted to other uses, due to loss of flood retention capacity. Large scale irrigation schemes and hydropower reservoirs which are dependant on a good water flow for multiple uses are affected when reservoir capacity is reduced due to siltation. This has also reduced the capacity for hydro-power which is a source of cheap and clean energy. Conversely, the proliferation of mini-hydropower plants that have not adhered to environmental safeguards may lead to the loss of habitat for some rare and endangered aquatic species. Examples of affected species are aquatic plants of the family Podostemaceae (Yakandalwela, 2012) and the endemic Asoka Barb *Systomus asoka*. In some areas there are conflicts of interest due to perceived impacts of mini-hydro-power plants on tourism related activities (e.g. white water rafting) and related local livelihoods. This underlines the need for sound environmental considerations when managing such enterprises and good communication between all stakeholders.

Coastal and marine systems have been affected due to loss and degradation of habitats, pollution, destructive fishing practices, and over-exploitation of resources. For example, the drop in the shrimp fishery in Negombo, which was linked to the loss of seagrass beds from destructive fishery practices, led to loss of livelihood for fishermen and reduced fishery productivity. As destructive fishing practices continue in other locations this can be expected to negatively affect both the food fishery and the ornamental fishery. The biodiversity of some coastal lagoons (e.g. lagoons within the Bundala National Park) have been seriously affected by hydrology and salinity changes, which have affected the fish and crustacean fauna, and consequently the fishery. This has also affected the composition of water birds that feed on crustaceans, reducing the attraction of the BNP to bird watching tourists (NSF, 2014 d).

1.5.2 Impacts of pollution

Pollution is widespread (BD/MOE &DNBG, 2012), and has resulted in loss or degradation of ecosystem services and species in wetlands, coastal and agricultural systems. Pollution occurs due to contamination with fertilizers, pesticides, weed killers, sewage, chemical compounds from shrimp farms in coastal areas, and unsafe dumping of untreated industrial wastes, e-wastes, and solid waste. Pollution has already prevented supporting ecosystem services in many aquatic system by rendering such habitats unusable to freshwater species, such as dragonflies, freshwater crabs, land snails, freshwater fish, amphibians and aquatic plants that need clean clear water (BD/MOE &DNBG, 2012). As such, several species that are important as food fish, ornamental fish and plants have been affected by pollution, affecting rural livelihoods and the gain of foreign exchange (BD/MOE &DNBG, 2012). Likewise, agro-chemical pollution has adversely affected bees and butterflies which are much needed pollinators in agricultural systems, which can affect agricultural production and livelihoods of farming communities. This is denoted by the high percentage of threatened species among bees and butterflies. Pollution of inland and coastal waters with sewage and agrochemicals has also significantly increased the incidence of disease among rural people, due to direct contact with polluted water or consumption of contaminated fishery and other wetland products. Reduced water quality for bathing and drinking has also affected human health as many rural people still rely on wells (ground water) and surface waters in rivers and irrigation tanks for domestic water needs.

1.5.3 Impact of over exploitation of biological resources and adverse resource extraction practices

Some pteridophytes and freshwater ornamental plants (e.g. ornamental ferns and aquatic plants such as Cryptocoryne, Aponogeton and Lagenandra) are the most affected due to over-exploitation (BD/MOE &DNBG, 2012) leading to their increased threat status (ibid). In wetlands,

freshwater ornamental fish, including many endemics, are at risk from over exploitation of wild stocks for the export industry. This is detrimental for the sustainability of the ornamental fish industry which earned export earnings of US$ 175,400 in 2013/14.[41] Other examples are the over exploitation of rattan species in the wet zone forests in the past which has led to non-availability of raw material and the total collapse of the rattan based traditional cottage industry in rural areas near wet zone forests. In recent years, a high demand and market price for walle-patta *(Gyrinops walla)* is causing damage to many wet zone forests when these trees are cut indiscriminately for extraction of the resin (found only in some stems) due to its high market price when exported for value added use in the cosmetic industry elsewhere. Over harvesting of herbivorous reef fish (e.g. the Humphead wrasse *(Cheilinus undulatus)* that feed on juvenile Crown of Thorns Starfish) is altering the ecological balance of coral reefs with detrimental impacts. Likewise, coastal waters are over–exploited in the food fishery.

1.5.4 Impact of the spread of Invasive Alien Species (IAS)

This has increased threat status of several species, and has caused degradation of natural and agricultural systems and the resources they provide. The accidental and intentional introduction of IAS has caused serious environmental and economic problems by reducing functional area of wetlands (e.g. infestations with Salvinia and Water hyacinth), creating reduced surface waters for human use, causing problems in irrigation tanks and hydro-power reservoirs, and leading to loss of habitat for native freshwater dependant species. Some introduced fish species such as tilapia are believed to imperil local indigenous fish species. Intentional and accidental introduction of invasive alien fish species such as *Chitala chitala* (Clown knife fish) and *Hypostomus plecostomus* (Suckermouth catfish) are threatening the existence of native fresh water fishes (Gunawardane, 2012). Several national parks now have major problems due to the spread of IAS (Perera, 2012). Examples are *Lantana camara* in the Udawalwe National Park and *Prosopis juliflora* in the Bundala National Park. Such vegetation reduces the grazing area for large herbivores. Apart from the impact on wildlife, this reduces the food for charismatic grazing animals and their prey that are major tourist attractions. Agricultural systems too have been periodically challenged by IAS, requiring remedial measures at high cost and considerable effort.

1.5.5 Escalation of human-wildlife conflict

Human-wildlife conflict in Sri Lanka has increased in recent years, resulting in increased threat to target species and socio-economic loss to affected people. The most predominant problem is the human-elephant conflict due to forest clearing for development, human settlements, and irrigated agriculture, as it has reduced habitat for elephants and disrupted their migration routes. *Chena* (slash and burn) cultivation in the Dry Zone forests with crops that attract elephants have also brought elephants into closer contact with humans. This has led to increased vulnerability of elephants to poaching and has intensified problems for humans. This conflict resulted in 68 human deaths and 203 elephant deaths in 2013 in addition to large scale damage to crops and human habitations.[42] Likewise, the human-monkey problem has increased in the past few years. The large number of hotels and human habitations that have been established in close proximity to forests in the dry zone, poor garbage disposal, and lack of adequate food in forests year round are factors that have compounded this problem with the endemic toque macaque. Likewise, the rapid fragmentation of home gardens and resultant loss of food trees have led to an increase of human-monkey conflict in the wet zone due to increased competition between humans and monkeys for fruit crops. In addition, many wet zone forest reserves that could serve as 'monkey refuges' are too small, degraded and isolated to provide this service adequately.

41 Data from the Department of Customs, 2014
42 Data from DWLC in 2014

1.5.6 Reduced potential for crop enhancement, bio-prospecting and natural product development

Section 1.2.5.1 provides information on the potential for bio-prospecting, crop enhancement and natural product development in the country. Already some species such as Exacum spp. (Binara), which are rare wild plants found in Sri Lanka with floriculture prospects in future, are now facing severe genetic erosion due to anthropogenic threats to habitats. Many of the orchids in the country are also threatened with extinction. Sri Lanka has been identified as a country with a gene pool for global edible insects, numbering about 20 species which are currently not used by local people.[43] Thus the loss of species and genetic diversity due to the threats listed above, especially due to disruption of ecosystem services caused by habitat loss/degradation, pollution, and spread of invasive species will reduce Sri Lanka's potential for bio-prospecting and natural product development with a view to increasing foreign exchange earnings for the country.

1.6 Possible future changes in biodiversity and their impacts

Threats to biodiversity if not addressed adequately in a timely manner will have many socio-economic implications in the future. For example it will affect resources available for tourism, agriculture and livestock production, fishery (ornamental and food fishery), energy generation, provision of water for multiple uses, and traditional systems of health care. Forest loss will also reduce adaptability to climate change in the future and increase the impacts of potential water scarcity predicted due to climate change (MoE, 2010c). Apart from the impacts already presented in section 1.5 that would be increased in intensity, climate change has been identified as a key factor that could seriously affect biodiversity for ecosystem services in the future. While the impacts are yet not certain, some are very probable. Sri Lanka being an island is vulnerable to the possible impacts of sea level rise and coastal flooding based on global models of sea level rise. Low lying agricultural systems in coastal areas would be affected by saline intrusion, and coastal areas would be affected by frequent storm surges and coastal erosion, with the loss or severe degradation of beaches, mangroves, coral reefs, seagrass beds, and the organisms they contain.

The changes wrought in coastal and marine systems in terms of species diversity and abundance, and ecosystem services, due to sea level rise, global warming and ocean acidification, can be expected to cause significant changes in fish stocks. This will directly affect the coastal and marine fishery, livelihoods of a large number of local fishers and others connected with the fishery, and ultimately affect the national economy and nutritional status.

Sri Lanka's abundant inland freshwater that is dependant on rainfall could also be jeopardized in the future due to increased rainfall variability and changes in rainfall regimes. This can be expected to have negative impacts on the health of forests and wetlands, and accordingly on forest and aquatic species, and the use of freshwater for human well-being and economic development (MoE, 2010c).

Figure 1.5 shows a composite map prepared by the superimposition of the distribution of threatened amphibians, dipterocarps and orchids[44] during preparation of the Climate Change Adaptation Strategy for Sri Lanka (MoE, 2010b). Amphibians and orchids are considered very sensitive to climate change, show high endemicity, and are mainly found in the island's rainforests. All Dipterocarp species in Sri Lanka are endemic, and occur in the country's biodiversity rich rain forests. Together the location of these three groups was expected to indicate areas of rich biodiversity and endemism. The map thus provides an insight into how climate change could adversely impact Sri Lanka's unique endemic species in the biodiversity rich wet zone. Further, it shows that forest ecosystems and species in fringe areas between the major climatic zones are expected to be the most likely to be impacted by climate change. These areas contain some of the most biodiversity rich forests of the wet zone. More work is necessary, however, to make definite predictions in this regard.

43 Data from Dr M N Goonetilleke, Colombo National Museum provided by Sampath Goonetilleke, 2014 at the final workshop to validate this document

44 Using maps prepared under the PAM&WC project/Portfolio of Strategic Conservation Sites/Protected Area Gap Analysis in Sri Lanka (2006]

Climate change can also be expected to change flowering/fruiting and flushing in forest species and crops and to disrupt the breeding and reproduction of wild fauna and livestock. It is also expected to result in greater spread of invasive species. This will inevitably lead to an increase in the number of threatened indigenous species, leading to species extinctions (MoE, 2010b).

Changes in rainfall regimes due to climate change could lead to pronounced water scarcity, droughts and unpredicted heavy rains that will disrupt cropping cycles and cause socio-economic upheavals among farming communities, affect human well-being and impede national development (MoE, 2010a, 2010b, 2010c, and 2010d).

Due to the influence of climate change on phenology of forest and crop species, it can have adverse impacts on forest structure and species composition, and affect agriculture and livestock production. There can also be the increase of pest and disease, and increase invasions by IAS. This will affect the national food supply, nutrition, and human health and wellbeing.

Climate change impacts on biodiversity of ecosystems (including beaches and protected areas) that are attractive to tourists could impede Sri Lanka's drive to make tourism one of the highest foreign exchange earners for the country in the future.

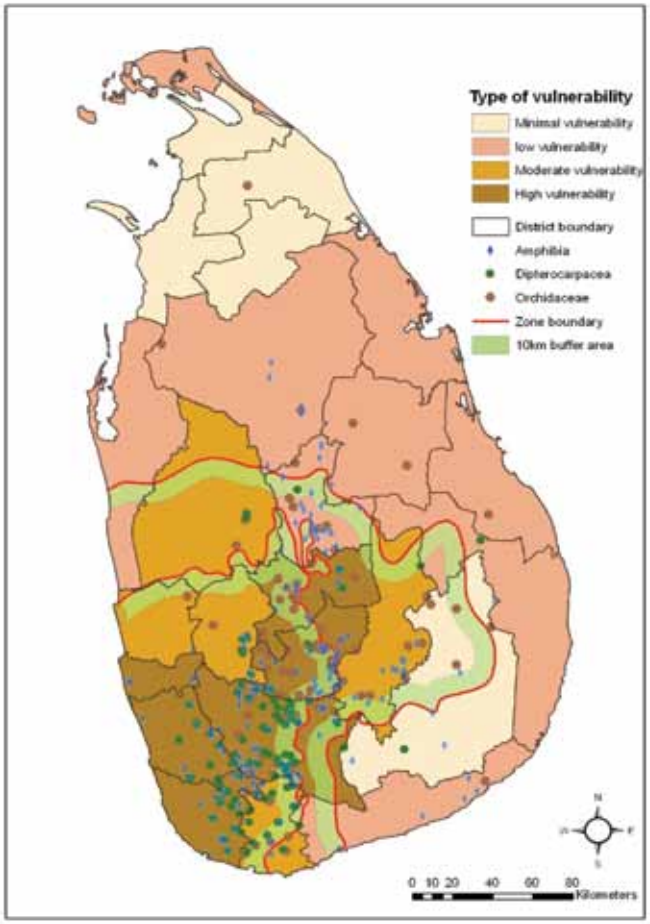

FIGURE 1.6: The potential vulnerability of Sri Lanka's biodiversity rich areas and sites of high endemism to climate change, by Divisional Secretary Division.

Source of distribution of threatened amphibians, orchids and dipterocarps is MoENR, 2006

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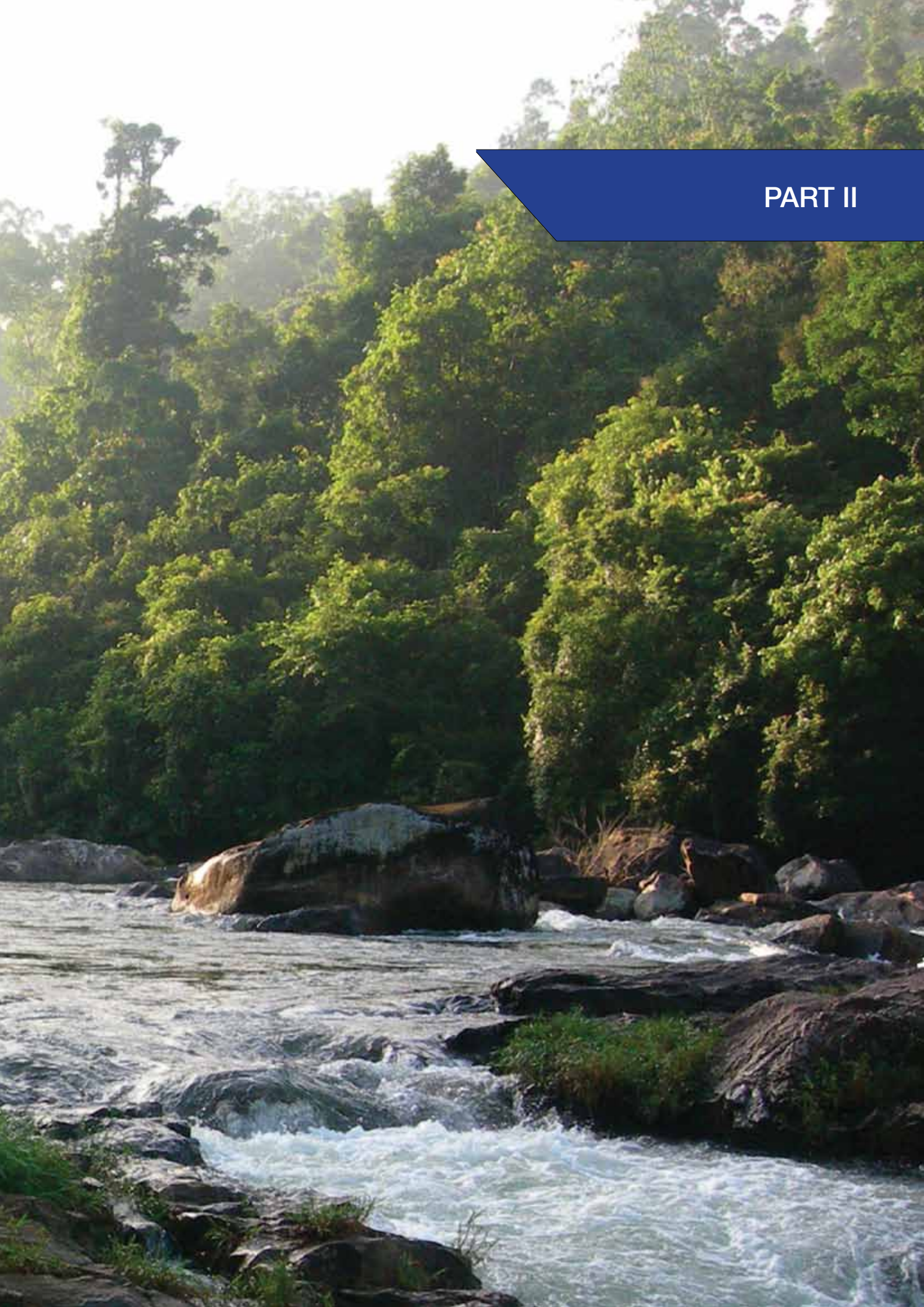

PART II

The National Biodiversity Strategy and Action Plan, It's Implementation and the Mainstreaming of Biodiversity

2.1 INTRODUCTION

This section begins with a brief description of the Thematic Programs of Work established by the Convention of Parties (COP) and the key matters of relevance to those thematic areas, i.e. the Cross-Cutting issues, followed by listing of the National Goals and Broad Objectives of biodiversity conservation in Sri Lanka. The Biodiversity Targets in Sri Lanka specified in the 'Biodiversity Conservation Action Plan', commonly referred to as BCAP, and 'Addendum to the BCAP' is presented next. The actions taken to implement the convention, since submission of the Fourth National Report (2009) and their outcomes are then summarized, where the specific outcomes are achieved, their contributions to national actions, and any obstacles hindering implementation of recommended actions are then highlighted. The effectiveness of mainstreaming biodiversity into relevant sectoral and cross sectoral strategies, plans and programs are further explored. Finally, it presents the level of achievement of recommended actions included in the BCAP and Addendum, individually and collectively.

2.1.1 Thematic Programs and Cross-Cutting Issues Established by the CBD

The revised and updated 'Strategic Plan for Biodiversity', including the Aichi Biodiversity Targets for the 2011 – 2020 period, which was adopted at the meeting of the Conference of the Parties (COP), held from 18 to 29 October 2010 in Nagoya, Japan, provides an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system. All the parties to the convention are engaged in biodiversity management and policy development specified under the 20 headline targets which are organized under five strategic goals[45].

The Conference of the Parties (COP) agreed to translate this international framework into a revised and updated National Biodiversity Strategies and Action Plan (NBSAP) within two years and to prepare the Fifth National Report mainly focusing on reporting the implementation of newly updated NBSAP. The COP has established seven thematic programs of work, which correspond to some of the major biomes on the planet, including: (1) Agricultural Biodiversity; (2) Dry and Sub-humid Lands Biodiversity; (3) Forest Biodiversity; (4) Inland Waters Biodiversity; (5) Island

45 www.cbd.int/sp/

Biodiversity; (6) Marine and Coastal Biodiversity, and (7) Mountain Biodiversity. Each program establishes a vision for, and basic principles to guide future work. They also set out key issues for consideration, identify potential outputs, and suggest a timetable and means for achieving these objectives. Implementation of the work programs depends on contributions from Parties, the Secretariat, relevant intergovernmental and other organizations. The COP has also initiated work on key matters of relevance to all thematic areas.

These Cross-Cutting issues correspond to the issues addressed in the Convention's substantive provisions in Articles 6-20, and provide bridges and links between the thematic programs. Some cross cutting initiatives directly support work under thematic programs, for example, the work on indicators provides information on the status and trends of biodiversity for all biomes. Other initiatives develop discrete products quite independently from the thematic programs. The work done for these cross-cutting issues has led to a number of principles, guidelines, and other tools to facilitate the implementation of the Convention and the achievement of the 2010 biodiversity targets.[46]

2.1.2 National Goal and Broad Objectives of Biodiversity Conservation

The overall National Goal of Biodiversity Conservation, as stated in the BCAP, is to 'conserve the biological diversity of Sri Lanka, while fostering its sustainable use for the benefit of the present and future generations'. In order to achieve this goal in the long term, the following five broad objectives were set out:

1. To build capacities and develop programs for gaining a better understanding of the different components of the country's indigenous biological diversity and the processes that govern their functioning.
2. To identify adverse impacts (including potential impacts) on the different components of biodiversity; to take action to mitigate such impacts and to avert potential adverse impacts.

46 Aichi Biodiversity Targets; Access to Genetic Resources and Benefit-sharing; Biodiversity for Development; Climate Change and Biodiversity; Communication, Education and Public Awareness; Economics, Trade and Incentive Measures; Ecosystem Approach; Gender and Biodiversity; Global Strategy for Plant Conservation; Global Taxonomy Initiative; Impact Assessment; Identification, Monitoring, Indicators and Assessments; Invasive Alien Species; Liability and Redress; Protected Areas; Sustainable Use of Biodiversity; Tourism and Biodiversity; Traditional Knowledge; Innovations and Practices; Technology Transfer and Cooperation.

3. To build capacities and develop programs to enhance the populations of species those are in demand and are under threat due to excessive collection.
4. To manage bioresources so as to conserve biodiversity while enabling the use of the resources within sustainable limits.
5. To enhance public awareness on biodiversity and encourage public participation in its conservation.

2.2 The Biodiversity Targets Set by Sri Lanka

In the context of Sri Lanka, action taken to incorporate those 20 headline targets specified under five strategic goals through development of appropriate national targets to produce an updated NBSAP was limited to formulation of the 'Biodiversity Conservation Action Plan' (BCAP), which was undertaken in response to Article 6 of the Convention of Biological Diversity in early 1996 and finalized in 1997, and later in 2003, preparation of an 'Addendum' to the BCAP. These two documents serve as the key strategic action plans as of today showing the pathways to achieve the key objectives governing biodiversity conservation in Sri Lanka, and are discussed in turn.

A strategy for the preparation of a National Biodiversity Action Plan was developed by IUCN Sri Lanka in 1994. This was followed by the preparation of a Biodiversity Conservation Action Plan (BCAP), which was approved by the Cabinet in 1998 and published in 1999. It sets out the range of activities needed for addressing biodiversity as a coordinated, holistic exercise, and urges that biodiversity conservation is of critical importance for the ecological and economic sustenance of the nation, and brings together within a single framework, all activity areas that need to be addressed.

For the preparation of the BCAP, the ecosystem diversity of Sri Lanka was categorized into four broad thematic areas: (1) Forests; (2) Wetlands; (3) Coastal and Marine systems, and (4) Agricultural systems, which are somewhat parallel to the thematic work programs identified under the CBD in ecosystems that are of relevance to Sri Lanka (Table 2.1).

