



# National Biodiversity Strategic Action Plan 2016-2022



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## Table of Contents

List of Figures	viii
List of Tables	ix
List of Boxes	xi
Team of Contributors	xii
Message from His Excellency, the President of the Democratic Socialist Republic of Sri Lanka, Minister of Mahaweli Development and Environment	xiii
Message from the Secretary, Ministry of Mahaweli Development and Environment	xiv
Message from the Director, Biodiversity Secretariat, Ministry of Mahaweli Development and Environment	xv
Vision	xvi
List of Acronyms	xvii
Chapter 1. National Biodiversity Stocktaking and Information Management	1
1.1 The Development of Sri Lanka's Biodiversity Action Plans	2
1.2 Existing Gaps	3
1.3 Introduction to the NBSAP	3
1.4 National Obligations under the CBD	8
1.5 Biodiversity of Sri Lanka, Trends and Linkages to Human Well-being	10
1.5.1 General Description of Sri Lanka	10
1.5.2 Status of the Biodiversity of Sri Lanka	20
1.5.3 The Value of Biodiversity and Ecosystem Services in Sri Lanka	33
1.5.4 Contribution of Biodiversity and Ecosystem Services to Human Well-being	35
1.5.5 Trends of biodiversity in Sri Lanka	44
Trends in Ecosystems	44
Trends in Species	44
Trends in <i>In-situ</i> Conservation — Protected and other Managed Areas	51
Trends in <i>Ex-situ</i> Conservation	57
1.5.6 Causes and Consequences of Biodiversity Loss	59
Causes	59
Underlying Driver	59
Habitat-related Drivers	59
Species-related Drivers	68
Climate Change-related Drivers	77
Consequences	82
1.5.7 Existing Institutional, Legal and Policy Framework for Biodiversity Conservation	84
Policies	84
Legislation	87
Organizations	95
The Role of Civil Society in Biodiversity Conservation	102

## Table of Contents Contd.

Biodiversity-related International Treaties and Conventions Enacted by the Sri Lankan Government	102
1.5.8 Barriers and Challenges for Effective Conservation and Sustainable use of Biodiversity	113
Policy	113
Institutional	113
Implementation	113
Financial	113
Chapter 2. Setting National Targets	117
2.1 Existing National Biodiversity Targets	118
2.2 National Targets for 2022	119
Chapter 3. National Strategic Action Plan	129
3.1 Vision	
3.2 Consideration of Concepts in Developing the Strategy	130
3.3 The Strategic Objectives	131
3.4 The Approach Taken in the Preparation of the NBSAP	131
3.4.1 A Three-tiered Hierarchical Approach	131
3.5 National Actions to Implement the Strategic Objectives	131
Chapter 4. Needs for Implementation	155
4.1 Capacity Building	156
4.1.1 Plan for Capacity Development for the Implementation of the NBSAP	156
4.2 Communication and Outreach	163
4.2.1 Preliminary Strategy for the Communication and Outreach of the NBSAP	163
4.3 Resource Mobilization	165
4.3.1 Road Map for Resource Mobilization for NBSAP Implementation	165
Principle behind Resource Mobilization	165
Strategy for Resource Mobilization	166
Approach to Resource Mobilization	166
Budget estimate for implementing the NBSAP 2016-2022	166
Possible Financing Mechanisms	168
Bio-prospecting	168
Payments for Ecosystem Services (PES)	170
Ongoing Projects	170
Chapter 5. Coordination, Monitoring, Evaluating and Reporting	173

5.1 National Coordination and Reporting Format	174
5.2 Biodiversity Clearing-House Mechanism	174
5.3 Supervision of and Advice for the Implementation of the NBSAP	175
5.4 Monitoring and Evaluation	175
Citations	177
Annexes	195
Annex 1. List of Stakeholders Consulted during the NBSAP Development Process	196
Annex 2. Matrix of Stakeholders Listed in the Plan	202
Annex 3. The NBSAP Communication and Capacity Building Strategy for the Action Plan: a preliminary proposal	236
Annex 4. Budget Estimates for Implementing the NBASP 2016-22	274