Table 2.1: Classification of specific objectives and recommended actions in the BCAP thematic areas

Thematic Areas Identified in the BCAP	No. of Specific Objectives	No. of Recommended Actions	Corresponding Area in the CBD
1. Forests	7	24	Forests
2. Wetlands	3	16	"Inland Waters"
3. Coastal and Marine Systems	5	28	Coastal and Marine
4. Agricultural Systems	3	6	Agricultural
Total	**18**	**74**	

This classification, besides signifying an ecological differentiation, is useful in terms of the division of responsibilities between different organizations of government. In turn, several specific objectives were set to be achieved under each thematic area. To achieve those specific objectives, in particular, and the broad national objectives for biodiversity conservation in Sri Lanka in general, a number of Recommended Actions were included under each thematic area. In addition to the 4 thematic areas listed above, the BCAP identified specified objectives, recommended actions, and main implementing institutions for several Cross-Cutting areas, including: (A) Priority action of selected Bioregions; (B) Ex-situ conservation; (C) Research; (D) Education and awareness; (E) Biodiversity information; (F) Legal matters; (G) Institutional support, and (H) Valuation of biodiversity (refer to: BCAP, 1997).

In summary, the BCAP comprised of 74 Recommended Actions to achieve 18 specific objectives listed under 4 thematic areas and another 73 recommended actions to achieve 22 specific objectives listed under 7 cross-cutting areas, and serves as the key document governing the national policies, programs, projects and strategies towards biodiversity conservation in Sri Lanka.

There has not been a systematic approach to upgrade the BCAP by including measurable national targets developed in line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020.

2.3 Updating the National Biodiversity Strategy and Action Plan to Incorporate Targets and to Serve as an Effective Instrument for Mainstreaming Biodiversity

With the objective of updating the BCAP to serve as an effective instrument, the Minister of Environment appointed the Second National Experts Committee on Biological Diversity in 2003. The 'Addendum' to the BCAP coming out of this exercise consists of 102 recommendations made by the 16 Task Force Teams[47], and 31 out of which 45 were categorized as "high priority category"[48] (refer to: Addendum to the BCAP, 2003).

Since then, there has not been an effective and systematic mechanism in place to upgrade the BCAP by including measurable targets, especially to incorporate those Aichi Biodiversity targets to NBSAP.

2.4 Actions Taken to Implement the Convention since Submission of the Fourth National Report and their Outcomes

The key actions taken, major outcomes achieved and obstacles encountered through implementation of 74 Recommended Actions stated in BCAP thematic areas (i.e. Forest, Wetlands, Coastal and Marine systems, and Agricultural systems) are highlighted in Table 2.2, 2.3, 2.4 and 2.5, respectively. Table 2.6 reports the same for the 31 Priority Recommendations listed in the Addendum to the BCAP.

The impacts of actions implemented on prevention/mitigation of threats identified in Part I of this report are provided in Annex 6.

47 The 16 Thematic and Cross-cutting areas identified were as follows: (i) In-situ conservation; (ii) Ex-situ conservation; (iii) Access to genetic resources; (iv) Traditional knowledge and cultural biodiversity; (v) Impacts on biodiversity; (vi) Sustainable use and benefit sharing; (vii) Biosafety; (viii) Biodiversity valuation and economics of conservation; (ix) Policies, strategies and action planning; (x) Monitoring and co-ordination; (xi) Institutional aspects and capacity building; (xii) Legal framework on biodiversity conservation; (xiii) Education, awareness and training; (xiv) Research, development and technology transfer; (xv) Information management, and (xvi) Agricultural biodiversity.

48 Addendum to the BCAP, 2003

Table 2.2 - Key actions taken, major outcomes achieved, and obstacles faced for BCAP thematic area: "Forest"

No	Recommended Action	Key Actions Taken Since the 4th National Report and The Major Outcomes	Obstacles Faced in Implementations
1	Develop a system for the regular monitoring of forest biodiversity, and take remedial action to rectify any negative trends as and when necessary, including threats from invasive species.	Since the 4th National Report, no systematic monitoring of biodiversity was done at national or regional level. However, several assessments of isolated nature have been carried out in number of locations, including Kanneliya Biosphere Reserve, and few other places. Biodiversity assessment carried out in Kanneliya Biosphere Reserve indicates that the species composition in the forest has changed. Pioneer and secondary species in the forest have reduced, and primary species have increased.	A country wide biodiversity monitoring is generally an expensive activity. Initial biodiversity assessment (National Conservation Review) was carried out during 1992 – 1996 with financial support from Forestry Sector Development Project (FSDP). Since then, systematic country wide monitoring of biodiversity was not undertaken primarily due to (1) Lack of financial resources; (2) Non-availability of expertise in the Forest Department for systematic country wide biodiversity monitoring; (3) This activity gets low priority in regular annual programs.
2	Take effective action to stop further encroachments on the wet zone forests (bioregions 4, 5 and 6).	Forest Ordinance was amended in 2009 and legal provisions regarding preventing encroachments were strengthened, and as a result, encroachments in the forests have been reduced.	Prevention of encroachments is a regular forest protection program in both FD and DWLC. Inadequacy of staff is a significant barrier for doth departments for more effective prevention of encroachments
3	Take action to prevent the use of high-forest areas and fragile ecosystems for chena cultivation.	This is carried out on regular basis, as it is a normal forest protection activity of the FD and DWLC.	Main barrier to prevent the use of forest areas and fragile ecosystems for ***chena*** cultivation is poverty. Due to this situation, some village people in very remote areas do ***chena*** cultivation as their livelihood. Most of them do not have their own private lands for cultivation of their crops; hence, they tend utilize the forest lands for cultivation.

No	Recommended Action	Key Actions Taken Since the 4th National Report and The Major Outcomes	Obstacles Faced in Implementations
4	Complete the preparation of management plans (including surveying and boundary marking) for all protected areas; ensure that such plans continue to recognize the participatory role of communities living in proximity to the areas under protection and adequately address the conservation and sustainable use of biodiversity.	Management plans have been prepared for several protected areas, (Example: Revision of the Management plans of Sinharaja and Knuckles World Heritage Forests were completed in 2009). Several new/revised management plans in place. Preparation of management plans has become a mandatory legal requirement according to the amended Forest Ordinance (2009) and Fauna and Flora Protection Ordinance (2009).	The main barrier for preparation of management plans for forest areas (including surveying and boundary marking) is non-availability of adequate financial resources to carryout surveying and boundary marking work.
5	Actively implement the conservation-management plans of protected areas, giving due attention to buffer zone activities involving the peripheral communities.	Management plans for protected areas are being implemented on regular basis, as this is a normal activity of the FD and DWLC.	No significant barrier for this program.
6	The Forest Department and Department of Wildlife Conservation to collaborate to strengthen their capabilities in protected area management.	Capabilities of two departments are strengthened independently. However, there is no significant collaborative effort for strengthening capabilities of FD and DWLC.	No significant collaborative effort for strengthening capabilities due to low priority in collaborative approaches.
7	Enhance field staff capability in pest management, protection against unlawful activities, and fire protection.	Enhancing field staff capability in pest management, protection against unlawful activities, and fire protection are regular programmes of relevant departments. Hence these activities have been carried out since the 4th National Report.	As these are regular programmes of relevant departments, there are no significant barriers for implementation of these programmes.

No	Recommended Action	Key Actions Taken Since the 4th National Report and The Major Outcomes	Obstacles Faced in Implementations
8	Define, demarcate and establish an optimal protected area system network utilizing scientific and distributional data available from the NCR, paying special attention to the conservation of endemic species of plants and animals.	Define, demarcate, and establish an optimal protected area system network has been partially completed. Further, the FD has demarcated and gazetted a large number of protected areas since the 4th National Report. Thirty two (32) Conservation forests and large number of Forest reserves have been demarcated and gazetted after 2008.	This activity has been completed partially. Considerable forest areas are still to be surveyed and demarcated by the FD in order to complete the establishment of protected area system. As this activity involves high cost, lack of financial resources act as the main barrier.
9	Ensure that activities in forests outside protected areas are governed by management plans that pay adequate attention to the conservation of biodiversity.	No significant action in this aspect, and as a result, no significant outcome is seen.	Most of the forests outside protected areas are owned by private organizations and state agencies outside FD and DWLC.
10	Both within and outside protected areas, promote *in-situ* conservation activities that specially target threatened species.	The *in-situ* conservation activities targeting threatened species are being carried out within protected areas. Commercial logging operations in all the natural forests in the country are banned since 1990; therefore species in state forest areas are protected. Forest Ordinance, Fauna and Flora Protection Ordinance and National Heritage and Wilderness Areas Act provide the legal protection for flora and fauna species within protected areas.	No significant barrier for this programme within protected areas. But, no effective programme and legal protection for outside protected areas.
11	Establish a mechanism to continually expand and update the Forest Department's database on faunal and floral species in forests and other natural habitats.	A mechanism to continually expand and update the FD's database on faunal and floral species is not available.	Lack of financial resources act as the main barrier for this activity.

No	Recommended Action	Key Actions Taken Since the 4th National Report and The Major Outcomes	Obstacles Faced in Implementations
12	Strengthen research capacity and pursue research on the silvics of selected forest species, with a view to promoting natural regeneration of, or actively propagating, these species.	This is carried out by the Research Division of the FD on regular basis, as this is within their normal program.	No significant barrier for this program.
13	Review the issue of deniya permits for cultivation in forests in relation to the impact of this practice on biodiversity.	This recommended action has been recognized as not relevant as this practice of issuing ***deniya*** permits have been abandoned around year 2000.	This practice has been abandoned some years back.
14	Strengthen research capacity and pursue research to determine sustainable use thresholds for selected forest species.	This has not been done effectively, and as a result, there is no significant outcome is there.	This activity has not been recognized as a priority action.
15	In forest extension work, promote the use of selected indigenous species of timber, medicinal plants, and food and fibre producing plants, targeting home gardens, private woodlots, etc.	This is carried out as a regular programme. FD annually raise over one million seedlings for forestry extension work, majority of these seedlings are indigenous species of timber, food and fruit seedlings.	No significant barrier for this activity.
16	Promote the conservation and propagation of indigenous medicinal plants.	This has not been done effectively.	This activity is not a priority in FD programs due to inadequate co-ordination between the FD and Ayurveda Department.
17	Establish a suitable mechanism for ensuring co-ordination in the management of protected areas and the conservation of biodiversity between the Forest Department and the Department of Wildlife Conservation.	No effective mechanism for co-ordination, and as a result, no significant outcome is there.	Establishing an effective mechanism for co-ordination between the two departments for management of protected areas and the conservation of biodiversity has not been given adequate priority.
18	Expand programmes for afforestation, reforestation and forest rehabilitation, paying attention to the use of indigenous species as far as possible.	Indigenous species are being used by the FD in their afforestation and reforestation programs.	No significant barrier for this activity. Nevertheless, the timber value and growth rate of the tree species planted are important considerations in selecting tree species for planting by FD for timber production.

No	Recommended Action	Key Actions Taken Since the 4th National Report and The Major Outcomes	Obstacles Faced in Implementations
19	Promote the improved utilization of timber and the use of alternative materials in place of timber.	This is carried out to some extent by the State Timber Corporation (STC) under their annual research programme.	No significant barrier for this, but need to provide more emphasis on this aspect.
20	Organize skills enhancement and awareness programmes on biodiversity conservation for operational staff, NGO participants, CBO personnel and rural communities.	This is carried out on annual basis for operational staff of the FD and DWLC. This is being done for CBO personnel and rural communities by the FD under its Community Forestry Program.	No significant barrier for this program. However, funding is a limitation to undertake these programs extensively.
21	Establish forest plantations on currently non-productive land as entrepreneurial ventures in collaboration with the private sector to cater to the timber and fuel wood demand.	This is being carried out annually by the FD at present as a component of their normal program.	Funding is a limitation to undertake this activity at large scale.
22	Review legal instruments relating to the collection of forest plants and animals, including regulations relating to export, and amend in order to eliminate anomalies and strengthen the law, so as to afford protection to threatened species of indigenous plants and animals.	This has been carried out to some extent. Further amendments to legal provisions are needed.	No significant barrier for this.
23	Strictly enforce the laws relating to collection, possession, sale, and export of plants and animals protected by law.	This is carried out as a regular activity of the FD and DWLC.	No barrier for this activity.
24	Expand and maintain the program of setting up urban forests, and develop educational and awareness programs in relation to these forests.	This has been carried out in several areas.	No barrier for this activity.

Table 2.3 - Key actions taken, major outcomes achieved, and obstacles faced for BCAP thematic area: "Wetlands"

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
1	Continue to develop strategies and plans for the management of wetlands.	Activities under the purview of the National Wetland Policy and National Wetland Steering Committee are in effect to some extent.	Lack of coordination between institutions hinders effective implementation.
2	Strengthen and enhance current efforts to identify critically important wetlands in terms of biodiversity, and prepare site reports and management plans where necessary.	National Wetlands Directory in collaboration with the CEA, IUCN and IWMI. However, this is not comprehensive enough, as it has not covered the North and East provinces of the country.	Lack of comprehensive information with respect to a complete array of wetlands and their biodiversity values / Lack of funds and commitment by the mandated institutions.
3	Prepare suitable maps and implement the management plans for wetlands, taking into account the need for collaboration between the several state institutions concerned, including the provincial administration, and based on participatory management principles.	The Strategic Environmental Assessment carried out for the Northern Province identified wetlands as a critical habitat. Also, Wetland Mapping carried out for Ampara district in the Eastern Province.	Lack of funds and adequate specialized staff are limitations to undertake activities at large scale.
4	Increase public awareness of the importance of wetlands and their benefit to local communities through the print and electronic media (government departments in collaboration with the private sector, media and NGOs).	The CEA individually and with the aid of NGOs carried out several environmental awareness programs for various target groups. Also, annual events are organized to celebrate the Wetland Day. Wetlands Magazine has been published regularly.	Lack of funds and adequate specialized staff are limitations to undertake activities at large scale.
5	By prohibiting or strictly regulating collection from the wild and adopting active measures, promote the conservation of aquatic fauna and flora species under threat.	The Flora and Fauna Protection Ordinance (2009) was amended targeting better protection of wetlands and their biodiversity.	Lack of human resources to enforce the law properly.
6	Carry out a comprehensive awareness program to combat disposal of household and industrial refuse into wetlands and enhance capability for law enforcement.	Implementation of *"Pilisaru"* Garbage Management Project by the CEA. The Urban Development Authority (UDA) implement the household garbage disposal project.	Lack of funds, adequate specialized staff on scientific land filling, and community awareness act as limitations to undertake these activities.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
7	Increase the use of wetlands for education and eco-tourism.	There are certain private sector initiatives towards utilization of some wetlands for educational purposes.	Lack of availability and access to valid information.
8	Strengthen the capability of NARA and other relevant state institutions for regular monitoring of freshwater aquatic-biodiversity, in collaboration with universities and NGOs, and provide guidelines where necessary.	There is properly designed and active system in place.	Lack of coordination between institutions, resulting from funds, staff and interest, hinders effective implementation.
9	Carry out studies on the impact of introduced exotic species of fish, and measures for their control if found to be harmful to indigenous wetland biodiversity.	No systematic program in effect	Lack of interest and resources, both physical and finance.
10	Undertake research programmes to culture threatened freshwater flora and fauna with emphasis on economically important species including those that are commonly exported.	Small to medium-scale research programs funded by the Treasury were carried out annually.	Lack and proper release of funds, qualified staff constraint effective implementation.
11	Assist those in the aquarium trade to culture organisms for export with stringent monitoring and control by the state sector through a licensing scheme.	Monitoring program has been conducted by Sri Lanka Customs in order to verify quantities of freshwater fishes and aquatic plants.	Lack of interest from responsible institutions.
12	Increase national funding for wetland associated research, with special emphasis on the ecology and culture of endangered and economically important freshwater species.	There is no effective program is in effect.	Not identified as a priority area. Lack of local or foreign funding to initiate programs.
13	Ensure that the forests identified as important hydrologically through the NCR study are brought within the protected area system and given strict protection.	Forest identified by the NCR as priority forest, has been surveyed, declared as conservation forest, as included in the protected areas network.	Inadequacy of funding to continue the survey and declared program for the balanced forest areas.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
14	Enforce the legal provisions for protecting river and stream reservations.	National Policy on Protection and Conservation of Water Sources, which includes a review of existing laws of conservation of water sources, was drafted. It is still not approved by the Cabinet of Ministers. Lack of enforcement of laws at present.	Lack of coordination with the Department of Irrigation.
15	Review the legal framework that relates to the conservation of wetlands, identify gaps and rectify as necessary either through strengthening existing laws or enactment of new laws pertaining to wetlands.	Certain revisions were made by the CEA and Department Agrarian Services.	Poor coordination and not in priority areas to allocate funds adequately and on time.
16	Examine government policies that may promote adverse activities concerning wetlands (e.g. reclamation of wetlands for urban development), and recommend remedial measures thorough the National Wetlands Steering Committee.	National Policy on Protection and Conservation of Water Sources, which includes a review of existing laws of conservation of water sources, was drafted. It is still not approved by the Cabinet of Ministers. However, adverse impacts have not been reviewed.	No coordination and plan to receive information on adverse activities to the Steering Committee.

Table 2.4 - Key actions taken, major outcomes achieved, and obstacles faced for BCAP thematic area: "Coastal and Marine Systems"

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
1	Strengthen and enhance current efforts to conduct a comprehensive fish resource assessment in Sri Lankan marine waters and an assesment of sustainable levels of harvesting for the food fishery.	Based on the NARA Annual Action Plan, comprehensive survey-based research studies on large and small pelagic fish species are in progress	-
2	Promote the preparation of management plans for the sustainable use of the fisheries resource, taking into consideration the establishment of fisheries reserves where necessary and regeneration of the near shore fishery resource.	Sustainable fisheries management on selected areas and species with economical value. Certain amenmends were made to the Fisheries Act.	Lack of emphasis on conservation of certain economically valuable fish resources
3	Promote research programmes to determine the sustainable levels of fish catches	Included in the NARA Annual Action Plan. Analysis and subsequent publications on impacts of harmful gears that are on progress.	-
4	Monitor the extent and sustainability of harvesting coastal resources such as ornamental fish, sea cucumber, moluscs, sponges and other species with a market demand.	Monitoring activities have been carried out in selected areas and some reports and publications were made.	Lack and proper release of funds, qualified staff constraint effective implementation.
5	Initiate and strengthen research for ex-situ cultivation of economically important coastal and marine species and identify alternatives to selectively exploited species where possible; disseminate results to the industrial sector through seminars, workshops and trainning programmes.	Several awareness program, seminars and workshops conducted that helped promotion of knowledge transfer to the relevant authorities.	Lack and proper release of funds, qualified staff constraint effective implementation.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
6	Initiate a comprehensive programme to study wild stocks of marine mammels in Sri Lankan waters, the catch estimates and the feasibility of alternative income generation through eco-tourism, and carryout an islandwide awareness campaign to stop the killing and sale of flesh of these species.	Initiated project work in collaboration with the universities	Lack and proper release of funds, qualified staff constraint effective implementation.
7	Preserve seagrass beds and encourage use of resources via proper in-situ culture and harvest practices among local communities and entrepreneurs.	Projects on seagrass are in effect. Awareness program for local communities completed and in place. GIS Mapping is being carried out.	Lack and proper release of funds, qualified staff constraint effective implementation.
8	Strengthen and enhance current efforts to map the biological resources, including corals, seagrass geds etc. in the coastal waters of Sri Lanka based on Geographical Information Systems (GIS).	Preparation of maps through GIS is in effect to produce resource maps.	-
9	Carryout scientific biodiversity assessment of coral reefs and other important marine systems to identify a minimum network of marine reserves to conserve the totality of marine biodiversity based on principles similar to the National Conservation Review of Forests.	Few isolated assessments have been done in selected areas (e.g. Wankarei, Silavathura, Bar reef). However, no proper network has yet been established.	No coordinated program. Lack and proper release of funds, qualified staff constraint effective implementation.
10	In collaboration with relevant state agencies, user groups and communities, prepare management plans for identified marine protected areas to conserve biodiversity, strengthen capabilities for management.	Awareness programs have been conducted in collaboration with the state sector institutions to provide data/information on bar reef marine santuary. Assessment reports were prepared in collaboration with the state sector agencies.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
11	Prepare and implement management plans and strengthen capability among stakeholders for conservation and mangement of mangrove areas using a participatory approach.	Awareness programs were conducted with the support of NGOs to promote conservation and effective management of mangroves. Management plans have, however, not yet been prepared.	-
12	Examine and monitor effects of fishing methods that may have adverse effects on biodiversity, and take appropriate action.	NARA Annual Projects on impact of fishing gears and monitoring activities carried out by the Fisheries Department. The findings are disseminated as reports to relevant authorities.	-
13	Enforce, strictly the current laws against the use of explosives, illegal types of fishing gear and harvesting of juvenile and gravid lobsters in the sea.	Implementation of regulations based on the Fisheries Act	-
14	Strengthen capabilities to enforce existing regulations against the slaughter of small cetaceans and turtles (including harvesting of their eggs), and provide better protection for feeding, breeding and nesting grounds of marine species, including licensing and state monitoring of turtle hatcheries.	Researches and continuous monitorng is being carried. Provision of data/information to take appropriate actions.	-
15	Control the expansion of prawn farms into mangrove areas and salt marshes to prevent excessive biodiversity loss, and preserve all biodiversity rich areas as habitats for aquatic fauna and flora.	Awareness programs have been conducted. Expansion is controlled to some extent.	Lack and proper release of funds, qualified staff constraint effective implementation.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
16	By prohibition or strict regulation of collection from the wild and other active measures, promote the conservation of coastal and marine species of fauna and flora of species under threat.	2009 Amendment of the Fauna and Flora Protection Ordinance - strictly protected list - Reptile, mammals, amphibians,whale,wetland birds.Proposals were made to conduct on Marine species in Yala, Kumana and Wilpattu. Legal actions are being taken to impose penalties.	-
17	Increase institutional capacity for strict enforcement of laws against sand and coral mining.	Controls being made under the Acts of CCD and MPP.	Lack of coordinated action and funds, qualified staff constraint effective implementation.
18	Promote policy incentives for the use (including the import) of substitutes for coral based lime in the building industry.	Persuade through alternative plans and recommendations.	-
19	Carryout research in collaboration with universities and the private sector to produce alternative materials to replace marine coral-based lime for the building industry and to promote designing that obviates the use of lime plaster.	Alternatives have been introduced for lime based products.	-
20	Develop capacity among entrepreneurs and guidelines for acqaculture that take into account preservation of the natural environment.	Carried out and recommendations are provided by the NARA and NAQDA to some extent.	Lack and proper release of funds, qualified staff constraint effective implementation.
21	Initiate and promote research programmes to determine the effects of sea level rise on marine and coastal habitats.	No activities are currently exercised. Plans are been made on future research programmes.	Lack of funds
22	Establish a strong and effective cordinating mechanism to secure the collaboration of all the concerned institutions in effective management of coastal zone.	Appointed 70 officers out of 325 areas to cordinate activities by CCD for effective management.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
23	Initiate action in collaboration with agricultural and irrigation authorities and provincial/ regional bodies to prevent siltation of lagoons, estuaries and marine ecosystems due to soil erosion inland.	Undertake by the Department of Agriculture (effective areas: Govijanaseva and Kudawewa)	-
24	Develop capacity for eco-tourism in selected coastal areas, with the participation of communities and local entrepreneurs, for viewing coral life, watching marine mammels, etc.	Whale watching is being conducted by communities in Mirissa and Puttlam. (Permission has been granted and regular monitoring is done). Revenue is being generated through eco-tourism.	-
25	Enlist support of NGO's and rural communities to establish woodlots in sand dunes adjoining mangroves, with fast growing fuelwood trees such as Casuarina, to ameliorate pressure on mangrove vegetation.	Certain projects aiming conservation of coastal environment are being conducted on ad-hoc basis.	Proper coordination is not there.
26	Develop and apply feasible methods for waste disposal from industries, tourist hotels and households in the coastal zone, through surveys, research and community projects.	Environmental Protection Licenses (EPL's) are being issued. Industrial database is available.	-
27	Commence awareness programmes for different target groups to mitigate adverse effects of pollution, coral reef damage and over-harvesting of species from coastal and marine ecosystems.	Projects and awareness programmes are being conducted for different target groups. Fisheries management has been included as a component in the subject of Fisheries Science.	Lack and proper release of funds, qualified staff constraint effective implementation.
28	Srengthen and expedite the preparation and implementation of the special area management programmes identified in "coastal 2000" and the CZM Plan of 1996, and extend the programmes to other coastal sites as necessary.	This has been expanded in 2003	-

Table 2.5 - Key actions taken, major outcomes achieved, and obstacles faced for BCAP thematic area: "Agricultural Systems"

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
1	Promote the leasing of suitable state land for agro forestry and mixed cropping on the traditional home garden pattern.	Various ad-hoc programs were carried out, but there was no major large-scale program at place at the national level with a coordinated effort. None availability of appropriate policy / legislation acts as major barriers to have favorable outcomes.	None availability of appropriate policy / poor coordination amongst the relevant institutions.
2	Improve co-ordination and provision of institutional support for home-gardens, which would include credit and technical assistance.	The government's *"Divi Naguma"* program facilitates to some extent home garden owners to produce in excess amounts; but it runs at a minor scale with a very limited number of participants.	Lack of quality indigenous planting materials in right amounts and on time for cultivation. Absence of mechanism to develop proper agricultural markets and credit facilities.
3	Facilitate access (by farmers) to seed material of indigenous varieties.	There exist certain joint programs conduct by the Department of Agrarian Services, Department of Agriculture, Department of Export Agriculture and Coconut Cultivation Board. However, these programs could not fulfill the demand, as for the most part, limited supply of materials is observed.	No adequate supply of seed materials to tally the demand
4	Secure ownership of the land for farmers and leaseholders who demonstrate their commitment to conservation of biodiversity in their landholdings.	Although this is considered as a burning issue, no proper actions were taken to resolve it.	There is no coordination amongst responsible institutions.
5	Provide economic incentives for the popularization of conservation farming; these could include fiscal measures, provision of services, improvements in land and tree tenure, training and awareness creation, etc.	Some of the Donor funded project and NOG programs concentrate on this aspect. The government's "Divi Neguma" program and the new program initiated by the Ministry of Agriculture is in effect, but not at large-scale to have a substantial impact.	No novel programs initiated due to lack of awareness and coordination amongst major stakeholders.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
6	Provide incentives and technical and other assistance for integrated farming in coconut, and support research on such activities under rubber and tea.	The previous Perennial Crop Development project is in progress. Department of Agriculture, Department of Export Agriculture and Coconut Cultivation Board conduct scattered programs.	Funding and adequate number of staff are major limitations to undertake this activity at large scale.

Table 2.6 - Key actions taken, major outcomes achieved, and obstacles faced for priority recommendations in Addendum to the BCAP

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
1	Identify critically important BD hotspots and linkages outside PA network and bring them under protection.	Carried out the National Conservation Review (NCR) and a Gap Analysis	Lack of Funding / Social and political support / Appropriate legal framework.
2	Prepare and implement recovery plans for threatened species.	Identification and develop suitable recovery measures for threaten species. Revisions were made to the Fauna & Flora Protection Ordinance to include additional protected species.	Gaps in research and information.
3	Establish more ex-situ conservation facilities such as botanical gardens and Zoological gardens and rescue and rehabilitation centers in suitable areas under relevant state institution.	Establishment of Botanical Gardens in Hambantota and Avissawella / Establishment of Medicinal Plant Gardens at Haldumulla, Giradurukotte, Pinnadoowa and Nawinna / Proposed Zoological Garden at Pinnawala / Expand the activities of Elephant (Animal) orphanage at Udawalawa / Establishment of Elephant holding ground Horowpatana (Anuradapura).	Inadequate funds are the major issue in all these projects.
4	Develop a database and register of all local and foreign institutions and their collections dealing with ex-situ conservation.	Databases and registers are being maintained by the DWLC for Elephants and Turtles / Database has been established & maintained for Ex-situ collection at botanical gardens & Department of Ayurveda.	Difficulty in getting information from private sector / inadequate funding / lack of expertise.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
5	Develop a national policy, regulations, procedure, guidelines (MTA, PIC, Sui generis system), Benefit sharing mechanisms etc for access to genetic resources.	Develop the policy on access to genetic resources and benefit sharing / Development of draft Act on access to genetic resource and benefit sharing (draft Act has been submitted to legal draftsman).	Administrative issues
6	Develop and implement consultative process, including public consultation on access regulatory mechanisms for access to genetic resources.	Consultative process has been established for development of policy and legislation on access to genetic resources.	-
7	Regional identities and sentimentalities be harnessed to biodiversity conservation and living in harmony with nature.	Rights of indigenous people are recognized by the government / "Vannilaetto Trust Fund" has been established.	-
8	Establish a National Register of Traditional Knowledge, including agricultural biodiversity (Adopt Defensive Documentation).	Completed traditional knowledge compendium in three volumes	Lack of funds / Hesitation to provide information on traditional knowledge.
9	Legal protection to be provided to custodians of traditional knowledge.	No action was taken	-
10	Establish an Invasive Species Specialist Group.	Invasive Species Specialist Group was established by the Ministry of Environment.	-
11	Prioritize invasive alien species, including GMOs, terrestrial and aquatic species	Published the document on IAS (Invasive Alien Species) of Sri Lanka.	
12	Prepare a National Database on Invasive Alien species	Database on Invasive Alien Species (Flora & Fauna) was established in 2013.	Shortage of expertise
13	Provide funding for research on methods to control the spread of prioritized invasive alien species	Project on control of spreading of IAS.	-
14	Establish a task force to critically examine the impacts of all new cross-sectoral laws/policies/trade and access agreements and major developmental efforts on biodiversity conservation	Including laws, policies, trade, access agreements and development efforts.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
15	Formulate new policies to address conservation outside forests, integrating in-situ biodiversity concerns into land policy and wetland policy, and to bring in legislation for wetland conservation	No action was taken.	Not identified as a priority.
16	The Minister of Environment and Natural Resources to appoint a National Biodiversity Information Management Committee to implement the computerized networking and establishment of a meta-database on the following: a. Protected Areas and forest management data b. Medicinal plants and crop wild relatives c. Threatened animal species d. Herbarium and museum inventories relevant to biodiversity e. Invasive species f. Traditional knowledge relevant to biodiversity conservation and sustainable use	No action was taken.	Priority not identified.

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
17	Cabinet to appoint a National Biodiversity Valuation Committee to formulate policies and procedures for the purpose of assessing economic benefits from biodiversity (giving due consideration to ethical and cultural values), proposing also a framework of tariffs and incentives designed to strengthen biodiversity conservation and assure the equitable sharing of benefits: a. Aquatic resources b. Genetic resources c. Carbon and emissions trading d. Atmospheric emissions	No action was taken.	Priority not identified.
18	The Ministry of Environment and Natural Resources to appoint a Expert Working Group to harmonize existing and proposed sectoral policies relevant to biodiversity conservation, including: a. In and ex-situ conservation b. Access to genetic resources, traditional knowledge and benefit sharing c. Information management d. Wetlands	Biodiversity Expert Committee has been established by the Ministry of Environment & Renewable Energy.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
19	The human resources, technical capacity and infrastructure of the Biodiversity Secretariat of the Ministry of Environment and Natural Resources should be strengthened, so as to provide capacity to coordinate and monitor a comprehensive set of biodiversity indicators and programs, including the following: a. Threatened species b. Impact of climate change c. Integrity of critical conservation areas d. Environmental pollution e. Invasive species	Technical capacity has been partially strengthened / Existing vacancies in the biodiversity section need to be filled and capacity development as a urgent requirement.	Administrative issues
20	Cabinet to direct the Legal Draughtsman, in consultation with the Ministry of Environment and Natural Resources and other relevant Ministries and through a legal task force to identify the requirement of new legislation if any, and review the existing biodiversity related legislation with holistic approach for conservation and sustainable use of biodiversity and draft necessary bills and/or effect the necessary amendments.	FFPO and FO (Forest Ordinance) were amended based on a decision taken by the Ministry of Environment & Natural Resources to holistic approach for conservation and sustainable use of biodiversity.	-
21	Implement the National Biosafety Framework	Draft new Act on Biosafety was prepared in 2013 and the approval procedure is in progress	Disputes regarding the Act should be resolved.
22	Establish interim measures for biosafety until regulations and resources are in place	No action taken	-
23	Identify and improve laboratories for testing GMOs - Food Feed & Processed Products	Three GMO laboratories have been identified for Universities (Peradeniya, Colombo) and the Customs.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
24	Ensure biodiversity valuation and use in national income accounts and project evaluation.	Ministry of Environment and Department of Agriculture conducted two workshops for awareness and information gathering on biodiversity valuation.	-
25	Ensure innovative and sustained financing mechanisms for biodiversity conservation.	No action was taken.	Priority not identified.
26	Establish a strategic coordinating mechanism within Biodiversity Secretariat for implementation of BCAP (coordination should include integrating biodiversity into sectoral plans and programs).	No action was taken.	Funding and institutional issues.
27	Strengthening systematic & institutional capacity to implement BDFAP actions at policy & middle institutional level.	Capacity building programs are being carried out in related institutes.	-
28	Establish a coordinating body incorporating (NGO's) universities & NIE for human resource development (formal & informal sectors) in relation to all biodiversity related aspects.	No action was taken.	Not prioritized.
29	Establishing a special coordinating body under BDS to promote research on biodiversity related issues to ensure that all intra- and inter-disciplinary aspects are addressed.	A special coordination body has not been established for coordinating of biodiversity research; however the Code of Ethics for biodiversity research has been established by the biodiversity Secretariat / Research committees in DWLC and FD are functioning as a coordination body to coordinate biodiversity research related to these two departments.	-
30	Propagate the tenets of conservation agriculture through the education and agro-eco-tourism.	Agro-ecotourism activities are being promoted.	-

No	Recommendation	Key Actions Taken Major Outcome/s (Since 4th National Report)	Barriers to Implement
31	Formulate, adopt and implement appropriate legislative, regulatory and other related legal measures in order to conserve agricultural biodiversity and facilitate the Access, Sustainable Use and Equitable Sharing of Benefits of it.	No appropriate action was taken.	Not identified.

2.5 Effectiveness of Mainstreaming Biodiversity into Relevant Sectoral and Cross Sectoral Strategies, Plans and Programs

Sri Lanka has made a significant progress in integrating biodiversity in to relevant sectoral and cross sectoral planning. In recent times, a number of positive steps have been taken to mainstream biodiversity in to relevant sectoral and cross sectoral plans, strategies and programs. Biodiversity Conservation Action Plan (BCAP) itself promotes this integration into other relevant sectoral plans and programs, both in public and private sector domain. Nevertheless, the outcomes of such actions do not yield expected results in some sectors due to inadequate coordinated functioning mechanisms, insufficient funds and human resources to implement them in a holistic manner.
It is noticeable that biodiversity concerns are adequately integrated into the plans, policies and programmes of the agencies of environmental and related sectors such as forest, wildlife, wetlands, coastal and marine, fisheries, agriculture etc, while this cross sectoral integration is inadequate in the agencies of the development sectors (business/industrial and service sectors, including urban, harbor, tourism, mining, energy, road and telecommunication etc).

Overall, there are more than 30 state institutions and 15 laws directly involved in conservation and sustainable use of biological diversity in Sri Lanka. This institutional and legal framework provides an important framework to support maintaining of biodiversity in to sectoral and cross sectoral strategies, plans and programs. Those with greatest and direct responsibility for biodiversity conservation are the Ministry of Environment and Renewal Energy (MoERE), which is the focal point for the Convention on Biological Diversity, and other key state institutions such as the Forest Department (FD), Department of Wildlife Conservation (DWLC), Central Environmental Authority (CEA), Department of Agriculture (DOA), Department of National Zoological Gardens (DNZG), Department of National Botanic Gardens (DNBG), Plant Genetic Resources Centre (PGRC), Department of Export Agriculture (DEA), Coast Conservation Department (CCD), Department of Export Agriculture (DEA), Department of Fisheries & Aquatic Resources (DFAR), National Aquatic Resources Research and Development Agency (NARA), Department of Ayurveda, Sri Lanka Customs etc.

In addition, MoERE has further strengthened implementation mechanisms in policy, legislative and administrative measures including implementation of strategies, projects and programmes for biodiversity conservation and management. In this context, the major initiatives include: Establishment of National Steering Committee (NSC) on Biodiversity & Biodiversity Expert Committee, and integration of biodiversity concerns in Environmental Impact Assessment (EIA) of development projects under the National Environment Act (1988). Currently EIA is a mandatory requirement for any development project in any sector.

The main policy frameworks, legislations, strategies and action plans in place that drive the country in achieving all the objectives of the CBD and BCAP since the 4th national Report is provided in the Table 2.9.

Table 2.7: Key Policies/Plans & Strategies and Legislation relating to Conservation and Sustainable Use of Biodiversity in Sri Lanka

Policies
Mahinda Chintana (A vision for a new Sri Lanka) (2006-2016)
National Policy on Climate Change of 2011
National Livestock Breeding Policy 2010
National Policy on Biotechnology of 2010
The National Land Use Policy of 2009
The National Policy on Agriculture of 2007 (deals with conservation of traditional varieties of crops)
National Physical Planning Policy and Plan of 2007
Plans & Strategies
National Action Plan for ***Haritha*** (Green) Lanka Programme (2009)
Caring for the Environment, Path to Sustainable Development (2008)
Legislation
Fisheries and Aquatic Resources (Amendment) Act 35 of 2013
Coast Conservation (Amendment) Act No. 49 of 2011
The Forest Ordinance No. 16 of 1907, and its subsequent amendments, including Act No. 65 of 2009
The Fauna and Flora Protection Ordinance No. 2 of 1937, and subsequent amendments including Act No. 22 of 2009

Source: (1). Sector Vulnerability Profile: Biodiversity and Ecosystem Services, National Climate Change Adaptation Strategy for Sri Lanka, Ministry of Environment, Sri Lanka, 2010

(2). IUCN, Sri Lanka Tropical Forest and Biodiversity Analysis, 2011

All these institutional, policy and legal framework together with plans and strategies already developed provide an adequate framework for implementation of BCAP recommendations and work towards achieving Aichi biodiversity targets and other biodiversity concerns relating to various sectors. However, even today, biodiversity concerns are not adequately integrated into the plans, policies and programmes of the agencies of the development sectors. The emphasis given by some development sector agencies for the need of biodiversity conservation when preparing and carrying out their plans and programmes is inadequate [49].

2.5.1 Projects and programs contributed for strengthening capacities for biodiversity conservation:

During the recent years, various initiatives to develop national capacities for biodiversity conservation have been undertaken at different levels involving wide range of stakeholders. National level capacity building is a primary requirement for mainstreaming biodiversity into relevant sectoral and cross sectoral plans and programs. In this regard, large number of projects and programmes implemented in Sri Lanka after ratifying the CBD (1994) has served for this purpose to varying degrees. The main projects that have built capacity for biodiversity conservation in the country (planned, undertaking or completed since the 4th National Report) are given below.

49 Fourth Country Report from Sri Lanka to the CBD, 2009

Table 2.8: Project Related to Conservation and Sustainable Use of Biodiversity in Sri Lanka

Project	Funding Amount	Objective
Locally Funded Projects (GOLS) (Funds in Rs. Millions)		
1. Species Conservation & National Biodiversity Hotspot Survey Programme for Sustainable Development	19.5	Conservation of environmentally sensitive sites and promote sustainable development through implementation of sustainable tourism programmes while creating awareness at both local and global levels
2. Palaeobiodiversity Conservation and Sustainable Tourism Programme	19.3	Conservation of environmentally sensitive pale biodiversity sites and promote sustainable development through implementation of sustainable tourism programmes while creating awareness at both local and global levels
3. Conservation and Sustainable Use of Microbial Diversity in Sri Lanka	19.5	Formulation of a national policy and preparation of action plan for conservation of microbial diversity in Sri Lanka and to integrate the aspects of the microbial conservation and sustainable use in to the national planning process with the special emphasis of microbial bio-prospecting
4. Conservation and Sustainable Use of Mangrove Ecosystem & Its Diversity in Sri Lanka	19.5	Formulation of a national policy and preparation of action plan for conservation and sustainable use of mangrove ecosystem and its diversity in Sri Lanka and to integrate the aspects of the mangrove conservation and sustainable use in to the national planning process with the special emphasis of ecotourism enhancement of livelihood of the neighbor community
5. National and Global Assessment of Flora & Fauna of Sri Lanka & Identification of Important Plant Areas	18.0	To achieve national goals of biodiversity by conservation and sustainable utilization of fauna and flora of Sri Lanka
6. Implementation of National Policy on Traditional Knowledge for Sustainable Livelihood	10.0	Implementation of national policy on traditional knowledge for sustainable livelihood
7. Proposal for the implementation of provincial biodiversity profiles and action plans	19.5	To achieve national goals of biodiversity conservation and sustainable use through successful implementation of the recommendations of the provincial biodiversity profiles and action plans

Project	Funding Amount	Objective
Foreign Funded Projects (GEF) (Funds in US$)		
1. National Biodiversity Planning to Support the Implementation of the CBD 2011-2020 Strategic Plan in Sri Lanka	200,000	To integrate Sri Lanka's obligations under the Convention on Biological Diversity into its national development and sectoral planning frameworks through a renewed and participative 'biodiversity planning' and strategizing process, in a manner that is in line with the global guidance contained in the CBD's Strategic Plan for 2011-2020
2. Strengthening Capacity to Control the Introduction and Spread of Alien Invasive Species in Sri Lanka	1,825,000	To build capacity across sectors to control the introduction and spread of invasive species in Sri Lanka in order to safeguard globally significant biodiversity
3. Mainstreaming Biodiversity Conservation and Sustainable use for Improved Human Nutrition and Wellbeing	828,000	Strengthening the conservation and sustainable management of agricultural biodiversity through mainstreaming into national and global nutrition, food and livelihood security strategies and programmes
4. Mainstreaming Agro-biodiversity Conservation and Use in Sri Lanka Agro-ecosystem for Livelihoods and Adaptation to Climate Change	1,450,455	To ensure agro-biodiversity in Sri Lanka is optimally conserved and used to meet the challenges of climate change and improve rural livelihoods

2.5.2 Other significant institutional programmes undertaken for strengthening capacity for mainstreaming biodiversity conservation:

The National Red listing exercise: Sri Lanka has been engaged in the preparation of nationally threatened species lists since 1989. New red list for threatened and endangered species have been prepared by MoERE with the assistance of IUCN in 2012. These actions have influenced policy and legislation for conservation of species biodiversity in the country; **Publication of a National Wetlands Directory** – Prepared by the Central Environmental Authority (CEA) in collaboration with the International Water Management Institute (IWMI) and IUCN, Sri Lanka, and is being updated every 3 to 4 years, and also web accessibility is provided to the policy planners in order to strengthen and enhance current efforts to identify critically important wetlands in terms of biodiversity, and prepare site reports and management plans where necessary; **Preparation of management plans for high priority wetlands**: Efforts are being made to prepare management plans for high priority wetlands and to prioritize wetland areas for better/ strict conservation; **Gazetting of Environmental Protection Areas:** Gazetting of 8 Environmental Protection Areas by the CEA under the National Environmental Act; **Integrated Strategic Environmental Assessment:** Integrated Strategic Environmental Assessment of the Northern Province by the CEA to prepare zoning plans for development of the region; ***Ex-situ* conservation:** Setting up ex-situ conservation facilities by the Department of Botanic Gardens in different climatic zones.

2.5.3 Mobilize stakeholders at multiple levels in support of biodiversity conservation:

Over the years, public awareness has been created in forest, wetland, coastal and marine and agriculture sectors on importance of biodiversity conservation. The public awareness programmes target two categories of target groups, school children and general public in the country. The forest and biodiversity conservation has been included in the school curricular of secondary schools, basic degrees as well as university postgraduate courses. Extension and public awareness activities are being implemented under the usual annual programs of the relevant institutions. Community participation in forest management is another aspect of public awareness created by the FD. Under the public awareness and extension programmes of FD and DWLC considerable amount of electronic, printed and other material have been developed during the last 15-20 years. Some of these are; video documentaries, maps, leaf lets, broachers, trail guides, posters, booklets and other materials such as caps, T-shirts, stickers etc.