## List of Figures

Figure 1.	Sri Lanka's Location and Exclusive Economic Zone	11
Figure 2	The Earth During the Early (above) and Late (below) Jurassic	12
Figure 3.	The Topography of Sri Lanka	14
Figure 4.	Rivers of Sri Lanka	16
Figure 5.	Reservoirs of Sri Lanka	17
Figure 6.	Bioclimatic Zones of Sri Lanka	19
Figure 7.	Endemicity Among Some of the Main Taxonomic Groups in Sri Lanka	25
Figure 8.	Figure 8. a) Repeated land Bridge Formation, due to Lowering of the Sea Level during periods of Glaciations (between 3 myrs – 3000 yr), Connected the Indian Mainland with Sri Lanka Facilitating Faunal Exchange between Sri Lanka and India.	27
	Figure 8. b) Sea level Rise as in the Present Day Separates India from Sri Lanka	
Figure 9.	Sri Lanka's Ichthyological Zones	28
Figure 10.	Sri Lanka's Mammalian Zones	29
Figure 11.	Sri Lanka's Avifaunal Zones	30
Figure 12.	Sri Lanka's Vegetation Zones	32
Figure 13.	Ecosystem Services and Linkages to Human Well-being	33
Figure 14.	Schematic Illustration of Ecosystem Services in Sri Lanka	36
Figure 15.	Forestry Sector Contribution to GDP	37
Figure 16.	Forestry Sector Contributions to the Sri Lankan Economy	39
Figure 17.	A High Proportion of Species in Most Taxonomic Groups seen in Sri Lanka are Listed as Threatened	48
Figure 18.	Protected Areas of Sri Lanka (under the Jurisdiction of the Forest Department and Department of Wildlife Conservation)	52
Figure 19.	Other Managed Areas of Sri Lanka (under the Jurisdiction of the Department of Fisheries and Coast Conservation and Coastal Resource Management Department)	54
Figure 20.	Environmental Protection Areas (EPAs) under the Jurisdiction of the CEA and proposed by the NWPEA	56
Figure 21.	<i>Ex-situ</i> Conservation Centres and National Repositories of Sri Lanka	58
Figure 22.	Sri Lanka's Population and Growth in the last 150 years	59
Figure 23.	Mangrove Destruction around Puttalam Lagoon	61
Figure 24.	Increase in Visitors to Yala National Park	69
Figure 25.	Projected Sea Level Rise in Sri Lanka	78
Figure 26.	Changes in Climate Boundaries in 2050	79
Figure 27.	Increasing Revenue from Visitation to Four National Parks (2007-2014)	82
Figure 28.	Sectoral Contributors to Biodiversity Conservation in Sri Lanka	100
Figure 29.	Change in the Number of Species in Three Decades	120

Figure 30.	The Three-tier Hierarchical Approach used in the Preparation of this NBSAP	131
Figure 31.	Matrix of Stakeholders	157
Figure 32.	Matrix of Stakeholder Engagement	158
Figure 33.	Proposed Hierarchical Coordination	174

## List of Tables

Table 1.	An Overview of Sri Lanka's Ecosystem Diversity	20
Table 2.	An Overview of Sri Lanka's Species Diversity	26
Table 3.	Contribution to the National Economy by the Forestry Sector	38
Table 4.	Summary of Ecosystem Services Provided by Sri Lankan Ecosystems	40
Table 5.	New Species of Fauna Recorded since 2007 in Sri Lanka	45
Table 6.	Conservation Status of Nationally Assessed Taxa of Sri Lanka	46
Table 7.	Current Coverage of Protected Areas in Sri Lanka	53
Table 8.	Summary of Habitat-related Threats to Sri Lanka's Ecosystems	65
Table 9.	Summary of Species-related Threats to Sri Lanka's Ecosystems	70
Table 10.	Current and Projected Areas under Three Major Climatic Zones	79
Table 11.	Impact of Climate Change on Ecosystems	80
Table 12.	Breakdown of Tourist Visitation and Revenue by National Park	83
Table 13.	A Selection of Policies and Plans that have a Bearing on Biodiversity	84
Table 14.	A Selection of Acts and Ordinances that Directly or Indirectly Affect Biodiversity	87
Table 15.	A Selection of Organizations that have a Bearing on Biodiversity	95
Table 16.	International Conventions related to Biodiversity Conservation to which Sri Lanka is a Signatory	102
Table 17.	Key Capacity Needs by Type of Group	159
Table 18.	Summary Budget Estimates for Implementing the NBSAP 2016-22	167
Table 19.	Selected Ongoing Biodiversity-related Projects	170

## List of Boxes

Box 1.	The Aichi Targets	4
Box 2.	Sustainable Development Goals (SDGs)	6
Box 3.	The Ecosystem Approach	7
Box 4.	Other National Obligations	9
Box 5.	The Contribution of the Forestry Sector to the National Economy of Sri Lanka	37
Box 6.	The National Red List	47
Box 7.	The Conservation History of the Critically Endangered (CR) Point-endemic Freshwater Fish, Bandula Barb ( <i>Pethia bandula</i> ): a Success Story	49
Box 8.	Environmental Protection Areas (EPAs) for the Conservation of Biodiversity	55
Box 9.	Loss of Mangroves and Salt Marshes around Puttalam Lagoon	61
Box 10.	The National <i>Pilisuru</i> Programme	63
Box 11.	Habitat Loss = Loss of Carbon Sequestration	67
Box 12.	Over-visitation	69
Box 13.	Strengthening Capacity for Managing Invasive Alien Species (IAS) in Sri Lanka	72
Box 14.	The UN REDD Programme	109
Box 15.	Globally Important Biological Sites	110
Box 16.	Justification for the Formulation of National Targets	120
Box 17.	The Process of Preparing the NBSAP	126
Box 18.	The NBSAP: Synergies among Global and other National Targets	130
Box 19.	Failure of Communicating Conservation	163
Box 20.	Bio-piracy and Bio-theft	169

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## **Message from His Excellency, the President of the Democratic Socialist Republic of Sri Lanka, Minister of Mahaweli Development and Environment**

Sri Lanka is blessed with immense natural wealth — with a multitude of species and a range of breathtaking ecosystems that provide us Sri Lankans with life-sustaining services. Historical records reveal that our unique culture has been nourished by conservation-friendly religions and philosophies. The Theravada Buddhist tradition teaches us to convey loving kindness to all living beings and centuries of using our traditional knowledge have validated this compassion.

However, in our efforts to improve our economy, we are now squandering this natural wealth. While developing the country's infrastructure, we are ravaging its ecosystems. Since 1900, more than 75% forest cover has been lost; and 50% of our wetlands have been reclaimed or destroyed. In the process of improving agriculture and advancing our industries, we are poisoning the water and polluting the air. In our determination to better ourselves and our daily lives, we are consuming more, discarding more and accumulating solid waste. We are also currently experiencing changing weather patterns, influenced by global warming, that lead to extreme weather events, such as the devastating floods of 2016.

We cannot improve our economy at the cost of our inherited natural wealth. However, at the same time, I am committed to improving the quality of lives of our people and to making this country a haven where everyone is content and lives in harmony with each other. The challenge facing us today is to ensure that we achieve this so that we not only live in harmony with each other but also with nature.

In order to attain this difficult balance between development and the conservation of our rich natural heritage, we need a holistic policy and a comprehensive road map. In this context, I welcome this National Biodiversity Strategic Action Plan (NBSAP), which presents the current state of our natural wealth and provides recommendations that mainstream our island's biodiversity into national development. It is a great pleasure for me to send this message for this critical policy intervention.

It is proposed that this NBSAP will be implemented with the active support of a wide range of stakeholders, in a variety of sectors. I believe that this action plan was prepared in line with the 'Towards a Blue-Green Era National Sustainable Development Programme' designed to bring the country's coastal, marine and terrestrial resource management into a new era of effective conservation.

I extend my grateful thanks to everyone who contributed to the preparation of this NBSAP. I wish everyone engaged in its implementation all the very best in their endeavours to make the vision of 'Living in Harmony with Nature' a reality.

### **Maithripala Sirisena**

President, Democratic Socialist Republic of Sri Lanka  
Hon. Minister of Mahaweli Development and Environment

## **Message from the Secretary, Ministry of Mahaweli Development and Environment**

Among the major functions vested with our Ministry are the provision of national leadership for formulating policies for sustainable development and collaborative implementation of plans and pilots with line agencies, other organizations and different social groups. As a member of the United Nations Organization, Sri Lanka has responsibilities and obligations to fulfil the commitments to the global community that stem from international conventions and treaties.