2.5.4 Further improvements needed:

i) Biodiversity concerns are not adequately integrated into the plans, policies and programmes of the agencies of the development sector. According to the key stakeholders contacted, although the focus and due attention given to the biodiversity concerns associated with direct environmental (e.g. forestry, wildlife, wetlands, coastal and marine systems) and other environment related (e.g. agriculture and fisheries) sectors with respect to setting up of appropriate policies, legislation, plans/strategies and programs was improved, at a relatively slow pace but positively, such attention given to the development sectors (i.e. business/ industrial and service sectors, including urban, harbor, tourism, mining, energy, road and telecommunication networks), of which the relative contribution to national and economic development is much frequently highlighted, has still been inadequate.

ii) Minimal efforts are in place with respect to mainstreaming of agricultural activities towards conservation of agro-biodiversity and to eliminate rural poverty. There is a need to provide traditional varieties of both plants and livestock in order to promote biodiversity conservation, and there exists a need to strengthen community level crop improvement programs (e.g. participatory plant breeding) towards establishing Community Seed Banks. Lack of responsible institutions with coordinated action, together with necessary funds and staff, makes it difficult to mainstream these activities.

iii) Further, with regard to coordination of various sectoral and cross-sectoral strategies and activities, there has been no significant progress observed over time, although wider discussions are promoted with the respective stakeholder institutions (public, private and NGOs), which have, however, led to revisions in policies, strategies, management plans or action plans within and outside the environmental sectors. However, the stakeholders, in general, perceive that the bargaining power of these key institutions to effectively tackle such issues to maintain a right balance between the environmental management and economic development is not in favor of the former, especially with respect to the issues arising from large-scale infrastructure development projects.

2.6 Progress of implementation of the National Biodiversity Strategy and Action Plan

The level of implementation of the Recommended Actions included in the BCAP Thematic Areas and the Priority Recommendations listed in the Addendum (since the 4th National Report) was investigated. The outcome of analysis is presented below.

2.6.1 Implementation of Recommended Actions under the BCAP Thematic Areas

In order to complete this task, the expert views on the progress of implementation of each recommended action in BCAP thematic areas were obtained through "Expert's Working Groups" formed to represent each of the BCAP thematic area (i.e. Forest, Wetlands, Coastal and Marine, Agricultural). The respective group was, in turn, asked to classify each and every recommended action under the particular BCAP thematic area to indicate its 'level of completion' into one of three categories, namely: (1) *"Not satisfactorily achieved";* (2) *"Partially Achieved",* and (3) *"Satisfactorily achieved".*

2.6.1.1 Progress Related to "Forests"

In the context of thematic area of Forests in the BCAP, 9 out of 24 recommended actions (i.e. 37.5%) were completed to the satisfaction of key stakeholders. There were 8 recommended actions which were achieved partially, while another 6 recommendations were not achieved satisfactorily.

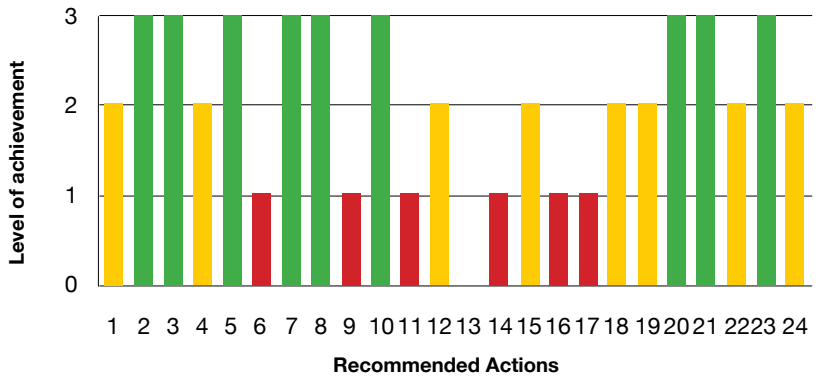

Figure 2.1 - Level of implementation of recommended actions in BCAP Thematic area of "Forest"

2.6.1.2 Progress related to "Wetlands"

Considering the thematic area of Wetlands in the BCAP, only 1 out of 16 recommended actions (i.e. 6.25%) were observed to be achieved satisfactorily. The actions taken to implement 10 out of 16 actions were not satisfactory (62.5%).

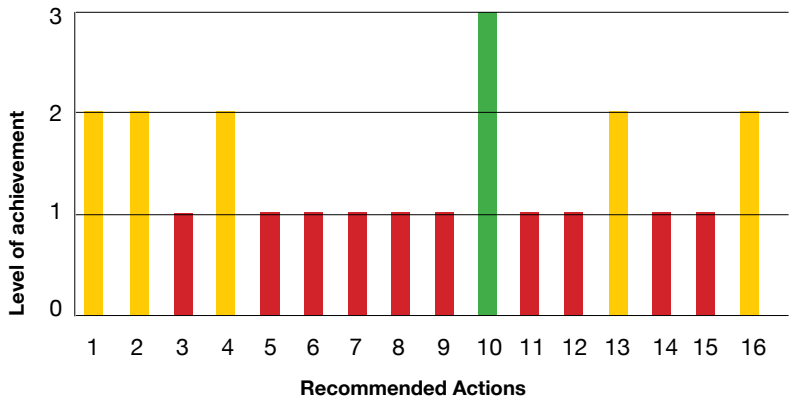

Figure 2.2 : Level of implementation of recommended Action in BCAP thematic area of "Wetlands"

2.6.1.3 Progress related to "Coastal and Marine Systems"

In the context of thematic area; Coastal and Marine Systems in the BCAP, only 1 out of 28 recommended actions (i.e. 3.5%) were achieved satisfactorily. The actions taken to implement 22 other recommendations were not satisfactory (62.5%), while the rest of the 5 recommendations were achieved partially.

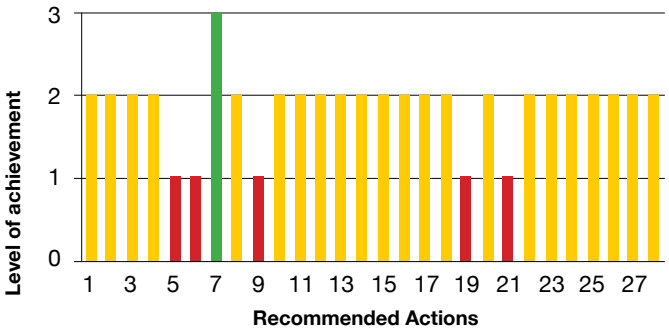

Figure 2.3 : Level of implementation of recommended actions in BCAP thematic area of "Coastal and Marine Systems"

2.6.1.4 Progress related to "Agricultural Systems"

In the context of thematic area; Agricultural Systems in the BCAP, none of the recommended actions were achieved satisfactorily. While 1 out of 6 recommendations were achieved partially, the level of implementation of other 5 recommendations were observed as unsatisfactory achieved.

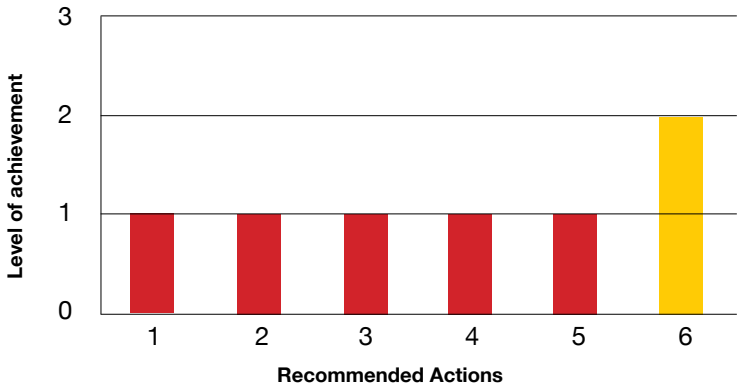

Figure 2.4 : Level of implementation of recommended Actions in BCAP thematic area of "Agricultural Systems"

2.6.1.5 Breakdown on level of achievement of BCAP recommended actions

Figure 2.5 shows that only 11 out of 74 BCAP recommended actions were achieved satisfactorily, while another 36 were achieved partially. The level of achievement with respect to the thematic area of Forest is comparatively high, i.e. 17 out of 24 recommendations (70.8%) were achieved either completely or partially. On the other hand, the success rate in Wetlands and Agricultural Systems were comparatively low, i.e. only 37.5 and 16.6 percent of recommended actions were achieved satisfactorily or partially.

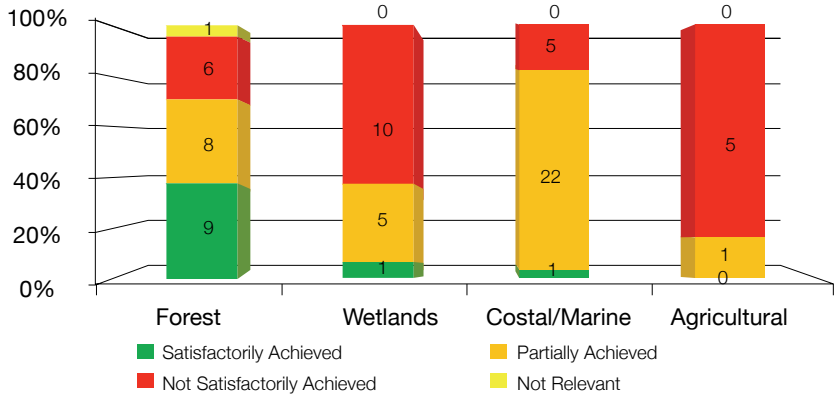

Figure 2.5 : Breakdown of the level of achievements of recommended actions in BCAP thematic areas (No. and Percentage)

2.6.2 Implementation of Priority Recommendations in the Addendum

The members in the four Expert's Working Groups formed to work on BCAP thematic areas were also asked to rate each and every priority recommendation listed in the Addendum based on its 'level of completion' using the same three categories [i.e. (1) *"Not satisfactorily achieved";* (2) *"Partially Achieved",* and (3) *"Satisfactorily achieved"]*.

Figure 2.6 depict the level of implementation of 31 priority recommendations on individual basis. The number of recommendations fall into three categories is illustrated in Figure 2.7. These highlight that only 6 out of 31 priority recommendations have been achieved satisfactorily (i.e. 19.4%), while 9 were unsatisfactory (29.0%) in implementation.

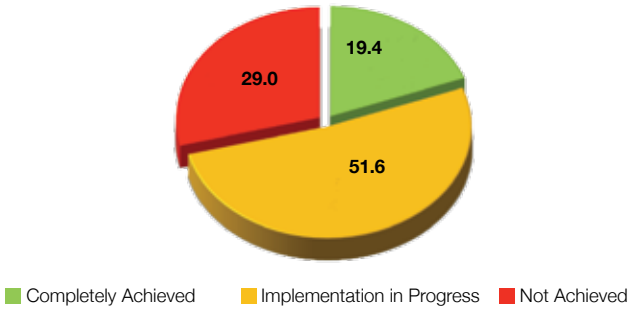

Figure 2.6 : Breakdown of the level of achievements of priority recommendation in the Addendum (Percentage)

Figure 2.6 shows that a satisfactory progress was obtained with respect to the priority recommendations 6, 10, 11, 12, 18 and 20 included in the Addendum. On the other hand, action taken to achieve a progress with respect to priority recommendations 9, 15, 16, 17, 22, 25, 26, 27 and 31 were rather unsatisfactory.

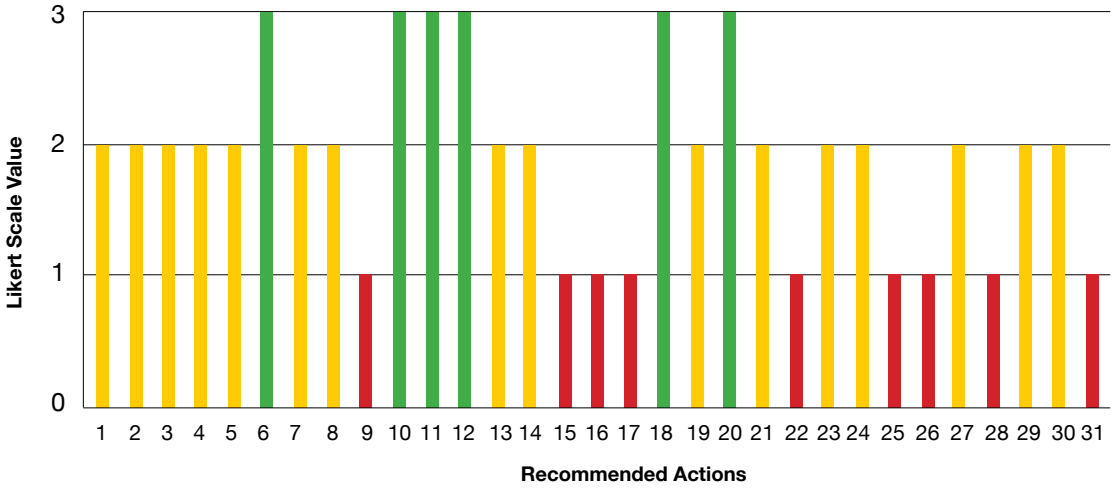

Figure 2.7 : Level of implementation of priority recommendations in the Addendum

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PART III

Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 Targets of the Millennium

3.1 INTRODUCTION

Biodiversity plays a crucial role in functioning of the ecosystems, on which mankind depends on all sorts of ecosystem services. Conservation of biodiversity at the national level requires inputs from several Ministries/Departments at the Central and Provincial levels, thereby reiterating the need for mainstreaming of biodiversity concerns in the development planning processes.

The second generation of the National Biodiversity Strategies and Action Plan (NBSAP) for Sri Lanka is yet to be prepared in light of the CBD Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets adopted in 2010. It is noted that BCAP 1998 does not specify concrete national biodiversity targets, indicators and the baseline for the performance assessment. These aspects will have to be incorporated into the revision of the next generation NBSAP. Through this revision, national targets on biodiversity will be developed, implementing agencies will be determined and a resource mobilization plan will be prepared.

Since the last reporting period, Sri Lanka has made progress in the development of biodiversity related policies, growth in legislative frameworks and the undertaking of biodiversity related initiatives. The subsequent sections describe the progress made by Sri Lanka towards achieving the 20 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals, by referring briefly to the relevant programmes and initiatives.

3.2 PROGRESS MADE TOWARDS THE IMPLEMENTATION OF THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020 AND ITS AICHI BIODIVERSITY TARGETS

In the tenth meeting of the Conference of Parties, held from 18 -29 October 2010, in Nagoya, Aichi Prefecture, Japan, adopted a revised and updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011 – 2020 period.

The Strategic Plan provides an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system and all other partners engaged in biodiversity management and policy development. Parties agreed to translate this overarching international framework into revised and updated national biodiversity strategies and action plans. Additionally, in decision X/10, the Conference of Parties decided that the fifth national reports, due

by 31 March 2014, should focus on the implementation of the 2011 – 2020 Strategic Plan and progress achieved towards the Aichi Biodiversity Targets.

This section analyses the progress made towards each of the 2020 targets of the Strategic Plan for Biodiversity 2011-2020 by using the information from part I, status and trends in biodiversity, and main threats, and part II, the national biodiversity strategy and action plan and the mainstreaming of biodiversity.

The twenty (20) Aichi Biodiversity targets cross-cut all sectors of the national economy and affect ecology and human well- being. The policies, programmes and projects of different ministries/ Departments of the Government of Sri Lanka, which are directly or indirectly related to biodiversity conservation, are vital for achieving progress towards Aichi Biodiversity Targets.

Although there is no updated common action plan for biodiversity conservation, many actions have been achieved or are ongoing in different sectors which are in line with biodiversity conservation. Therefore, the evaluation of the progress of national achievements towards implementation of CBD 2020 Aichi targets has been done by estimating the level of relevant sectoral achievements. A rough estimation on the progress in the achievement of those specific actions executed in different sectors has been highlighted with regard to each Aichi target, as presented in the Table 3.1 in the final part of this section.

3.2.1 Strategic Goal A: Address the underline causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably

Addressing the direct and underline drivers of biodiversity loss will ultimately require behavioral change by individuals, organizations and governments. Understanding, awareness and application of the divers values of biodiversity, underpin the willingness of individuals to make the necessary changes and actions and to create a “political will” for governments to act. Given this, actions taken towards this target will greatly facilitate the implementation of the Strategic Plan and the fulfillment of other 19 Aichi Targets, particularly Target 2.

The Ministry of Environment and Renewable Energy (MoERE), along with several other sectoral ministries implement policies and programmes relating to conservation of the country's environment and natural resources. Environmental education, awareness and training are key tools used in this endeavor for enhancing the understanding of people at all levels about the relationships between human beings and the environment and to develop capabilities/skills to improve and protect the environment in collaboration with them.

Many Communicational, Educational and Public Awareness (CEPA) activities in relation to the awareness of biodiversity values, its conservation and sustainable use have been initiated and are ongoing. Following are some of the key initiatives undertaken;

- Biodiversity conservation has been included in the curricula of secondary schools, basic degrees as well as university postgraduate courses.
- Public awareness being carried out through mass media awareness programs (TV, Radio, Newspapers).
- Awareness being created by relevant departments, as well as by secondary and higher education institutions.
- Efficient communication and outreach tools on environmental management have been developed (websites, newspapers, brochures, leaflets, manuals, etc.)
- International Biodiversity day commemorated every year and focuses on public awareness on nature and biodiversity.
- Several other international days (ex. Environment Day, Mountain Day, Weather Day, Water Day, International Day of Forests etc.) are commemorated with attention paid to biodiversity conservation as well.
- The Central Environmental Authority (CEA) individually and with the aid of NGOs is carrying out several environmental awareness programs for various target groups.
- Several Corporate Social Responsibility (CSR) Projects are being implemented by private sector/NGO/government projects focusing environment, where biodiversity aspects also being integrated.
- Provincial programs are held in parallel with national programs taking school children, local government stakeholders and the community as target groups.

Continued efforts to increase public awareness (and particularly that of youngsters) of the importance and value of biological diversity are expected to help Sri Lanka to reach this target.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems

The values of biodiversity are not widely reflected in decision-making. This is true in the context of development and poverty reduction strategies. Integrating and reflecting the contribution of biodiversity, the ecosystem services it provides, the relevant strategies, policies, programs and reporting systems is an important element in ensuring that the diverse values of biodiversity and the opportunities derived from its conservation and sustainable use are recognized and reflected in decision-making. Similarly accounting for biodiversity in decision-making is necessary to limit the unintended negative impacts of development strategies.

As mentioned in the Development Policy Framework of the Government of Sri Lanka; Mahinda Chintana Vision for the Future; the government of Sri Lankan aims to promote sustainable development in close liaison with the land, fauna and flora and to bestow countries natural heritage to the future generations. It proposes concerted efforts to overcome the major environmental issues of the country, such as gradual depletion of the green cover, increasing trends in the human –wildlife conflicts due to degradation of natural habitats, environment pollution etc.

In 2010, the government developed the National Action Plan for Haritha Lanka (Green Lanka) programme through an interactive process involving all the key ministries. Its missions focused on addressing the critical issues, including the conservation of fauna, flora and ecosystems, meeting the challenges of climate change, wise use of the coastal belt and marine resources etc.

Although the environment and biodiversity values have been incorporated into national policies and planning processes, biodiversity valuation has not been properly incorporated into accounting or reporting. In this context, no adequate valuation has been done as yet in Sri Lanka.

The legal, policy and administrative measures adopted in Sri Lanka which contribute to the achievement of Aichi Biodiversity Target 2, can be summarized as follows.

- Protected areas and environmentally sensitive areas have been included in national/ provincial development and land use planning.
- Ecotourism is being recognized in national development plans
- National physical policy and planning process of the National Planning Department has recognized protected areas.
- An innovative project titled 'Pricing the Biodiversity of the Island' has been started in 2011 by the MoERE with the aim of valuing country's biodiversity and ecosystem services relative to the livelihood context. The project expects to integrate such values into national planning process for sustainable development.
- Ministry of Environment and Renewable Energy along with the Department of Agriculture conducted two workshops for awareness and information gathering on biodiversity valuation.
- A Special Task force dealt with biodiversity valuation and mainstreaming economics of conservation during preparation of the Addendum to the Biodiversity Conservation Action Plan (BCAP) in 2007.

Target 3 - By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Incentives including subsidies are often justified in the presence of positive externalities and for redistribution objectives. Financing of subsidies however induces its own cost and over subsidization can adversely affect allocation of resources and environment.

Substantial and widespread changes to subsidies and other incentives that are harmful to biodiversity are required to ensure its sustainability. Ending or reforming harmful incentives is a critical and necessary step that would also generate net socio-economic benefits. The creation or further development of positive incentives for the conservation and sustainable use of biodiversity, provided that such incentives are in harmony with the Convention and other relevant international obligations, could also help in the implementation of the Strategic Plan by providing financial resources or other motives to encourage actors to undertake actions which would benefit the biodiversity.

Sri Lanka has been providing subsidies in several sectors including agriculture, energy and industry as a means of providing livelihood security to the underprivileged sections of the society. However, the country is yet to take significant measures to promote positive incentives that encourage activities beneficial to biodiversity

Some of the subsidies provided in agriculture sector (e.g. chemical fertilizer and pesticides) are likely to have adverse impacts on biodiversity. However, it is encouraging to note that there is a positive trend to popularize organic farming to reduce pesticide and chemical fertilizer use. It is a major constituent of the island wide home garden development program called Divineguma conducted by the Ministry of Economic Development. The horticulture division of the Department of Agriculture also encourages organic farming and use of traditional varieties of vegetables for home gardening,

Promotion of composting technologies incorporated into subsidized animal production and health programs (i.e. free cattle sheds, loan schemes) will promote the use of organic fertilizers to replace harmful chemical fertilizers in order to minimize or avoid negative impacts to soil fertility and human well-being.

Several departments including Forest Department, Export Agriculture Department, and Department of Ayurveda have their own programs to issue plants free of charge or at a subsidized rate to the rural farmers for the development of home gardens.

Target 4 - By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits

The unsustainable use or over exploitation of resources is one of the main threats to biodiversity. Currently many individuals, businesses and countries are making efforts to substantially reduce their use of fossil fuels, with a view to mitigating climate change. Similar efforts are needed to ensure that the use of other natural resources is within sustainable limits.