The Convention on Biological Diversity (CBD) is an iconic convention of the United Nations. Each party of this Convention is mandated to prepare an action plan to achieve strategic goals to manage the country's sustainable management of biodiversity. This National Biodiversity Strategic Action Plan (NBSAP) 2016 - 2022 was prepared to meet the above requirement. IUCN, Sri Lanka Country Office provided technical assistance to our Ministry.

What we refer to as biodiversity is the variety and variability of all life on Earth. Sri Lanka's biodiversity is unique as there is a high species richness per unit area, very high endemism, and a wide variety of ecosystems. In addition, we have inherited a unique traditional knowledge nourished with experiences from our ancestors, who cherished the natural environment.

Current anthropogenic threats to biodiversity and its resultant depletion and degradation is not only confined to Sri Lanka but is also rampant at a global scale. The conservation of biodiversity must not be relegated to our Ministry but must become integral to all sectors. Therefore, we need to join hands to implement the recommendations of the NBSAP and ensure the conservation of our nation's natural wealth so that future generations may also benefit from this wealth. In this mission we need to stand together, supported by strong scientific data.

During the preparation of the NBSAP, not only line agencies and biodiversity experts, but other organizations, CBOs and NGOs involved with community-based biodiversity conservation were also invited to provide their inputs.

I believe that we will be able to make biodiversity everyone's business. Without active support from each and every individual in the country, it will be difficult to implement the actions of the NBSAP. I am delighted that the NBSAP included sustainable livelihoods in their actions, as that is a critical need for a fast developing country like Sri Lanka. I convey my sincere gratitude to those who contributed to make this document a reality.

**Udaya R. Senevirathne**

Secretary,

Ministry of Mahaweli Development and Environment

## Message from the Director, Biodiversity Secretariat, Ministry of Mahaweli Development and Environment

We are currently in the United Nations Decade on Biodiversity, from 2011-2020. This Decade emphasizes as its theme 'Biodiversity is Life — Biodiversity is Our Life'. In 1994, Sri Lanka became a signatory to the United Nations Convention on Biological Diversity (CBD). The Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment acts as the operational focal point to the CBD. The Biodiversity Secretariat has led the way in implementing programmes to mainstream the country's biodiversity into national development policies and plans.

At a national level, National Biodiversity Strategies and Action Plans (NBSAPs) are the principal instruments for implementing the CBD (Article 6 of the CBD). The Convention requires countries to prepare a national biodiversity strategy (or an equivalent instrument) and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity.

Therefore, the Biodiversity Conservation in Sri Lanka — A Framework for Action (BCAP) was prepared in 1998 with the recommendations to implement the objectives of the convention. The Addendum for the BCAP was prepared in 2007 to review the progress of implementation of this BCAP, to identify important areas missing (cross-cutting or inadequately dealt with), to compile available information, and to propose actions and recommendations to facilitate effective implementation of the BCAP.

In Nagoya City, Japan, the 10<sup>th</sup> Conference of Parties (COP X) of the CBD was held and key historical decisions were taken. COP X decided that every party of the Convention needed to update existing biodiversity strategies and action plans to achieve the goals of the new strategic plan and the adopted 20 Aichi (2020 Targets).

Therefore, the Biodiversity Secretariat implemented a project titled 'the National Biodiversity Planning to Support the Implementation of the CBD 2011-2020 Strategic Plan in Sri Lanka and to prepare National Report to the CBD (NBSAP) Project'. Through this project, the Biodiversity Conservation in Sri Lanka — Framework for Action launched in 1998, addendum and chapter reports in 2007, were updated according the guidelines of the CBD Strategic Plan 2011-2020 and national priorities. It was mandated that the Aichi Targets were incorporated when preparing the National Biodiversity Strategic Action Plan (NBSAP) for Sri Lanka.

The NBSAP (2016-2022) includes five strategic objectives 12 national targets. Altogether, there are 87 actions covering all the thematic areas from forests and wildlife, agricultural biodiversity, marine and coastal biodiversity and invasive species, to biosafety and equitable sharing of benefits arising from the use of biodiversity.

During the process of national consultation, public sector officials, experts, social activists, Indigenous People and Local Communities (IPLCs), CBOs and NGOs members, as well as representatives from the private and corporate sector, were consulted. Their generous inputs improved the NBSAP. We thank IUCN, Sri Lanka Country Office for providing technical assistance to prepare the NBSAP in order to meet global obligations and national commitments.

The NBSAP would not have become a reality without generous financial support from the Global Environmental Facility and coordination from UNDP. We acknowledge the Technical Evaluation and Procurement Committees of the Ministry for supporting us in the timely completion of the project. We especially thank the Secretary for guidance and encouragement, as well as the strong support throughout the process from the Additional Secretaries.

We anticipate your active support to implement the actions recommended by the NBSAP, so that we may create a nation in harmony with nature.

**R. H. M. P. Abeykoon**  
Director (Biodiversity),  
Ministry of Mahaweli Development and Environment



## **VISION**

Sri Lanka's biodiversity is valued, conserved and sustainably used to benefit all its citizens



## List of Acronyms

AA	–	Affected Area
ABS	–	Access and Benefit Sharing
ASTER	–	Advanced Space borne Thermal Emission and Reflection Radiometer
AT	–	Aichi Target
BACC	–	Mainstreaming Biodiversity Conservation and use in Sri Lankan Agro-ecosystems for Livelihoods and Adaptation to Climate Change Project
BC	–	Before Christ
BCAP	–	Biodiversity Conservation in Sri Lanka: A Framework for Action
BCPs	–	Biocultural Community Protocols
BDS	–	Biodiversity Secretariat
BDSL	–	Biodiversity Sri Lanka
BEC	–	National Biodiversity Experts Committee
BES	–	Biodiversity and Ecosystem Services
B4FN	–	Biodiversity for Food and Nutrition Project
BINGO	–	Big International Non-Governmental Organization
BIOFIN	–	The Biodiversity Finance Initiative
BMARI	–	Bandaranayake Memorial Ayurvedic Research Institute
BOBLME	–	Bay of Bengal Large Marine Ecosystem
BOI	–	Board of Investment
BP	–	Before Present
CA	–	Conservation Area
CANARI	–	Caribbean Natural Resources Institute
CBC	–	Ceylon Bird Club
CBD	–	Convention on Biological Diversity
CBO	–	Community Based Organization
CC&CRMD	–	Coast Conservation and Coastal Resource Management Department
C-CAMP-P	–	Community Camp Programme
CCD	–	Coast Conservation Department
CCF	–	Central Cultural Fund
CCS	–	Climate Change Secretariat
CEA	–	Central Environmental Authority
CEB	–	Ceylon Electricity Board
CEPA	–	Communication, Education and Public Awareness Strategy
CG	–	Coast Guard
CHM	–	Clearing House Mechanism
CITES	–	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	–	Convention on Conservation of Migratory Species
COP	–	Conference of the Parties
CR	–	Critically Endangered

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## List of Acronyms Contd.

CR (PE)	–	Critically Endangered Possibly Extinct
CRI	–	Coconut Research Institute
CSR	–	Corporate Social Responsibility
CZMP	–	Coastal Zone Management Plan
DAD	–	Department of Agrarian Development
DAPH	–	Department of Animal Production and Health
DCS	–	Department of Census and Statistics
DD	–	Data Deficient
DFAR	–	Department of Fisheries and Aquatic Resources
DIMO	–	Diesel and Motor Engineering Plc
DMC	–	Disaster Management Centre
DNBG	–	Department of National Botanic Gardens
DNM	–	Department of National Museums
DNZG	–	Department of National Zoological Gardens
DoA	–	Department of Agriculture
DoArch	–	Department of Archaeology
DoAyur	–	Department of Ayurveda
DoDD	–	Department of Divinaguma Development
DoEA	–	Department of Export Agriculture
DoH	–	Department of Health
DoM	–	Department of Meteorology
DWC	–	Department of Wildlife Conservation
EbA	–	Ecosystem-based Adaptation
Eco-DRR	–	Ecosystem-based Disaster Risk Reduction
EFL	–	Environmental Foundation Limited
EIA	–	Environmental Impact Assessment
EN	–	Endangered
EPA	–	Environmental Protection Area
ES	–	Ecosystem Service
EBSA	–	Ecologically or Biologically Significant Marine Area
FAO	–	Food and Agriculture Organisation
FCO	–	Forest Conservation Ordinance
FD	–	Forest Department
FEO	–	Federation of Environmental Organizations
FFPO	–	Fauna and Floral Protection Ordinance
FMA	–	Fishery Management Area
FPIC	–	Free and Prior Informed Consent
GDP	–	Gross Domestic Product
GEF	–	Global Environment Facility
GIS	–	Geographic Information System
GIZ	–	German Development Cooperation