Sustainable use of natural resources is emphasized through various policy and legislative statements of the Government of Sri Lanka including *Mahinda Chintana Vision for the Future* and *Haritha Lanka* (Green Lanka) Programme. Actions taken to achieve the above target by different sectors are summarized below;

- The National Council for Sustainable Development is established under the Chairmanship of the H.E. the President of Sri Lanka and includes the Ministers in charge of major economic development programs. The council is in charged with responsibility for producing an integrated policy, and overseeing and guiding the implementation of the Haritha Lanka Programme to ensure the sustainability of social and economic development programmes.
- Preparation of management plans for all forests managed by the FD and the DWLC are now a mandatory requirement under the revised Forest Ordinance and Fauna and Flora Protection Ordinances. Accordingly, Forest Department (FD) and Department of Wildlife Conservation (DWLC) are engaged with the preparation of Management Plans with the objective of achieving sustainable forest management.
- Meeting the timber demand of the country through non forest tree resources are continuing. Enhanced home garden development programs of the Forest Department aiming the development of tree resources outside forests (TROF) will further reduce the pressure on forests for timber supply.
- The concept of Special Area Management (SAM), which involves a collaborative, adaptive and flexible approach to sustainable resource management within a defined geographic area, is now an integral component of national coastal zone management policy.
- Several legal measures taken for the control of destructive fishing methods such as banning the use of monofilament nets as well as intensified monitoring of illegal fishing.
- National Aquatic Resources Research and Development Agency (NARA) is conducting surveys on lagoon systems in order to make conclusions on the levels of sustainable utilization.
- As reported in the 4th National Report, traditional Sri Lankan home gardens and rice fields are sustainable agro-ecosystems. One of the government's major livelihood development programs called Divineguma, invests heavily on development of home gardens by providing various incentives to the rural households including planting material, fertilizers, as well as extension services. Creating a separate department for Divineguma will inevitably help to institutionalize the sustainability of this program.
- The tourism related policy adopted by the government promotes development of sustainable tourism as a key sector of the economy to increase tourist arrivals and earnings. In Sri Lanka, tourism became the 5th largest foreign exchange earner in 2012, and contributed 5.2% to the total country foreign exchange earnings while generating employment for 162,869 people (SLTDA, 2012). In this regard ecotourism is being given special emphasis. A positive trend is observed especially among private sector to invest more on ecotourism based enterprises as opposed to the conventional tourism (Refer to section 1.2.5.1 of the report for more details).

3.2.2 Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5 - By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Habitat loss, including degradation and fragmentation, is the most important cause of biodiversity loss globally. Natural habitats in most parts of the world continue to decline in extent and integrity, although there has been significant progress to reduce this trend in some regions and habitats. In Sri Lanka too, habitat destruction has been identified as a major threat for biodiversity in all three zones (dry zone, wet zone and montane zone) of the country.

Following section describes the current status and measure taken to combat habitat destruction in major ecosystems of Sri Lanka.

Forests:

As reported in Part 1, overall, the total forest cover in the country has decreased from 31.2 % of the island in 1999 to 29.7% in 2010. But the actual total forest loss is estimated as 48,900 ha from 1999-2010 which is approximately a loss of 0.23% of forest area or 4445 ha of forest loss annually. This is a positive feature when compared with 40,000 ha of forest loss annually between 1956 and 1992, and the predictions made in the Forestry Sector Master Plan of 1995 for a reduction of the 23.9% closed canopy natural forest cover in 1992 to about 17% in 2020.

Following measure are being taken to minimize deforestation and forest degradation

- Forest Ordinance (FO) and Fauna and Flora Protection Ordinance (FFPO) were revised in 2009 to strengthen the forest and wildlife protection law.
- Institutional capacity of the Forest Department (FD) and the Department of Wildlife Conservation (DWLC) developed by improving manpower as well as providing technological improvements such as Geographical Information Systems (GIS) and Remote Sensing (RS).
- Large extents of forest areas were surveyed, demarcated and proclaimed as reserved or conservation forests with special attention paid to more vulnerable forest ecosystems
- National Policy on Elephant Conservation developed.
- Participatory approaches for forest management have been tested and implemented throughout the country.
- Public awareness on the importance of forests and need for conservation is increased.

Wetlands:

Several positive features have occurred for conservation of wetlands in the past few years but wetlands continue to be lost, degraded and their resource exploited beyond sustainable levels. Most wetlands in Sri Lanka face compound threats that are mainly of anthropogenic origin.

Some progress has been made in terms of managing wetland ecosystems in the country. Among these, following are the key achievements;

- Establishment of a special Wetland Unit at the Central Environmental Authority to oversee the interests of wetlands and to implement the National Wetlands Policy of 2006, which is now due for revision.
- National Wetlands Directory was developed by the Central Environmental Authority (CEA), in collaboration with IUCN and International Water Management Institute (IWMI).
- The Strategic Environmental Assessment carried out for the Northern Province identified wetlands as a critical habitat. Also, Wetland mapping carried out for Ampara district in the Eastern Province.
- Conversion of rice fields into other uses is banned in the Western Province.

- Preparation of management plans for wetlands (Management Plan for Bolgoda Wetlands is completed, while the preparation of that for Thalangama Wetland is ongoing).
- Awareness activities were carried out targeting communities living in close proximity to the important wetlands.

Coastal and Marine ecosystems:

While no major changes have taken place in areas covered by these systems, loss of quality in most coastal systems have continued since the last reporting period.

However, following positive feature are also observed.

- Coast Conservation (Amendment) Act No 49 of 2011 has increased the coastal zone to cover 100 meters of riparian land on either side of the 2 km water source perpendicular to a river mouth in the coastal zone.
- The Amendment No 49 of 2011 introduced to the Coast conservation Act (CCA) paves the way for more positive coastal zone management activities.
- People's perceptions were changed after 2004 tsunami, towards realizing the value of coral reefs to minimize coastal damage from events such as tsunami and sea erosion. Similar attitudinal change observed with regards to mangrove vegetation too.
- Government imposed a ban on using lime based paint for government buildings. As a result coral mining for lime production has significantly reduced during the recent past.
- Coast Conservation Act was strictly enforced, particularly with regard to transportation of coral to lime kilns.
- Coast protection structures were established along the vulnerable areas of the coastline to stem the coastal erosion.
- Significant reduction in large scale clearing of mangroves for aquaculture observed due to the white spot disease that affected most prawn farms.
- Mapping of sea grass beds were carried out using GIS techniques.
- Illegal sand mining on the south west coast was controlled through strict law enforcement.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits

Overexploitation is a severe pressure on marine ecosystems globally, and had led to the loss of biodiversity and ecosystem structure. Harvests of global marine capture fisheries have been reduced from the unsustainable levels of a decade or more ago. However, overfishing still occurs in many areas, and fisheries could contribute more to the global economy and food security with more universal commitment to sustainable management policies.

Being an island nation, Sri Lanka has a great potential to develop fishery. It has a vast marine area, representing different types of ecosystems. Fisheries in the coastal zone determine the livelihood of a large number of fishermen, who are economically more vulnerable to changes in the environment.

As reported in Part I, the marine and inland fishery are yet not fully sustainable. The coastal fishery has been over exploited, while the offshore fishery is not fully exploited by local fishermen.

Following are the summary of positive actions taken by relevant authorities towards achieving sustainability in fishery.

- Fisheries and Aquatic Resources (Amendment) Act No 35 of 2013, strengthens the legal authority of the Department of fisheries in controlling the use of destructive fishing implements.

- Reduced use of destructive fishing methods were observed due to actions taken (such as raiding of shops that sell such equipment) by National Aquatic Resources Research and Development Agency (NARA).
- Several management measures were adopted under regulations incorporated into the Fisheries and Aquatic Resources Act No.2 of 1996. (eg. Lobster Fishery Management Regulations, Chank Fishery Management Regulations, Beach–de-mer Management Regulations, Export & Import of Live Fish Regulation, Export of Cultured Marine Organisms on Artificial Substrate Regulation, Prohibition of Catching Thresher Shark Regulation).
- 15 Marine Fisheries Management Areas have been declared since 1998 under the Fisheries Act, of which 13 have been declared after 2000.
- Management plans have been prepared and implemented to manage depleting fish species district vise based on abundance.
- A National Plan on Shark Management is being prepared under the assistance of BOBLME Project.
- Exotic fish breeding and culture trials are being carried out by National Aquatic Resources Research and Development Agency (NARA) to enhance the production harvest.
- Integrated fish culture program of NARA is introducing food fish species aiming sustainable aquaculture and poverty reduction.
- Fish feeds development program of NARA is introducing low cost high nutrient fish feeds to increase the fresh water fish production as well as to reduce the production cost.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity

The increasing demand for food, fiber and fuel will lead to increasing losses of biodiversity and ecosystem services if issues related to sustainable management are not addressed. On the other hand, sustainable management not only contributes to biodiversity conservation but can also deliver benefits to production systems in terms of services such as soil fertility, erosion control, enhanced carbon sequestration, and minimize the vulnerability to climate change, enhance pollination and reduce pest outbreaks, as well as contributing to the well-being and sustainable livelihoods of local communities engaged in the management of local natural resources.

Some of the measures adopted in Sri Lanka for sustainable management of agriculture, aquaculture and forestry are summarized below;

- The revised National Policy on Agriculture (2007) emphasizes the need for sustainable management. The sustainable growth is one of the main objectives of the national policy.
- Increased attention and focus has been paid to sustainable agriculture during the recent past as a result of clear evidences observed with unsustainable practices. (Ex. Significant increase of kidney diseases reported in the North-Central province is being debated for its possible association with the water contaminated by agrochemicals). Government departments and environmental NGOs are encouraging farmers to move towards more sustainable forms of agriculture.
- Department of Agriculture (DoA) has banned several pesticides in Sri Lanka from 2010, namely Carbaril, Chlorophyriphos, Carbofuran and Propanil and the weedicide Glyphosate, due to their propensity to contaminate soil and water and toxicity when applied in large quantities. These measures are expected to improve sustainable management of agricultural systems.
- Soil Conservation Act is now in force which has created a situation where conservation of soil and prevention of soil erosion from cultivated lands is a mandatory requirement by law.
- There is a significant improvement of sustainable agricultural practices in the export agriculture, tea, rubber and coconut sectors in which soil conservation is highly emphasized and has become an integral part of the planting designs.

- During the recent times, the promotion of organic tea farming has been widely accepted as a panacea for emerging environmental problems such as land degradation and surface water pollution and negative impacts on biodiversity. Tea itself contributes to 13% of export earnings in Sri Lanka with around 180,000 ha of land area presently under tea cultivation. Conventional tea cultivation practice that uses a massive amount of synthetic chemicals which has raped the natural environment in the tea growing up country and is reported to have affected the health of human beings and other living organisms. Considering these adverse effects organic tea cultivation has been introduced which uses zero level of inorganic chemicals.
- The demand for organic food is continue to increase both in the local as well as in the world market. Several private companies are operating in Sri Lanka purely to supply the world market with organic agricultural products including spices. They readily purchase certified organic products from the farmers at significantly higher prices, thus attracting more farmers to their certification schemes.
- Several measures were taken to facilitate optimum utilization of aquatic resources through eco- friendly aquaculture practices. They include;
  - Aquaculture fish production increase has been targeted from selected fish species.
  - Identification of potential productive systems for aquaculture. (Ex: Seasonal Tanks).
  - Conservation of natural breeding habitats.
  - Conducting breeding programs for stock enhancement of indigenous fish species in order to increase fish production (both food fish and ornamental fish).
- Awareness programs carried out to enhance different aspects of sustainable aquaculture. (ex. application of crop calendars for aquaculture)
- Co-management practices have been introduced into inland fisheries, so that those engaged in fishing will on their initiative, adopt responsible fishing practices and protect the resources.
- Preparation of management plans for all forests managed by the FD and the DWLC are now a mandatory requirement under the revised Forest Ordinance (2009), and Fauna and Flora Protection Ordinance (2009). Accordingly, Forest Department and Department of Wildlife Conservation are engaged in preparation of management plans with the objective of achieving sustainable forest management.
- Community forestry initiatives are being strengthened under the Australian Aid funded Sri Lanka Community Forestry Program which is currently being implemented in the dry and intermediate zones of Sri Lanka. The project is focusing at mainstreaming community forestry concept into the forestry sector and to make it a main strategy for the sustainable management of forest resources which are subjected to increased anthropogenic pressure.
- Meeting the timber demand of the country through non forest tree resources is continuing. A massive national tree planting campaign *(Deyata Sevena)* is currently being implemented with the government sponsorship.
- Enhanced home garden development programs of the Forest Department aiming the development of Non Forest Tree Resources (NFTR) will further reduce the pressure on forests for timber supply.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity

Pollution refers to chemical contaminants that are introduced to the environment resulting instability or harm. Pollution can take numerous forms as a variety of chemical compounds can cause environmental damage depending on their properties and concentration.

Various sources of pollution, both point and non-point sources, pose threat to biodiversity in Sri Lanka. In particular nutrient loading, primarily of nitrogen and phosphorous, is a major and increasing cause of biodiversity loss and ecosystem dysfunction, especially in wetland and

coastal areas. Other major threats include improper disposal of municipal solid wastes, improper/ inadequate sewerage disposal, excessive use of chemical pesticides as well as hazardous chemicals, and dumping of untreated industrial wastes and solid waste. The release of ballast water and waste oil and tar from ships adds to coastal pollution, whereas the major source of air pollution is accounted for vehicular traffic.

The measures taken to control pollution are summarized below;

- In terms of industrial pollution, the Central Environmental Authority (CEA) enforces Environmental Impact Assessment (EIA) procedures and an Environmental Pollution Licensing (EPL) scheme. Both are mandatory under the National Environmental Act of 1988.
- The Central Environmental Authority (CEA) prepares guidelines and the Sri Lanka Standards Institute (SLSI) sets standards for industrial effluents, vehicle emissions, ambient air and water quality (for both inland and coastal waters).
- The Coast Conservation Department (CCD) has continued to deal with coastal zone management, including pollution, in the coastal zone under the provisions of the Coast Conservation Act of 1981.
- Central Environmental Authority (CEA) is setting standards for bathing in coastal waters.
- Monitoring of waters at 5 coastal sites (Mount Lavinia, Hikkaduwa, Unawatuna, Polhena, Nilaweli and Arugam Bay) is currently being carried out.
- Pollution caused by the chemical compounds released from shrimp farms in coastal areas has automatically reduced to a greater extent as a result of majority of shrimp farms being abandoned due to a fungal disease.
- In addition to CEA and CCD, many other government organizations such as Mahaweli Authority, Board of Investment (BOI), National Aquatic Resources Research and Development Agency (NARA), Irrigation Department, Water Resource Board, National Water Supply & Drainage Board (NWSDB), which are vested with legal powers for water quality monitoring continued and intensified their activities to control water pollution. At the same time, institutes such as Industrial Technology Institute (ITI), National Building Research Organization (NBRO), Institute of Fundamental Studies (IFS), also carry out independent water quality studies.
- The Marine Environment Protection Authority (MEPA) is mandated to deal with marine pollution under the Marine Pollution Prevention Amendment Act No.35 of 2008. The MEPA is responsible for warning and promoting prompt remedial action in the event of a major oil spill in the Sri Lankan waters, or in adjacent waters that could affect the country's marine environment.
- Ministry of Environment and Renewable Energy is implementing a program termed as Pavithra Ganga (Clean River) Programme, to deal with the wide spread problem of river pollution.
- The National Water Supply and Drainage Board is engaged in the control of pollution in the city canal system under the Colombo Environment Improvement Project (CEIP).
- Strict enforcement of the vehicle emission testing system has contributed significantly to reduce vehicular air pollution. This was further strengthened by the use of unleaded petrol and recent positive action taken by the Ceylon Petroleum Corporation (CPC) to replace 95-Octane petrol with 98-Octane petrol without any price increase.
- Improvement of road network to control vehicular traffic congestion has been continued. Government continued to invest heavily on road improvements covering the entire island. Introduction of three new expressways to the road network is a significant achievement during the reporting period, considerably easing the traffic congestions on some of the islands' busiest roads. This will significantly contribute to the reduction of air pollution by way of decreasing emissions from vehicles.
- Of the 12 chemicals known as Persistent Organic Pollutants (POPS), eight are banned from use as pesticides in Sri Lanka.

- As reported under Target 3, reduction of inorganic fertilizer use is being promoted by the Department of Agriculture (DoA). Fertilizer subsidy has been minimized encouraging farmers to move towards organic farming.
- Programs conducted by the Department of Animal Production and Health (DAPH) for efficiency development in livestock breeds and improved waste management in livestock, helped to curb the pollution from livestock farming.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment

Invasive Alien Species (IAS) is one of the main direct drivers of biodiversity loss at the global level. In some ecosystems, such as many island ecosystems, invasive alien species are the leading cause of biodiversity decline. Invasive alien species primarily affect biodiversity by preying on native species or competing with them for resources. In addition to their environmental impacts, invasive alien species can pose a threat to food security, human health and economic development. Increasing travel, trade, and tourism have facilitated the movement of species beyond natural bio-geographical borders by creating new pathways for their introduction. With increasing globalization, the occurrence of invasive alien species is likely to increase unless additional measures are taken.

The accidental or intentional introduction and spread of Invasive Alien Species (IAS) is a growing concern in Sri Lanka, with several species of exotic fauna and flora well established in wild habitats over the past two decades, and threatening native biodiversity. About 20 species of invasive alien fauna and 39 species of invasive alien flora have been documented from natural and semi-natural ecosystems in the different bioclimatic zones of Sri Lanka (Bambaradeniya, 2002), and several new species of IAS have been discovered over the past few years.

Following measures were undertaken and the mechanisms are in place for the prevention of entry, establishment, as well as eradication of IAS in Sri Lanka.

- The Plant Protection Division of the Department of Agriculture is responsible for the prevention of invasive alien species entering the country under the legal provisions of The Plant Protection Act No. 35 of 1999. All imported plants and animals, or their parts, are thus required to be declared at the point of entry to the country and should be subject to quarantine regulations.
- All imported seeds should be certified by the National Plant Quarantine Service and the Seed Certification and Plant Protection Centre of the Department of Agriculture prior to release or use within the country. Species (or parts of species) that are perceived as probable sources of potential invasive species have been listed.
- Highly threatening IAS for agricultural systems such as Parthenium weed ***(Parthenium hysterophorus)*** have been identified by the Department of Agriculture and legal measures are in place for prohibiting them being grown in farmlands.
- Database on Invasive Alien Species (Flora & Fauna) was established in 2013. Information related to the priority IAS species have been collected and published.
- Invasive Species Specialist Group has been established by the Ministry of Environment and Renewable Energy.
- Various awareness and education programs were conducted by different agencies on IAS and the capacity of stakeholders to eradicate invasive species is being strengthened.
- The MoERE is currently implementing a project for 'Strengthening Capacity to Control the Introduction and Spread of Invasive Alien Species (IAS) in Sri Lanka', with funding from the Global Environmental Facility (GEF). The project will support the development of an enabling policy and legal environment for effective IAS control. The preparation of National IAS Policy, National IAS Control Act, and the National IAS Strategy and Action Plan are currently underway through stakeholder participation and technical assistance. The project will also enhance integrated management planning and action, with corresponding budgetary and technical support for the prevention, detection and management of IAS. It will also build

capacities of the National Focal Point for IAS and other stakeholders, especially those involved in enforcement and local communities, to encourage their support for IAS control activities. Information related to IAS will be assembled and managed through a national database that will be made widely accessible through the internet.

- A FAO funded project for the control of Forest Invasive Alien Species is currently in the pipeline. The project is expected to concentrate on establishing demonstration plots depicting IAS control mechanisms in selected locations associated with forest invasive species.
- Control of IAS had been conducted in Protected Areas (PAs) under the DWLC where considerable areas have been affected. Special programs of IAS management were conducted in 06 PAs managed by the DWLC on a pilot scale under the recently concluded PAM&WC Project.
- The CEA has conducted several programs with the participation of communities for the removal of invasive alien species (mainly Mimosa pigra –Giant Mimosa) in Thalangama Environment Protection Area (wetland).

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning

The effects of climate change and ocean acidification have the potential to have a particularly negative effect on those ecosystems which are sensitive to temperature fluctuations and/or depend on the availability of carbonate minerals. For the marine environment this includes warm water and deep ocean coral reefs as well as shellfish beds which will be greatly impacted by the combined effects of climate change and ocean acidification. For the terrestrial environment those ecosystems already at the extreme of their ranges will be particularly vulnerable.

In addition to climate change and ocean acidification, there are a variety of other human pressures affecting ecosystems. Reducing anthropogenic pressure on those ecosystems affected by climate change or ocean acidification will give them greater opportunities to adapt. Where multiple drivers are combining to weaken ecosystems, aggressive action to reduce those pressures most amenable to rapid intervention should be prioritized. Many of these drivers can be addressed more easily than climate change or ocean acidification.

Key actions taken by Sri Lanka to reduce the anthropogenic pressure on vulnerable ecosystems can be summarized as follows;

- Amendments introduced to the Coast Conservation Act in 2011, paves the way for more positive coastal zone management. It enables the declaration of (a) affected areas in the coast in which no development, dumping of waste or damaging activity can be carried out, (b) beach parks for preservation of scenic beauty and biodiversity, and (c) conservation areas for the protection of the coastal and aquatic eco-system, with no development activity to be permitted other than research and study.
- All mining activities in the Coastal Zone will need the concurrence of the CCD. As a result, the Coast Conservation Department has recorded a decrease in beach sand mining in coastal areas.
- Coral mining for lime production has stopped after the 2004 Tsunami as people realized the value of the reefs to minimize coastal damage from events such as Tsunami and sea erosion.
- Coupled with the government ban on using lime based paint for government buildings and strict enforcement of the Coast Conservation Act, particularly with regard to transportation of coral to lime kilns, has served to halt the rampant coral mining that exited in the past (CCD, 2014).
- The Coastal Zone and Coastal Resources Management Plan is currently being prepared in accordance with the requirements of the CCA.
- Sea coral removal has declined in the coastal stretch due to intensive law enforcement.

- Programs are being carried out for coral replanting with the involvement of NGOs as well as community organizations.
- Setting up shrimp farms observed to be significantly decreased due to white spot disease which was prevalent on the north-west coast.
- Fifteen (15) mangrove areas have been declared as conservation forests by the Forest Department.
- National capacity needs and technologies have been identified by the National Capacity Needs Assessment Project for Climate Change to minimize marine pollution and control to damaged resources.
- Forest Department commenced the implementation of REDD+ Readiness preparation activities under the Sri Lanka UN-REDD Programme in 2012. The unique value of Sri Lanka's forests, and the nature of the threat they face, makes the country a strong candidate for an effective REDD+ Programme.
- The vulnerability of tropical Wet Zone forests of Sri Lanka has been recognized. Boundary redefinition and demarcation of most of these forests with concrete posts has been completed. This has significantly halted further encroachments into these valuable natural ecosystems.
- A pilot project covering two Divisional Secretary (DS) Divisions (Walapane and Medirigiriya) to address the climate change impacts on rural livelihoods is being implemented by the Climate Change Secretariat of the MoERE, with the participation of all stakeholders.

3.2.3 Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

Target 11: By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape

Well-governed and efficiently managed protected areas are a proven method for safeguarding both habitats and populations of species and for delivering important ecosystem services. Particular emphasis is needed to protect critical ecosystems such as tropical forests, tropical coral reefs, see-grass beds, coastal wetlands and fresh water ecosystems. Additionally, there is a need for increased attention to the representation, connectivity and management effectiveness of protected areas.

Actions taken in Sri Lanka to achieve this target are described below;

Forests:

The Protected Area (PA) network of forests has expanded over the years to cover all climatic zones, especially in the Wet Zone. Even so, as reported in the Fourth National Report, the declaration of new PAs lacks coordination between the two main stakeholders (i.e. FD and DWLC).

Thirty-three (33) forests covering a total extent of 74,239ha have been declared by the FD as conservation forests since 2009. This is a significant increase of Conservation Forests set aside for strict conservation with more valuable wet zone forests coming into the protected area network. Likewise, 286 forests with a total extent of 574,170ha declared as reserved forests during this period.

Inscription of Central Highland World Heritage is a significant achievement during the reporting period. The Knuckles Conservation Forest, Horton Plains National Park and the Peak Wilderness Protected Area were accepted by UNESCO as a Serial Natural World Heritage site designated as the Central Highlands World Heritage site in 2010. This brought the total area under this category from 8,864 to 118,884 ha thus providing international recognition and additional protection to some of the countries' most sensitive and important ecosystems

The extent (proposed and implemented) as Biosphere Reserves has been increased with the identification of Transition Zones for the Sinharaja and Hurulu Biosphere Reserves

There has been a perceptible increase in the Protected Area network under the Department of Wildlife Conservation as well.

Wetlands:

Degradation and conversion of wetlands is a continuing problem, especially with regard to urban wetlands, despite identification and listing of important wetlands in the country (see Chapter 3). The development of policy on wetland conservation and re-establishment of a special unit for wetland conservation in the Central Environment Authority are the major initiatives to address these issues.

Eight critically important wetland areas have been declared as Environmental Protection Areas under the National Environmental Act (NEA, 1980) and management plans were prepared for them. Activities within these sites are regulated through a legal instrument. Another 10 wetlands are identified for declaration as Environmental Protection Areas.

Three more critically important wetland sites were inscribed as Ramsar sites since 2009 increasing the total number of Ramsar sites in Sri Lanka to 06. That will count as 198,027 ha under RAMSAR sites at present from the previous figure of 8,377 ha.

Coastal and Marine systems:

Some positive steps have been taken in coastal and marine systems to conserve biodiversity rich habitats as given below;

- Enactment of the Coast Conservation (Amendment) Act No 49 of 2011, which has increased the coastal zone to cover 100 m of riparian land on either side of the 2 km water source perpendicular to a river mouth in the coastal zone. This area is also meant to be a no build zone for new projects.
- Two marine protected areas were added to the PA network managed by the Department of Wildlife Conservation during the reporting period making the total marine protected areas into four (04).
- Identification of Special Area Management (SAM) Sites and several large scale projects such as the Coastal Resources Management Project (CRMP) that dealt with identifying and monitoring coastal ecosystems and management of the fishery resources.
- Two fisheries management areas were set up at Great and Little Bases and Polhena, under the Fisheries and Aquatic Resources Act to regulate the fishery in them.
- Twenty (20) mangrove sites are been protected by the Forest Department along the southwest and north-west coast by declaring them as reserved or conservation forests.

Under the National Environmental Act (NEA), the Central Environmental Authority (CEA) has recently declared eight Environmental Protection Areas (EPAs). Although they are not PAs with legal protection, only identified development activities are allowed in them by the CEA.

Target 12: By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained

Though some extinction of threatened species is the result of natural process, human actions have been greatly contributed to the current increased extinction rates. Reducing the threat of human-induced extinction requires action to address the direct and indirect drivers of change and it can be long term processes. However, in many cases, imminent extinctions of known threatened species can be prevented by protecting important habitats or by addressing the specific direct causes of the decline of these species.

As reported in Part I, about 44% of all flowering plants and 46% of vertebrate species are threatened in Sri Lanka. In this regard, preventing further extinction as well as improving the conservation status of threatened species is equally important. Measures taken to achieve the above target are listed below;

- The rate of deforestation has been significantly reduced during the reporting period and the existing conservation sites have been strengthened with the expansion of Protected Area (PA) network as well as inscribing a new natural World Heritage Site. As shown in Table 1.5, since submission of the Fourth National Report, the extent under PAs have been increased by 84%.
- A new red list of threatened and endangered species has been prepared by MoERE with the assistance of IUCN in 2012. Consequently, several awareness and education programs were carried out to highlight the importance of conserving the threatened flora and fauna.
- As a response to the national Red List of 2012, there is fair understanding of threatened species and their needs at the national level, and the preparation of species profiles and species conservation action plans are underway. In addition, several recovery plans, reintroduction programs, translocation programs are also being prepared.
- Several institutionalized biodiversity surveys have been conducted to document wild and cultivated species to identify and monitor trends in species diversity.
- There has been a perceptible increase in taxonomic research on the faunal and floral groups of Sri Lanka, which has led to the discovery and scientific description of many new species during the reporting period.
- Capacity building for in-situ conservation of threatened fauna and flora is being carried out within the stakeholder institutions.
- Establishment of two new botanical gardens, establishment of four medicinal plant gardens, establishment of elephant holding ground in Horowpatana and the expanding the activities of Elephant Orphanage at Udawalawa, can be identified as significant achievements for ex-situ conservation during the reporting period. In addition, construction of another zoological garden in Pinnawala is also underway.
- The National Botanic Gardens is involved in propagation of many indigenous floral species; including orchids; many of which are identified as threatened.
- The National Aquatic Resources Research and Development Agency (NARA) is carrying out research on captive breeding of threatened species of brackish water food fish species, endemic ornamental fish species. It also engaged with the propagation of many aquatic plant species as well.
- Several actions have been taken for ex-situ conservation of traditional crop varieties through various projects and institutional programmes of the Department of Agriculture. Among them, conservation of genetic material in the Plant Genetic Resources Centre (PGRC); provision of seeds of traditional varieties to farmers for on-field propagation; and setting up demonstration plots and extension programs to promote organic farming.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity

The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives is in decline as in the genetic diversity of other socio-economically and culturally valuable species. The genetic diversity which remains needs to be maintained and strategies need to be developed and implemented to minimize its current trend of erosion, particularly as it offers options for increasing the resilience of agricultural systems and for adaptation to changing conditions (including the escalating impacts of climate change).

There are several programmes implemented in Sri Lanka for ex-situ conservation of genetic diversity of crops and their wild relatives with a potential for economic, food or medicinal use. In recent years there has been a positive trend to conserve and use the germplasm of indigenous crops and their wild relatives for varietal improvement in rice, vegetables, other field crops and export agrucultural crops.

The actions taken to achieve the above target are summarized below;

- The collection of crop germplasm is increasing at the Plant Genetic Resources Centre (PGRC) of the Department of Agriculture (DoA). The wild relatives of crops are now being distributed to the relevant field research institutes for further research.
- All crop research and development institutes under the Department of Agriculture are engaged in research to characterize and investigate the properties of local varieties and wild relatives of crops for varietal improvements. As such, they maintain working collections of crops (including traditional varieties) and wild relatives of crops under their purview.
- The Plant Genetic Resource Centre (PRGC) and other research institutions of the Department of Agriculture also give out seeds of traditional varieties to farmers for on-field propagation. As a result, there are many farmers in the island who are cultivating traditional rice varieties as this fetches a higher price in the market due to better taste and nutritional value than the improved varieties.
- The DoA is also popularizing the use of organic fertilizer and the traditional varieties of vegetables for home garden growers as they need less intensive care, are more resilient to diseases, and need less fertilizer.
- The means of conserving wild relatives of crops; mainly *Oryza* spp and *Vigna* spp; have been addressed through a project for conservation of crop wild relatives. 22 locations have been identified for in-situ conservation of crop wild relatives in addition to the protected areas where they occur.
- The research institutes for plantation crops (i.e. tea, rubber, coconut and sugarcane) maintain live field collections of varieties, cultivars and clones of crops within their purview.
- The Department of Export Agriculture (DEA) maintains germplasm of species relevant for crop enhancement as per their mandate, while research institutions for minor export crops are also engaged in breeding new varieties with higher yield and beneficial traits. Wild types of crops are also being investigated for beneficial traits and for products such as essential oils, oleoresins and piperine of commercial value.
- The Department of Animal Production and Health (DAPH), and its research centre and the Veterinary Research Institute (VRI), is using germplasm of indigenous and local breeds of animals in their breeding programmes. Cattle breeding programmes are made available to cattle farmers island-wide to upgrade local breeds through artificial insemination programmes where local cattle are inseminated with imported high yielding germplasm. This has served to propagate the beneficial traits of locally adapted breeds that need less intensive care and are resistant to disease while increasing milk production.
- New Livestock Breeding Policy was developed in 2010, which deals with the *in-situ* and *ex-situ* conservation of indigenous livestock breeds includes the characterization, inventorying and monitoring of such breeds.
- Measures are being taken to conserve traditional knowledge associated with agriculture and livestock rearing, which is increasingly important for developing the agriculture sector in the face of climate change.
- In 2013, Sri Lanka became a contracting party to the International Treaty on Plant Genetic Resources of Food and Agriculture.

3.2.4 Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable

All terrestrial, freshwater and marine ecosystems provide multiple ecosystem services. However, some ecosystems are particularly important as they provide services that directly contribute to human wellbeing by providing services and goods to fulfill daily needs. Actions taken to protect and restore such ecosystems will have benefits for biodiversity as well as for human wellbeing.

In this regard, ecosystems which provide services related to the provision of food, fiber, medicines and fresh water, pollination of crops, filtration of pollutants and protecting from natural disasters are primarily important. As such, it is important to safeguard and restore those ecosystems while ensuring the needs of women, indigenous and local communities, and the poor and vulnerable sections of the society, when setting policies or undertaking certain types of action.

Some of the key measures undertaken in this regard are summarized below;

- Through judicious management, the rate of deforestation has been significantly reduced, and the *Mahinda Chintana* vision for the future policy framework has set a target of increasing the forest cover to 35% of the island's land area by 2020.
- The most important forest product used by villagers in fringes of Wet Zone forests is water for domestic use as well as for agricultural purposes. Significant efforts have been undertaken during the reporting period to conserve and protect these sensitive ecosystems through different measures such as survey and boundary demarcation, declaring them as Conservation Forests and including them in the protected area network as well as effective law enforcement.
- Water catchments (watersheds) that are located in isolation are being identified for declaration for the protection of water sources. A cabinet subcommittee appointed in 2013 for this purpose and a draft policy document was submitted to the cabinet through the Ministry of Lands.
- Considerable extents of the central hill country were declared as sensitive areas under the National Environmental Act (NEA) to ensure the sustainability of their environmental services. Most of those areas are covered with the Soil Conservation Act as well, to provide an added protection.
- Forests in the central hills provides freshwater for hydro-electricity which is a major source of energy in the country. Large numbers of hydroelectricity generation programs including micro and mini-hydropower projects aimed at rural electrification were established while maintaining the environmental protection guidelines.
- A large quantity of non-timber forest products (NTFPS) for subsistence and commercial use such as; ornamental plants, food items, medicinal plants, roof thatching material, raw materials for traditional craft based industries, oils and resins etc., have been issued to rural households under subsidized (royalty) rate. Whereas dead firewood collection from forests was allowed free of charge among the local communities.
- Mineral resources such as sand, clay, gravel, limestone, metal quarrying and quartz within the environmentally less sensitive Dry Zone forests were dispensed to the rural communities as well as state-driven rehabilitation programs with minimum damage caused to the environment.
- Ecotourism activities that strengthen the conservation of forests, wetlands and coastal and marine resources are being promoted.
- Large extents of grasslands and thorn scrub forests of the Dry Zone which are the main habitats for large charismatic species such as the elephant, deer, bear and leopard are continued to be maintained as National Parks for the attraction of visitors and nature lovers.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification

Deforestation, wetland drainage and other types of habitat change and degradation lead to the emission of carbon dioxide, methane, and other greenhouse gases. The reversal of these processes, through ecosystem restoration, represents an immense opportunity for both biodiversity restoration and carbon sequestration. Restored landscapes and seascapes can improve resilience including adaptive capacity of ecosystems and societies, and can contribute to climate change adaptation and generate additional benefits to people, in particular indigenous and local communities and the rural poor.

Sri Lanka's contribution to the above target is summarized below;

- Sri Lanka, as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) of 1992, has commenced several important initiatives to address climate change. Since ratification of the UNFCCC and acceding to the Kyoto Protocol, most of the requirements of the UNFCCC have been addressed by Sri Lanka to a considerable extent. So far, Sri Lanka has submitted two National Communications including greenhouse gas inventories to the UNFCCC, in year 2000 and 2012 respectively.
- Sri Lanka is currently implementing the Sri Lanka UN-REDD Programme with the objective of building capacities to implement the REDD+ activities towards the end of the programme period.
- The annual forest restoration program of the Forest Department has intensified with government allocating special annual allocation of Rs.500 million (US $ 4 million) from 2014 onwards, towards the achievement of the national target of 35 percent forest cover set by the Mahinda Chintana Vision for the Future. Large extents of degraded forest areas (especially located in the Dry Zone) are expected to be restored primarily using assisted natural regeneration (ANR).
- The Climate Change Secretariat (CCS) was established within the MoERE to serve as a node for the implementation of UNFCCC decisions and to formulate and implement projects and programmes at national level with regard to climate change.
- Designated National Authority (DNA) was established by the Ministry of Environment to deal with the CDM under the Kyoto Protocol (KP).
- The Centre for Climate Change Studies (CCCS) was established within the Meteorological Department (MD) for undertaking research on climate change including analysis of data collected by the Meteorological Department.
- Two Clean Development Mechanism (CDM) Centers were established in University of Moratuwa and University of Peradeniya to promote CDM activities in Sri Lanka.
- National Capacity Needs Self Assessment on Climate Change (2007) and the Technology Needs Assessment (TNA) for climate change (2012) were completed as a significant contribution to climate change mitigation and adaptation.
- A pilot Project covering two DS Divisions (Walapane and Medirigiriya) to address the climate change impacts on rural livelihoods is being implemented by the Climate Change Secretariat of the MoERE, with the participation of all stakeholders. The project aims to convert and restore human induced and degraded landscapes in the two DS Divisions into more sustainable land uses.
- New technologies for climate change adaptation were introduced by the Departments of Agriculture, Tea Research Institute, and several other institutions and universities that are developing new technologies for mitigation measures.
- Effective measures were undertaken to rehabilitate and conserve aquatic resources devastated by poor aquaculture practices. In this regard, a sound policy decision has been taken to conduct shrimp farming based on a zonal plan. Monitoring and extension activities

of shrimp farming have been strengthened (ex. issuing of licenses, monitoring and control of disease outbreaks etc.)

- MoERE is implementing a special program for the rehabilitation of mangrove areas by implementing replanting programs in several locations.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation

The fair and equitable sharing of the benefits arising out of the utilization of genetic resources is one of three objectives of the Convention on Biological Diversity. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity was adopted by the Conference of the Parties to the Convention on Biological Diversity at its tenth meeting of Nagoya, Japan.

The Nagoya Protocol provides a transparent legal framework for the effective implementation of the objective of fair and equitable sharing of benefits arising out of the utilization of genetic resources. The protocol covers genetic resources and traditional knowledge associated with genetic resources, as well as the benefits arising from their utilization by setting out core obligations for its contracting parties to take necessary measures in relation to access, benefit-sharing and compliance.

The operationalization of the Nagoya Protocol requires that it be implemented effectively at the national level. Countries will need, depending on their specific circumstances, to revise legislation, administrative or policy measures already in place or develop new measures in order to meet the obligations set out under the Protocol. Countries will also need to determine the institutional structure needed for implementing the Protocol.

Sri Lanka has not yet ratified the Nagoya Protocol. However, the country has realized the difficulty to stop the over exploitation and export of biological resources without a proper legislative support in the country. In order to address this issue MoERE has prepared a Draft Material Transfer Agreement. But since a Material Transfer Agreement cannot contain the rules, principles, and procedure by which it is to be developed and administered, a need of a clear policy on access to biological resources and benefit sharing emerged.

In 2013, MoERE has formulated a National Policy on Access to Biological Resources, Sustainable Use and Benefit Sharing with the objective of conserving the biological resources of the country for the benefit of the present and future generations, while assuring the sustainable use of these resources in a transparent manner. The national policy is expected to bind all relevant parties concerned with the conservation and sustainable use of the biological resources and to act as an umbrella policy in managing access and benefit sharing of those resources.

3.2.5 Strategic Goal E: Enhance implementation through participatory planning knowledge management and capacity building

Target 17: By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan

National biodiversity strategies and action plans (NBSAPs) are the key instrument for translating the Convention and decisions of the Conference of the Parties into national actions. For this reason it will be essential that parties have developed, adopted and commenced implementing an updated NBSAP as a policy instrument which is in line with the goals and targets set out in the Strategic Plan by 2015.

The second generation of the National Biodiversity Strategies and Action Plan (NBSAP) for Sri Lanka is yet to be prepared in light of the CBD Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets adopted in 2010.

It is revealed that the Biodiversity Conservation Action Plan (BCAP) 1999 as well as its addendum of 2007 does not specify concrete national biodiversity targets, indicators and baseline. This aspect will have to be incorporated into the revision of the next generation NBSAP. The new NBSAP will reflect how Sri Lanka intends to fulfill the objectives of the Convention in light of specific national circumstances, and a related action plan which outlines the sequence of steps to be taken to meet these objectives. The preparation of the new NBSAP will be done as a matter of urgency through a participatory process involving all relevant stakeholders.

Once developed, the NBSAP will have to be adopted into government policy, so that it can be effectively implemented. This is to ensure that it is mainstreamed into the planning and programs of those sectors which could have an impact on biodiversity.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

There is a close and traditional dependence of many indigenous and local communities on biological resources. Traditional knowledge can contribute to both the conservation and the sustainable use of biological diversity. This target aims to ensure that traditional knowledge is respected and reflected in the implementation of the Convention, subject to national legislation and relevant international obligations, with the effective participation of indigenous and local communities.

Sri Lanka's achievements in regard to this target are summarized as follows;

- Importance of traditional knowledge is being increasingly acknowledged, especially in the agriculture and health sectors.
- Final Draft of the Traditional Knowledge Policy has been prepared.
- Traditional knowledge compendium is completed in three volumes.
- A legal framework for the protection of traditional knowledge in Sri Lanka was developed in 2009. (visit http://www.wipo.int)
- A symposium on traditional knowledge is organized annually focusing intensely on pre-Buddhist knowledge and practices.
- A compendium on historically important trees is published. It is proposed to provide a special protection to those trees by legally declaring them under the Flora and Fauna Protection Ordinance.
- The Ministry of Indigenous Medicine is the national focal institution in place to promote and safeguard traditional healing. 62 Ayurvedic Hospitals, 208 Central Dispensaries, 1424 Ayurveda Medical Practitioners employed by the Government. In addition, there is a National Institute of Traditional Medicine, Sri Lanka Ayurveda Drugs Corporation, Sri Lanka Ayurveda Medical Council, Ayurveda Department, a Research Institute and Herbal Gardens operated under the Ministry (N De Silva, 2013, http://www.saarcculture.org/)

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied

Information is needed to identify threats to biodiversity and to determine priorities for conservation and sustainable use. Absence or difficulty in accessing information is an obstacle to the implementation of the goals of the Convention.

Therefore, it is important to increase knowledge, the scientific base and technologies relating to biodiversity. This target should be regarded as a general commitment to increase the amount and quality of biodiversity relevant information and technologies as well as to make better use of it in decision making as well as to share it as widely as possible.

In this regard, a national clearing-house mechanism was designed by the Biodiversity Secretariat of the MoERE with the objective of providing effective global information service to facilitate the implementation of the national biodiversity strategies and action plans. However, the implementation of the mechanism was delayed due to the dearth of capacity as well as human resources.

Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the strategy for resource mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.

Limited capacity, both financial and human, is a major obstacle for most countries to the implementation of the Convention. The capacity which currently exists in countries needs to be safeguarded and increased from current levels, in line with the process laid out in the Strategy for Resource Mobilization, in order to enable countries to meet the challenges of implementing the Strategic Plan for Biodiversity 2011-2020. The fulfillment of this target will have implications on the feasibility of achieving the other 19 targets contained in the Strategic Plan.

Although the government funding in Sri Lanka for biodiversity conservation per se has not significantly improved, funding for some specific sectors related to biodiversity conservation has been improved. Increased funding for forest restoration activities and home garden improvements through Dvineguma Program are some of the key indicators in this regard. Recent decision of the government to pay special allowances for the researchers working in government institutions who are involved with applied research programs will also likely to produce new inventions in biodiversity sector as well.

Table 3.1: Progress of implementation of Aichi Biodiversity Targets

Aichi Target		Headline Indicators used to assess progress	Assessment of change since 4th National Report			
Strategic Goal A: Address the underline causes of biodiversity loss by mainstreaming biodiversity across government and society						
1.	**Awareness Increased -** *By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably*	• Trends in awareness, attitudes and public engagement in support of biological diversity conservation.				
2.	**Biodiversity values integrated -** *By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems*	• Trends in integration of biodiversity and ecosystem service values into national development policies.				

Aichi Target		Headline Indicators used to assess progress	Assessment of change since 4th National Report			
3.	**Incentives reformed -** *By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.*	• Trends in identification, assessment and establishment and strengthening of incentives that reward positive contribution to biodiversity and ecosystem services and penalize adverse impacts.				
4.	**Sustainable consumption and production -** *By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.*	• Trends in population and extinction risk of utilized species, including species in trade				
Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use						
5.	**Habitat loss halved or reduced -** *By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.*	• Trends in extent of selected ecosystems and habitats • Trends in fragmentation of natural habitats				

	Aichi Target	Headline Indicators used to assess progress	Assessment of change since 4th National Report			
						
6.	**Sustainable management of marine living resources -** *By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits*	• Trends in area frequency and/ or intensity of destructive fishing practices • Trends in extinction risk of target and by catch aquatic species				
7.	**Sustainable agriculture, aquaculture and forestry -** *By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity*	• Trends in area of forest, agriculture and aquaculture ecosystems under sustainable management • Trends in proportion of products derived from sustainable sources				
8.	**Pollution reduced -** *By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity*	• Trends in emission to the environment of pollutants relevant for biodiversity • Trends in water quality in aquatic ecosystems				
9.	**Invasive alien species prevented and controlled -** *By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment*	• Trends in number of invasive alien species • Trends in invasive alien species pathways management • Trends in policy responses, legislation and management plans to control and prevent spread of invasive alien species				

Aichi Target	Headline Indicators used to assess progress	Assessment of change since 4th National Report			
					
10. **Pressures on vulnerable ecosystems reduced -** *By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning*	• Trends ion extinction risks of coral and reef fish • Trends in extent, and rate of shifts of boundaries of vulnerable ecosystems				
Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity					
11. **Protected areas increased and improved -** *By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape.*	• Trends in representative coverage of protected areas and other area based approaches, including sites of particular importance for biodiversity, and of terrestrial, marine and inland water systems • Trends in protected area condition and/ or management effectiveness				
12. **Extinction prevented -** *By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.*	• Trends in abundance and distribution of threatened species • Trends in extinction risk of species				
13. **Genetic diversity maintained -** *By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity*	• Trends in number of effective policy mechanisms implemented to reduce genetic erosion and safeguard genetic diversity related to plant and animal genetic resources				

Aichi Target		Headline Indicators used to assess progress	Assessment of change since 4th National Report			
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services						
14.	**Ecosystems and essential services safeguarded -** *By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable*	• Trends in benefits that humans derive from selected ecosystem services				
15.	**Ecosystem restored and resilience enhanced -** *By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification*	• Trends in area of degraded ecosystems restored or being restored				
16.	**Nagoya protocol in force and operational -** *By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation*	• Not applicable -				
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building						
17.	**NBSAPs adopted as policy instrument -** *By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan*	• Trends in implementation of NBSAPs, including development, comprehensiveness, adoption and implementation				

	Aichi Target	Headline Indicators used to assess progress	Assessment of change since 4th National Report			
18.	**Traditional knowledge respected-** *By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.*	• Trends in degree to which traditional knowledge and practices are respected				
19.	**Knowledge improved, shared and applied –** *By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied*	• Trends in biodiversity related capacity building, knowledge transfer, plus trends in uptake into policy				
20.	**Financial resources from all sources increased –** *By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties*	• Trends in mobilization of financial resources for biodiversity conservation efforts				

- Improving -
- Little or no overall change
- Deteriorating
- Insufficient or no comparable data

Scale 0-20% | 20 – 40% | 40 -60% | 60 -80% | 80 -100%

3.3 The Contribution of Actions to Implement the Convention towards the Achievement of the relevant 2015 Targets of the Millennium Development Goals (MDGs) in Sri Lanka

At the UN General Assembly in New York in year 2000, the world leaders decided on the Millennium Development Goals (MDGs) as a strategy to sustainable development. The MDGs are comprised of eight time bound goals, 18 reachable targets and 48 measurable indicators, with year 1990 taken as a baseline and year 2015 as the deadline to achieve the goals. Incidence and magnitude of poverty, illiteracy, child malnutrition, gender inequality, infant child and maternal mortality, environment pollution, access to basic amenities, access to health facilities and access to IT and communication facilities are some of the dimensions captured by the MDGs. The overall objective is to improve the living conditions of the people, raise economic and social empowerment at community level and ultimately bring about sustainable social and economic development of the country.

Sri Lanka has become a signatory to the Millennium Declaration by signing it with 190 other countries in year 2000. By including the MDGs into the Governments ten year development plan "Mahinda Chintana vision for the future" which extends from 2006 to 2016, the Sri Lankan Government has accorded high priority to achieving them and shown its determination to meet the set targets within the stipulated time frame.

As a result, Sri Lanka is in the forefront of the Millennium Development Goals. It has already achieved several of them, especially in the health and education sectors. Sri Lanka has also made great strides in poverty alleviation, child and maternal mortality rates and gender and equality. It is also on track to achieve the targets for most of the indicators by 2015.

The role of biodiversity in ensuring the achievement of MDGs is well recognized. However, the links between biodiversity and the path to achieving the MDGs have not been made explicit.

Among the eight Goals, the most relevant Millennium Development Goal for biodiversity is Goal 7, which focuses on ensuring environmental sustainability. However, attempts are being made to mainstream biodiversity not only into MDG 7, but also across other MDGs, as achieving the targets of the MDGs will directly or indirectly impinge on the status and use of biodiversity.

The most biodiversity-oriented targets under Goal 7 are:

- Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.
- Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.

Sri Lanka's efforts towards achieving the twenty (20) Aichi Biodiversity Targets are also relevant to the fulfillment of the Millennium Development Goals. Delivering on the Aichi Biodiversity Targets will contribute not only to MDG 7 of ensuring environmental sustainability, but also both directly and indirectly to the other seven MDGs.

The Department of Census and Statistics (DCS) as the authority on official statistics in Sri Lanka published a mid-term review in 2010 in which MDG indicators for Sri Lanka has been identified. With regard to Goal 7, it has identified eight indicators to be measured for the purpose of achieving environmental sustainability. Table 3.2 indicates the assessment of progress in relation to the four targets and eight indicators listed under Goal 7.

Table 3.2: The progress of achieving the relevant 2015 Targets of the Millennium Development Goals (MDGs) in Sri Lanka

Goal, Target	Indicators	Assessment of Progress
Goal 7: Ensure Environmental Sustainability		
7a. *Integrate the principals of sustainable development into country policies and programmes and reverse the loss of environmental resources* ***7b.*** *reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss*	Proportion of land area covered by forest	29.7 percent of the land area is under forest cover in Sri Lanka. Overall, the total forest cover in the country has decreased from 31.2 % of the island in 1999 to 29.7% in 2010. But the deforestation rate has significantly reduced. (Please refer Part I of the report for details)
	Ratio of area protected to maintain biological diversity to surface area	The area under protection managed by the Forest Department and the Department of Wildlife Conservation has increased from 2008 to present (Please refer Part 1 for details) The expansion of international Protected Areas, Conservation Forests, Reserved Forests, National Parks and Sanctuaries has contributed largely for this achievement
	Energy use (kg oil equivalent) per$1 GDP	Energy use (petroleum in kg) per $ GDP has followed a declining trend since 1990, with the highest value of 0.21 reported for 1990 and the lowest value of 0.05 reported for 2005[50]
	Carbon dioxide emissions per capita and consumption of ozone- depleting CFCs (ODP tons)	Sri Lanka ratified the United Nations Framework Convention for Climate Change in November 1993. The per capita Carbon Dioxide emissions per year have recorded a threefold rise from 0.20 MT to 0.64 MT between 1990 and 2005. However reports indicate that in 2010 it remains around 0.6MT[51].
		Sri Lanka partnered with Montreal Protocol in 1989, and introduced rigorous measures to phase out ozone-depleting substances (ODSs). As per the phase out schedule, by 2015there should be 10% reduction in the use of HDFCs and in 2030 it will be completely phased out[52].
	Proportion of population using solid fuels	Overall, the proportion of households using solid fuels has registered a marked decline of 10 percentage points between 1994 and 2006/07. However, still four households out of every five households in the island use fire wood, saw dust or paddy husk for cooking purposes

50 Department of Census and Statistics
51 Data.worldbank.org/country/sri-lanka
52 www.noulanka.lk

Goal, Target	Indicators	Assessment of Progress
Goal 7: Ensure Environmental Sustainability		
***7c.** halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation*	Proportion of population with sustainable access to an improved water source	The proportion of households with access to safe drinking water has increased over the decade and has reached the MDG target of 86 percent, by year 2006. In 2011 it has further improved and reached 92.6[53].
	Proportion of population with access to improved sanitation	The proportion of population with access to improved sanitation stands at 94 percent in 2006/07 and has exceeded the MDG target of 93%.
***7d.** achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers*	Proportion of households with access to secure tenure	Overall, 15 percent of the Sri Lankan population lives in urban areas. Apparently 5 percent of the urban dwellers live in slums or shanties. The National Housing Development Authority is implementing a special program called *"Sahasra Lanka"* targeting housing facilities to low income households in urban areas.

3.4 Lessons learned from the implementation of CBD in Sri Lanka

In general, biodiversity conservation and management in Sri Lanka have met with many successes particularly in the development of policies, legislative frameworks, as well as institutional structures that provides delivery and implementation of the country's biodiversity agenda.

However, there are several areas in need for improvements and effectiveness. In this respect, the formulation of the second generation NBSAP offers a great opportunity to address some of the shortcomings. The lessons learnt from the implementation of the Convention should form an integral part of the process of formulating the new NBSAP.

Following are the key lessons learned and issues to be addressed in the formulation of the next NBSAP

- The Biodiversity Conservation Action Plan (BCAP) which was developed in 1998 does not prescribe specific targets as well as timeline by which certain objectives are to be met. It was to function as a broad based and umbrella policy framework for biodiversity conservation. The scheduled review is expected to provide implementation timelines for critical biodiversity targets and actions.
- There is a need to improve the capacity and resources to implement biodiversity conservation legislation, policies and programmes. While the requisite laws, policies and programs are broadly in place, there is a significant gap in the actual implementation of recommended actions.
- Biodiversity conservation actions are adversely affected in some sectors due to inadequate coordinated functioning mechanisms, insufficient funds and human resources to implement them in a holistic manner.
- Although biodiversity concerns are adequately integrated into the plans, policies and programmes of the agencies of environmental and related sectors, the cross sectoral integration is inadequate in the agencies of the development sectors.
- There is a need to formulate an effective mechanism for the collection, analysis and sharing of biodiversity information. Furthermore, scientific and research capacity in the field of biodiversity should be enhanced.
- The application of economic instruments in biodiversity has not been fully realized for the integration of biodiversity values and ecosystems services into development planning and resource allocation.
- The lack of cohesive and comprehensive monitoring mechanisms has posed some challenges towards measuring actual progress in certain conservation areas.

53 www.unicef.org/infobycountry/sri_lanka

INFORMATION CONCERNING THE REPORTING PARTY AND PREPARATION OF THE FIFTH NATIONAL REPORT

INFORMATION CONCERNING THE REPORTING PARTY	
Contracting Party	Sri Lanka
NATIONAL FOCAL POINT	
Full name of the institution	Ministry of Environment and Renewable Energy, Democratic Socialist Republic of Sri Lanka
Name and title of contact officer	Mr. B.M.U.D. Basnayake, Secretary, Ministry of Environment and Renewable Energy
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CONTACT OFFICER FOR NATIONAL REPORT (IF DIFFERENT FROM ABOVE)	
Full name of the institution	Ministry of Environment and Renewable Energy, Democratic Socialist Republic of Sri Lanka
Name and title of contact officer	Ms. R.H.M.P. Abeykoon, Director, Biodiversity Secretariat
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SUBMISSION	
Officer responsible for signature for submission of national report	
Date of submission	

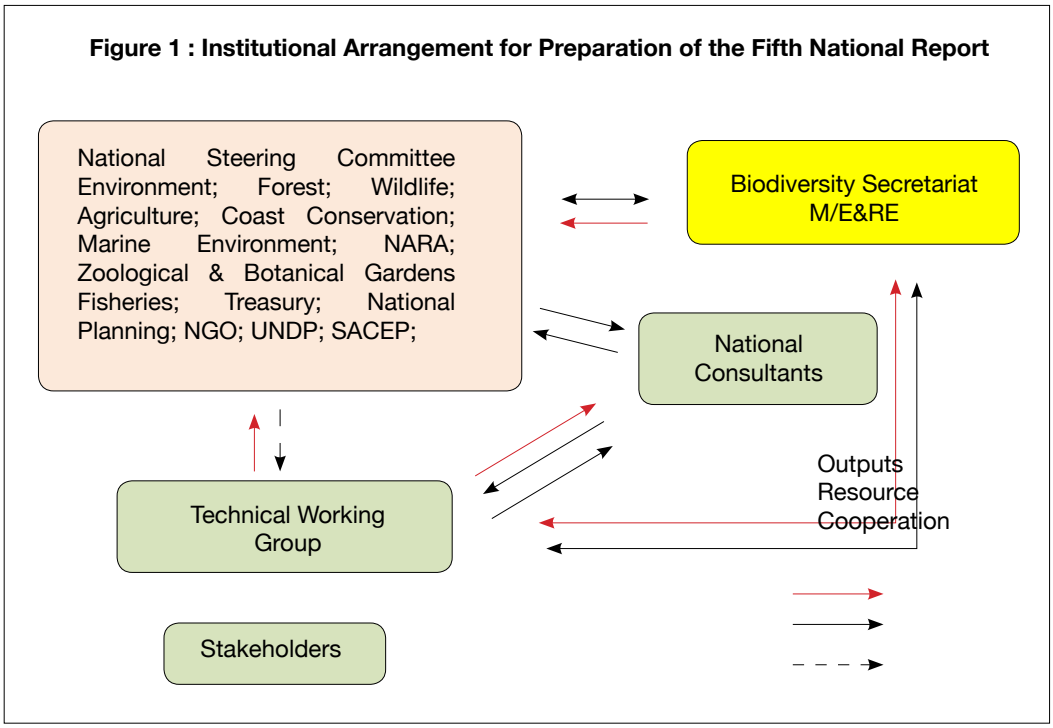
Information Concerning Process of Preparation of the Fifth National Report (FNR)

Sri Lanka as a contracting party to the Convention on Biological Diversity (CBD), according to the Article 26 of the CBD, it has to present to the Conference of the Parties (COP), reports on measures which it has taken for the implementation of the provisions of the Convention and their effectiveness in meeting the objectives of the convention. The Ministry of Environment and Renewable Energy as the focal point for the CBD has an obligation and commitment to submit the Fifth National Report on Biological Diversity to the Secretariat of the Convention in accordance with the CBD – COP decision x/10 on National Reporting. The Global Environmental Facility (GEF) provides the necessary financial support to facilitate the preparation of the Fifth National Report through the United Nations Development Programme UNDP),Colombo office, Sri Lanka.

The objective of this project is to prepare the Fifth National Report (FNR) based on the guideline adopted by the CBD to provide a complete picture of national implementation of the convention and to assess the progress towards the Aichi Biodiversity targets and Millennium Development Goals.

The Biodiversity Secretariat (BDS) of the Ministry of Environment and Renewable Energy (MoE&RE) of Sri Lankan has followed the guidelines for preparation of the FNR to Convention on Biological Diversity, Resource Manual for the fifth national report provided by Secretariat to the Convention on Biological Diversity (CBD) and the guidance from the eleventh meeting of the Conference of the Parties (decision X/10, paragraph 1). An overview of the institutional arrangement involved in preparation of the FNR is shown in Figure 1.

Figure 1 : Institutional Arrangement for Preparation of the Fifth National Report



Based on the guidelines proposed by the Secretariat to the CBD, the following steps in forming institutional arrangements have been performed by the Biodiversity Secretariat (BDS) of the MoE&RE:

- Establish the National Steering Committee (NSC) for Conservation of Biodiversity in Sri Lanka
- Identify relevant stakeholder agencies and personals for the National Steering Committee (NSC).
- Convene a meeting to discuss and agree the process to be adopted for the preparation of the fifth national report.
- Appoint of three (03) national consultants and a Team Leader for preparation of the fifth national report.
- Identify lead technical institutions and representing participants for the Technical Working Group (TWG), and other technical experts to provide inputs for preparation of the fifth national report.
- Establish the Technical Working Group (TWG) with representatives from relevant technical institutions, NGOs, civil society, indigenous & local communities, individual technical experts etc.
- Convene an inception meeting of the TWG to discuss and define process for involvement of all stakeholders.

Ministry of Environment and Renewable Energy (MoE&RE) & National Steering Committee (NSC):

Setting up of the National Steering Committee (NSC) which is the top most decision is making body concerning the preparation of the fifth national report was the first operational task undertaken in the preparation process of the fifth national report. The same NSC for Biological Diversity which was functional during 2013 was taken as the NSC for preparation of the Fifth National Report (FNR). The MoE&RE which is the focal point for Convention on Biological Diversity is the responsible Ministry for preparation of the FNR to Convention on Biological Diversity. Accordingly MoE&RE provides the leadership to the preparation process of the report. The NSC was chaired by the secretary of the MoE&RE and comprises 24 members including senior officers from the MoE&RE and all other relevant Ministries, Government institutions and members from non-governmental organizations. The Composition of the NSC is provided in table 1.1.

Table: 4.1: The Composition of the National Steering Committee (NSC)

Institution	Designation	Institution	Designation
1. MoE&RE	Secretary (Chairman)	13. Department of Wildlife Conservation	Deputy Director
2. MoE&RE	Addl. Sec (Natural Resources)	14. Department of Agriculture	Director General
3. MoE&RE	Addl. Sec (Environment & Policy)	15. IUCN	Country Representative
4. MoE&RE	Director (Biodiversity)	16. Central Environment Authority	Director General
5. MoE&RE	Director (Planning)	17. Marine Environment Protection Authority	General Manager
6. MoE&RE	Director (Climate change)	18. Coast Conservation Department	Director General
7. MoE&RE	Director (N/R Management)	19. NARA	Head(Environmental Studies)
8. UNDP	Assistant Country Director	20. Department of Fisheries	Director General
9. Department of National Planning	Director General	21. SACEP	Senior Programme Officer
10. Department of External Resources	Director (UN & TA)	22. Green Movement Sri Lanka	
11. General Treasury	Director General (Operations)	23. Dept. National Zoological Gardens	Deputy Director
12. Forest Department	Conservator General of Forest	24. Dept .National Botanical Gardens	Director General

Role of the Biodiversity Secretariat and National Consultants:

The Biodiversity Secretariat (BDS) which is responsible for preparation of the FNR, functions under the MoE&RE. A total of three (03) National Consultants and a team leader were appointed by the BDS in February 2014 to carry out the task of preparation of the FNR to the CBD. The responsibility of each Consultant was to prepare the relevant chapter of the fifth national report in accordance with the guidelines provided by the secretariat of the CBD. The three Consultants were responsible for preparation of three chapters of the report and they were required to provide their relevant chapter reports to the team leader within a given time frame. The responsibilities of the team leader comprised providing over all guidance to three Consultants, coordination of report preparation activities, preparation of the executive summary and appendices, compilation and edition of the report and submission of the consolidated fifth national report to the biodiversity secretariat. The NSC and Director of the BDS provided the overall guidance to the team leader and other consultants.

Responsibility of the Director of the BDS was to provide vision and leadership for the overall process of preparation of the FNR and submission to the secretariat of the CBD. This included facilitating the tasks of communication with the NSC, coordination and communication with TWG and other stakeholders, recruitment and coordination with national consultants, formation of networks with stakeholder institutions, information acquisition, and preparation of work plans & monitoring of the progress of preparation of the report. In addition, overall responsibilities of undertaking activities such as administrative support, organization of meetings and workshops as well as implementation of the work plan of the project were with the Director, BDS through the staff of the biodiversity secretariat.

Stakeholder Engagement Process:

Following the appointment of Consultants in February 2014, a number of interaction meetings were held with the BDS, concerned divisions in the MoE&RE and relevant agencies and organizations. A plan of action with tentative timelines was also prepared by the team leader and finalized in consultation with the BDS to ensure timely submission of the Report to the Secretariat of the CBD.

Preparation of the FNR involves collection of vast amounts of data and information from the relevant stakeholders, institutions, projects and programmes relevant to the implementation of CBD. Therefore, stakeholder involvement is very crucial to the preparation process of FNR. In order to get the stakeholder participation in this process, a Technical Working Group (TWG) was constituted by the BDS in order to ensure a consultative process involving all the relevant stakeholders. The stakeholders for the technical working group were identified in accordance with the guideline provided by the secretariat to the CBD. These stakeholders included members from the relevant government organizations & institutions with responsibilities for policy formulation and regulation, relevant NGOs, civil society, indigenous & local communities, and other relevant institutions such as universities and research organizations etc. The national counterpart organizations and institutions which are responsible for implementation of CBD and other related conventions were also included in the TWG. The Composition of the Technical Working Group is provided is attached.

Technical Working Group (TWG) Workshops and National Workshop:

The TWG included around 30-35 persons representing related organizations. The composition of the TWG was flexible and members could be included depending on the requirement. The BDS made all the arrangements together with Consultants to coordinate and facilitate working group discussions effectively in order to achieve maximum output.

The goals and objectives of the participatory process were discussed with the stakeholders at the Inception Technical Working Group Workshop held in mid March 2014 and agreed to the proposed process. At this meeting, objective of the preparation of the FNR and the purpose of stakeholder participation together with roles and responsibilities of stakeholder working group were also discussed and agreed. The main purpose of the stakeholder participation is to get their involvement throughout the report preparation process and for implementation of actions planned. The Second Technical Working Group Workshop was held during the third week of April and the first draft FNR was discussed in detail and responses of participants to the draft report were

noted by Consultants. In addition to the discussions with the TWG, the project Consultants have communicated with individual experts to get further information on various related matters. Based on the information gathered from TWGs, individual experts and various other sources including written and published documents and policy papers, the first draft report was revised and final draft of the FNR was prepared by the Consultants during April – June 2014.

Thereafter, a National Workshop to discuss the final draft of Sri Lanka's FNR was organized by the BDS on behalf of the MoE&RE in June 2014. The workshop was well attended by more than 45 participants, representing several concerned Ministries/Departments/organizations, specialized institutions and agencies, NGOs, academia, UNDP etc. During the workshop deliberations, some very useful inputs/comments were received. Many of the participants subsequently also sent their comments in writing via e-mail.

After deliberations at the National Workshop, the final version of the FNR was prepared by Consultants during the third week of June, 2014, by incorporating inputs received from all the participants. The final version of the report was then submitted to the NSC for approval. The FNR approved by the NSC was considered as the final version of Sri Lanka's Fifth National Report to submit to the secretariat of the CBD.

Table 4.2: The Composition of the Technical Working Group (TWG)

	Designation	**Institute**
1	Director/Agriculture Technology	Ministry of Agriculture
2	Conservator of Forests	Forest Department
3	Head, Department of Zoology	Faculty of Science, University of Colombo
4	Deputy Director, Natural Resources Management Unit	Central Environmental Authority
5	Deputy Director	Department of National Zoological Gardens
6	Director, Science	Ministry of Education
7	Scientist (Pharmacognosy)	Department of Ayurveda
8	Scientific Officer (Research Division)	National Science Foundation
9	Deputy Director	Royal Botanical Garden, Peradeniya
10	Director (Engineering)	Ministry of Wildlife Resources Conservation
11	Programme Officer	IUCN
12	Deputy Director	Sri Lanka Custom
13	Assistant Director (Livestock Development)	Ministry of Livestock & Rural Community Development
14	Assistant Director (Planning)	Coast Conservation and Coastal Resource Management Department
15	Research Officer	Office of the Registrar of Pesticides
16	Museum Keeper of Natural History Museum	Department of National Museum
17	Director (Research)	Department of Export Agriculture
18	Assistant Director (United Nations and Technical Assistance Division)	Department of External Resources
19	Chair of the Department of Forestry and Environmental Science	Department of Forestry and Environmental Science, University of Sri Jayawardenepura

	Designation	Institute
20	Deputy Director (Planning & ICT)	Department of Wildlife Conservation
21	Assistant Manager	MEPA
22	Director(Planning)	Min/Disaster Management
23	Assistant Director	Disaster Management Centre
24	Assistant Director	Department of Fisheries & Aquatic Resources
25	Director (Planning)	Ministry of Indigenous Medicine
26	Programme Officer	SACEP
27	Scientist	NARA
28	Deputy Director	Plant Genetic Resource Centre
29	Assistant Director	Ministry of Fisheries & Aquatic Resources
30.	Deputy Director(Research)	V.R.I, Department of Animal Production
31.	Deputy Director	Lands & Land Development
32.	Progremme Analyst	UNDP

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Important Web links:

Ministry / Department / Institution	Web link
Ministry of Environment and Renewable Energy	http://www.environmentmin.gov.lk/
Ministry of Fisheries and Aquatic Resources	http://www.fisheries.gov.lk/
Ministry of Indigenous Medicine	http://www.indigenousmedimini.gov.lk/
Ministry of Finance and Planning	http://www.treasury.gov.lk/
Ministry of Agriculture	http://www.agrimin.gov.lk/
Ministry of Disaster Management	http://www.disastermin.gov.lk/
Ministry of Health	http://www.health.gov.lk/
Ministry of Defense and Urban Development	http://www.defence.lk/
Ministry of Education	http://www.moe.gov.lk/
Ministry of Higher Education	http://www.mohe.gov.lk/
Ministry of Land and Land Development	http://www.landmin.gov.lk/
Ministry of Power and Energy	http://www.powermin.gov.lk/
Ministry of Maas Media and Information	http://www.media.gov.lk/
Ministry of Irrigation and Water Resources	http://www.irrigationmin.gov.lk/
Ministry of Technology Research and Atomic Energy	http://www.motr.gov.lk/

Forest Department	http://www.forestdept.gov.lk/
Department of Wildlife Conservation	http://www.dwc.gov.lk/index.php/en/
Department of Census and statistics	www.statistics.gov.lk
Department of Agriculture	www.agridept.gov.lk
Department of Export Agriculture	www.exportagridept.gov.lk
Department of Fisheries and Aquatic Resources	http://www.fisheriesdept.gov.lk/
Department of Agrarian Development	www.agrariandept.gov.lk
Department of Health Service	http://www.health.gov.lk/
Department of Meteorology	http://www.meteo.gov.lk/
Department of National Botanic Gardens	http://www.botanicgardens.gov.lk/
Department of National Zoological Gardens	http://www.colombozoo.gov.lk/
Department of National Physical Planning	http://www.nppd.gov.lk/
Department of Ayurveda	http://www.ayurveda.gov.lk/
Department of Coast Conservation	http://www.coastal.gov.lk/
Department of Customs	http://www.customs.gov.lk/
Department of Government Information	http://www.news.lk/
Department of External Resources	http://www.erd.gov.lk/
Department of Irrigation	http://www.irrigation.gov.lk/
Department of Meteorology	http://www.meteo.gov.lk/
Department of National Budget	http://www.treasury.gov.lk/
Department of Public Finance	http://www.treasury.gov.lk/
Department of Rubber Development	http://www.rubberdev.gov.lk/
Department of Social Services	http://www.socialservices.gov.lk/
Department of Survey	http://www.survey.gov.lk/
Ayurvedic Medical Council	http://www.ayurvedicmedicoun.gov.lk/
Central Bank of Sri Lanka	http://www.cbsl.gov.lk/
Bandaranayke Memorial Ayurvedic Research Ins	http://www.bmich.lk/
Central Environmental Authority	http://www.cea.lk/
Coconut Cultivation Board	http://www.coconut.gov.lk/
Ceylon Fisheries Corporation	http://www.fisheriescorporation.gov.lk
Coconut Development Authority	http://www.cda.lk/
Disaster Management Center	http://www.dmc.gov.lk/
Gampaha Wickramarachchi Ayurveda Institute	http://www.kln.ac.lk/institutes/wickramarachchi/index.htm
Hector Kobbwkaduwa Agrarian Training and Research Institute	http://www.harti.lk/
Institute of Molecular Biology and Biotechnology	http://www.ibmbb.lk/
Institute of Indigenous Medicine	http://iim.cmb.ac.lk/
International Union for Conservation of Nature (IUCN)	http://www.iucn.org/srilanka
National Aquaculture Development Authority	http://www.naqda.gov.lk/
National Aquatic Resource Research & Dev Agency (NARA)	http://www.nara.ac.lk/
Land Reform Commission	http://www.landcommdept.gov.lk/
National Science Foundation	http://www.nsf.ac.lk/
Post Graduate Institute of Agriculture	http://www.pgia.ac.lk/
Post Graduate Institute of Science	http://www.pgis.lk/
Ramsar Convention	http://www.ramsar.org/cda/en/
Sri Lanka Council for Agricultural Research Policy	http://www.slcarp.lk/
State Timber Corporation	http://www.timco.lk/statetimco/
Ayurvedic Drugs Corporation	http://www.ayurvediccorporation.lk

Annex 1

Detailed case studies of the Central Highlands World Heritage Site: a Haven for Threatened Endemic Relict species and other Ecosystem Services

The Central Highlands World Heritage site (CH WHS) consists of the Knuckles Conservation Forest (KCF), the Peak Wilderness Protected Area (PWPA) and the Horton Plains National Park (HPNP).

These wet montane forests of the Sri Lanka's central highlands, contain some of the most distinctive faunal elements of the island, particularly with respect to herpetofauna. Altogh ilsoated from the Indian sub-continent for the past 20 million years, some species were able to migrate across the land bridges with India during the Pleistocene, but some species remained isolated in the higher altitudes of the wet zone due to their relative immobility and the inhospitable dry climate which prevailed in the drier lowlands (Goonewardene, et al., 2006). Examples of such relict species are Ceratophora tennentii - confined to the higher elevations of the Knuckles Conservation Forest while close relatives have survived in the Rakwana hills and the central massif (Goonewardene, et al., 2006) which contains the Peak Wilderness Protected Area and the Horton Plains National Park. The skink Chalcidoceps thwaitesii from an endemic monotypic genus is found only in the KCF while all populations of the endemic Cerotopora stoddarti, Calotes nigrilabris and Cophotis ceylonica are 'mountaintop isolates' (Bahir and Surasinghe, 2005) , for which the Central Highlnads World Heritage Site provides critically important habitats for their future survival. It is significant that the three nominated sites between them provide habitats for 48% of the country's endemic vertebrate species (GoSL, 2008), among which are many geographically relict species "considered as living fossils of the biogeographical and ecological sense" (Cruz, 1986). The three sites also contain 21 out of the 27 bird species that are endemic to Sri Lanka (GOSL, 2008; BDS/MoE & DNBG, 2012).

Overall, some of the endemic species within the Central Highland World Heritage Site (CH WHS) are also very habitat specific, and include species that are found at only one location within the island. As such, the Central Highlands World Heritage Site containing the KCF, HPNP and PWPA assumes high importance as refugia for Sri Lanka's endemic and relict fauna that are of high global significance.

Another very significant feature of the CH WHS is that nearly all the river systems in the country originate from these forests. The PWPA covers the headwaters of Kelani and Kal Ganga (rivers), while the Walawe Ganga arises from the HPNP. The entire drainage system of the KCF belongs to the Mahaweli Ganga system while the Hulu Ganga flows down the dip slopes of the Knuckles range of mountains. These forests thus serve critical ecosystem functions of protecting the headwaters of major rivers, controlling floods, controlling soil erosion and fog interception.

The PWPA is the largest block of pristine and near-pristine montane and sub-montane rainforest in Sri Lanka. It contains 555 woody plant species, of which about 50% are endemic, and 310 vertebrate species of which 50% are endemic. Among the plant species are several dipterocarp species that occur at exceptionally high elevations for this group anywhere in the world (GOSL, 2012). Among the fauna, there are many point endemics in his forest such as the globally threatened Dasi's dwarf toad. (Adenomus dasi). This forest is also of high religious and cultural significance to all major religious in the island and contains a world famous Buddhist Shrine. Present day pilgrims continue to brave the steep terrain as in ages past, inspired by deep faith.

The HPNP occurs on a highland plateau with altitudes ranging from 1200m to 2300m from which arise two peaks Kirigalpotta and (2359m) and Thotupolakanda (2324m). The vegetation consists of gently undulating wet pathana grasslands and mist laden patches of cloud forest with characteristic flat topped canopy trees provide habitats for a rich and unique fauna

and flora. A total of 79 species of woody plants have been recorded here (IUCN/WCMC/FAO, 1997). Among these are 30 species of Strobilanthes, of which 26 are endemic and Arundinaria densifolia: one of the most reduced species of bamboo in the world. While this forest has less vertebrate species (98) than PWPA and KCF, nearly 40 %of these species are endemic (GOSL, 2008) and HPNP has higher percentages endemics than KRPA and PWS in terms of amphibians (100%), reptiles (88%) and mammals (38%). It also provides the main refuge of many rare taxa such as the characteristic bear monkey (Semnopithecus vetulus monticola), the montane subspecies of the toque macaque (Macaca sinica opisthomelas) and the Horton Plains slender loris of Sri Lanka (Loris lydekkerianus nycticeboides). This site also yields valuable Palaeo-ecological and cultural evidence of global importance. Mesolithic artifacts reveals occupation by prehistoric man on the plains as a hunter-forager, while fossil pollen grains of oat, barley and an Oryza sp. suggest that first agriculture emerged in South Asia in Sri Lanka. Interestingly there is evidence that systematic cultivation of what can be recognised as extant species of wildrice: Oryza eichingeri, O nivara and O. rhyzomatisat HPNP date as far back as 13,000-8700 BP (GoSL, 2008). HPNP is currently a very popular tourist destination and offers many prime scenic tourism sites such as the famous Baker's Falls.

Annex 2

Impacts of Actions Implemented for Prevention/Mitigation of Threats

Actions Implemented		Impacts on Prevention/Minimizing Threats
Forest Ecosystems		
1.	The Mahinda Chintana vision for the future policy framework has set a target of increasing the forest cover to 35% of the island's land area by 2020.	Most of the actions taken by government and other stakeholders on forest conservation focus to achieve this target, and it is considered as the benchmark.
2.	National Physical Policy and Planning process of the National Planning Department has recognized protected areas	This provides a significant contribution for mainstreaming biodiversity conservation, providing funding for forest management.
3.	Amendment of the Forest Ordinance (2009) and Fauna Flora Protection Ordinance (2009) to strengthen the forest & wildlife laws against prevention of illegal activities in forests.	(i) This action helped significantly to halt further encroachments into these valuable natural ecosystems, and prevent using forest and wildlife areas for Chena cultivation. (ii) Prevention of illegal activities in forests and wildlife areas such as illicit felling, gem mining etc minimizes forest degradation.
4.	Survey and boundary marking of most of the forests in Sri Lanka and declaring them as Conservation Forests and Forest Reserves as well as effective enforcement of law.	
5.	Survey and boundary marking of Wildlife Reserves and strengthening enforcement of the wildlife law (Fauna Flora Protection Ordinance).	
6.	Various community forestry initiatives are undertaken in the Dry and Intermediate Zones of Sri Lanka under the Australian Aid funded Sri Lanka Community Forestry Program.	Help to focus on mainstreaming community forestry concept into the forestry sector and to make it a main strategy for the sustainable management of forest resources
7.	Enhanced home garden development programs under Dvineguma Program and FD, aiming production of fruit, food and development of Tree Resources Outside Forests (TROF).	Contribution to food security, and reduction of pressure on forests for timber supply.
8.	Preparation and implementation of Management Plans for all the forests managed by the FD and the DWLC has made a mandatory requirement under the revised Forest Ordinance and Fauna and Flora Protection Ordinances.	Implementation of Management Plans will ensure sustainable management of forest and wildlife areas and help and provide justification and mechanism for close and effective monitoring and enforcement.
9.	Institutional capacity of FD & DWLC developed by way of improvements to manpower, technology (GIS, Remote Sensing).	Building of Institutional capacity will strengthen implementation of Management Plans, monitoring and forest protection.

	Actions Implemented	Impacts on Prevention/Minimizing Threats
Forest Ecosystems		
10.	The annual forest restoration program of the FD intensified with government allocating special annual allocation of Rs.500 million from 2014 onwards.	Under this, large extents of degraded forest areas (located especially in the Dry Zone) are expected to be restored using assisted natural regeneration.
11.	Inscription of Central Highland World Heritage Site (The Knuckles Conservation Forest, Horton Plains National Park and the Peak Wilderness Protected Area) by the UNESCO in 2010.	Due to this action, the total area under World Heritage category has increased from 8,864 to 118,884 ha.
12.	The extents of Biosphere Reserves have been increased with the identification of Transition Zones for the Sinharaja and Hurulu Biosphere Reserves.	Further, international recognition provided and additional protection of these most sensitive and important ecosystems are strengthened.
13.	A large quantity of non-timber forest products for subsistence and commercial use (e.g. food items, medicinal plants, roof thatching material, raw materials for traditional craft based industries) have been issued to rural households under subsidized (royalty) rate.	These actions reduce the pressure for adjacent forests, as alternatives for such activities are now in place. This reduces the threat to forests in terms of illegal encroachments, illegal extraction of forest products and utilization.
14.	Tourism related policy adopted by the government promotes development of sustainable eco tourism as a key sector of the economy. Private sector is encouraged towards ecotourism initiatives.	
15.	Rural communities are provided with the permission to obtain mineral resources (e.g. sand, clay, gravel, limestone etc.) from the environmentally less sensitive Dry Zone forests	This minimizes the overexploitation of resources and illegal access to which through highly protected and conservation areas.
16.	National Policy on Elephant Conservation developed.	Facilitate minimizing the human – elephant conflicts.
17.	Large extents of grasslands and thorn scrub forests of the Dry Zone are maintained as National Parks.	To secure the primary habitats of the large charismatic species such as elephants, deer, bear and leopard and to avoid conflicts for food and encroachment into human settlements.
18.	Large extents of forest areas are surveyed, demarcated and legally declared with special attention paid to more vulnerable forest ecosystems.	Impact on prevention of illegal encroachments, illegal extraction of forest products as well as deforestation.

Coastal and Marine Ecosystems		
1.	Coast Conservation Amendment Act No 49 of 2011 has increased the coastal zone to cover 100 m of riparian land on either side of the 2 km water.	Encroachments to coastal areas are prevented and no development activities are permitted other than research, studies, and conservation activities.
2.	The Coast conservation Act (CCA) amendment No 49 of 2011 paves the way for more positive coastal zone management activities.	
3.	Amendments introduced to the Coast Conservation Act in 2011 declared affected areas in the coast in which no development, dumping of waste or damaging activity can be carried out, beach parks for preservation of scenic beauty and biodiversity, and conservation areas for the protection of the coastal and aquatic eco-system are promoted.	
4.	Eight critically important wetland areas have been declared as Environmental Protection Areas under the National Environmental Act (NEA) (1980) and management plans have been prepared for them.	Activities within these sites are now regulated through a legal instrument.
5.	Measures are in place facilitate optimum utilization of aquatic resources through eco-friendly aquaculture practices (identification of targeted species and potential productive systems (e.g. seasonal tanks), conservation of natural breeding habitats, and conducting breeding programs for stock enhancement of indigenous fish species).	The strategies and actions implemented through these eco-friendly aquaculture practices will prevent over exploitation of species
6.	Introduction and make aware of application of crop calendars for aquaculture and co-management practices	Those engaged in fishing are directed to initiate / adopt responsible fishing practices to maximize resource utilization.
7.	NARA carries out research on captive breeding of threatened species of brackish water food fish, endemic ornamental fish species, and propagated many aquatic plant species.	These initiatives help to protect those threatened species and to bring back them to existence.
8.	Introduction of the Concept of Special Area Management (SAM)	This becomes an integral component of National Coastal Zone Management Policy, which promotes collaborative, adaptive and flexible approach to sustainable resource management within a defined geographic area.

9.	Ban on using lime based paint for government buildings and coral mining for lime production.	Threat - Destructive practices during resources extraction: Protection of coral reef / fish stocks at right amounts by minimizing destructive fishing practices / reduction of illegal sand mining etc. are the outcomes of these actions.
10.	Control of illegal sand mining on the south west coast through strict law enforcement	
11.	New Act on Fisheries and Aquatic Resources (amendment) No. 35 of 2013 introduced by the Department of Fisheries to control the use of destructive fishing implements.	
12.	National Plan on Shark Management is being prepared under the assistance of BOBLME Project.	
13.	Integrated fish culture programs and exotic fish breeding and culture trials are being carried out by NARA to enhance the production harvest and sustainable aquaculture.	
14.	All mining activities in the coastal zones need the concurrence of the CCD.	As a result, CCD records a decrease in beach sand mining in coastal areas.
15.	Thirteen (13) mangrove areas have been declared as conservation forests.	Further destruction of these sites are prevented and established as natural fish breeding sites.
16.	Monitoring of coastal water at 5 sites (i.e. Mount Lavinia, Hikkaduwa, Unawatuna, Polhena, Nilaweli and Arugambay).	Facilitate effect action in-prior to the damage and take precautions.
17.	Marine Environment Protection Authority (MEPA) is mandated to deal with marine pollution under the Marine Pollution Prevention Amendment Act No.35 of 2008.	This helps to issue warnings and promoting prompt remedial action in the event of a major oil spill in Sri Lankan waters, or in adjacent waters that may affect the country's marine environment.
Wetland Ecosystems		
1.	Three critically important wetland sites were inscribed as RAMSAR sites making the total number of sites 06.	Area under RAMSAR sites has increased to 198,027 ha from the previous figure of 8,377ha. International recognition provided and additional protection of these most sensitive ecosystems is strengthened.
2.	Conversion traditional paddy fields into other commercial uses in the Western Province are banned.	This helps to secure the extent of lands available for cultivation to guarantee food security and also protect from flooding.
3.	Preparation of management plans for wetlands (e.g. Bolgoda, Thalangama).	Sustainable Management of these wetland areas is ensured.
4.	Soil Conservation Act is now in force which has created a situation where conservation of soil and prevention of soil erosion is a mandatory requirement by law.	Development activities are now required to undergo with proper land use planning.
5.	Special Wetland Unit established at the CEA to oversee the interests of wetlands and to implement the National Wetlands Policy of 2006	Facilitate monitoring and effective law enforcement.

6.	National Wetlands Directory was developed by the CEA, in collaboration with IUCN and IWMI.	This provides first hand information for respective stakeholders (researchers, policymakers).
7.	ME&RE implement Pavithra Ganga program to deal with the wide spread problem of river pollution.	Facilitate effect action in-prior to the damage and take precautions.
8.	The National Water Supply & Drainage Board (NWS&DB) engaged with the control of pollution in the city canal system under the Colombo Environment Improvement Project (CEIP).	Effective utilization of city canal system without environmental issues.
Agriculture Systems		
1.	DOA has banned several pesticides in Sri Lanka from 2012 (e.g. *Carbaril, Chlorophyriphos, Carbofuran and Propanil and the weedicide Glyphosate).*	Not in sale; so, eliminate the potential damages to the environment.
2.	Promotion of organic tea farming	Cut down the inorganic fertilizer and agro-chemicals use
3.	DoA engaged in research to characterize and investigate the properties of local varieties and wild relatives of crops for varietal improvement.	Conservation of germplasm of indigenous crops and their wild relatives
Invasive Alien Species (IAS)		
1.	All imported plants and animals/their parts are required to be declared at the point of entry to the country and be subject to quarantine regulations under the Plant Protection Act No. 35 of 1999.	Law is in effect at the ports of entry, and illegal importations are curbed to a large extent.
2.	Species (or parts of species) that are perceived as probable sources of potential invasive species have been listed, and all imported seeds should be certified by the National Plant Quarantine Service and the Seed Certification and Plant Protection Centre of the DOA prior to release or use within the country.	Facilitate effective monitoring and enforcement of law.
3.	Legal measures are in place to prohibit growing of highly threatening IAS for agricultural systems such as *Parthinium.*	

4.	Database on IAS was established in 2013 and the information related to the priority IA species have been identified and published.	This provides necessary expertise as well as first hand information to deal with IAS. Also, the capacity development is in place through awareness and research.
5.	Invasive Species Specialist Group has been formulated by the ME&RE.	
6.	Various awareness and education programs were conducted by different agencies on IAS and the capacity of stakeholders are being developed.	
7.	The ME&RE is currently implementing a project for 'Strengthening Capacity to Control the Introduction and Spread of Invasive Alien Species (IAS) in Sri Lanka', with funds from the Global Environmental Facility.	
8.	The CEA has conducted several programs with the participation of communities for the removal of IAS (e.g. mainly Mimosa pigra – Giant Mimosa in Thalangama Environment Protection Area).	Threats to the biodiversity arising from such prominent and rapidly growing IAS could be minimized through this type of community participation programs.
Crosscutting Areas		
1.	New red list for threatened and endangered species have been prepared by ME&RE with the assistance of IUCN in 2012.	This provides first hand information for respective stakeholders (researchers, policymakers).
2.	National Policy on Access to Genetic Resources, Sustainable Use and Benefit Sharing	Direct towards conserving the genetic resources of the country and to bind all relevant parties concerned and to act as an umbrella policy.
3.	The National Botanic Gardens is involved in propagation of many indigenous floral species including the threatened orchid varieties.	These initiatives help to protect those threatened species and to bring back them to existence
4.	Divineguma – Island wide Home Garden Development Program of the Ministry of Economic Development and Horticulture Division of the DOA.	Pollution: This encourages organic farming and use of traditional varieties of vegetables for home gardening to reduce pesticide and chemical fertilizer use
5.	The CEA enforces EIA procedures and an EPL scheme under the National Environmental Act of 1988.	These help inevitably to minimize industrial pollution, reduction of water quality etc. and effective law enforcement for those who violated the conditions ex-ante.
6.	Guidelines and sets of standards for industrial effluents, vehicle emissions, ambient air and water quality set by CEA and SLSI are in place.	
7.	Strict enforcement of the vehicle emission testing system	Contributed significantly to reduce vehicular air pollution (e.g. use of unleaded petrol / recent move into 98-Octane petrol).

8.	Climate Change Secretariat (CCS) is established within the MoERE.	Facilitate, formulate and implement projects and programs related to climate chance at the national level on various issues (e.g. rural livelihoods) in the context of Sri Lanka.
9.	CCS undertakes a pilot project in two DS Divisions (i.e. Walapane and Medirigiriya)	
10.	National Capacity Needs Assessment Project for Climate Change is in place	Facilitate minimizing the marine pollution, in particular.
11.	Sri Lanka is currently implementing UN REDD+ Readiness Project	To reduce deforestation and forest degradation and increase resilience to climate change and to enhance Carbon footprint.