## List of Acronyms Contd.

GMO	–	Genetically Modified Organism
GoSL	–	Government of Sri Lanka
GPS	–	Global Positioning System
GSMB	–	Geological Survey and Mines Bureau
HSBC	–	Hong Kong & Shanghai Banking Corporation
IAS	–	Invasive Alien Species
ID	–	Irrigation Department
IDB	–	Industrial Development Board
IEE	–	Initial Environmental Examination
IEEP	–	Institute for European Environmental Policy
IEO	–	International Environmental Organization
ILCs	–	Indigenous and Local Communities
INGO	–	International Non-Governmental Organization
IPCC	–	Intergovernmental Panel on Climate Change
IPHT	–	Institute of Post-Harvest Technology
IPLC	–	Indigenous People and Local Community
IPS	–	Institute of Policy Studies
IUCN	–	International Union for Conservation of Nature
IWMI	–	International Water Management Institute
KDN	–	Kanneliya-Dediyagala-Nakiyadeniya
LMO	–	Living Modified Organisms
LUPPD	–	Land Use Policy Planning Department
M&E	–	Monitoring and Evaluation
MASL	–	Mahaweli Authority of Sri Lanka
MEA	–	Millennium Ecosystem Assessment
MEPA	–	Marine Environment Protection Authority
MoALF	–	Ministry of Agriculture, Livestock and Fisheries
MoE	–	Ministry of Environment
MoEPA	–	Ministry of Environment and Parliamentary Affairs
MoERE	–	Ministry of Environment and Renewable Energy
MoF	–	Ministry of Finance
MoFE	–	Ministry of Forestry and Environment
MoFARD	–	Ministry of Fisheries and Aquatic Resources Development
MoH	–	Ministry of Health
MoIWRM	–	Ministry of Irrigation and Water Resources Management
MoM&WD	–	Ministry of Megapolis and Western Development
MoMD&E	–	Ministry of Mahaweli Development and Environment
MoNRE	–	Ministry of Natural Resources and Environment
MoSD&W	–	Ministry of Sustainable Development and Wildlife
MPA	–	Marine Protected Area
msl	–	Mean Sea Level

## List of Acronyms Contd.

MSP	–	Multi-stakeholder platform
mya	–	Million Years Ago
mybp	–	Million Years Before Present
myr	–	Million Years
NAQDA	–	National Aquaculture Development Authority
NARA	–	National Aquatic Resources Research and Development Agency
NBRO	–	National Building Research Organization
NBSAP	–	National Biodiversity Strategic Action Plan
NCCAS	–	National Climate Change Adaptation Strategy
NCS	–	National Conservation Strategy
NCSA	–	National Capacity Needs Self-Assessment
NE	–	Not Evaluated
NEA	–	National Environmental Act
NEAP	–	National Environmental Action Plan
NERD	–	National Engineering Research and Development Centre
NFP	–	National Focal Point
NG&JA	–	National Gem and Jewellery Authority
NGO	–	Non-Governmental Organization
NIE	–	National Institute of Education
NIFS	–	National Institute for Fundamental Studies
NIP	–	National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants
NISSG	–	National Invasive Species Specialist Group
NMDC	–	National Mineral Development Corporation
NOSCOP	–	National Oil Spill Contingency Plan
NPD	–	National Planning Department
NPPD	–	National Physical Planning Department
NPQS	–	National Plant Quarantine Service
NRC	–	National Research Council
NSC	–	National Steering Committee
NSCAG	–	National Species Conservation Advisory Group
NSF	–	National Science Foundation
NT	–	Near Threatened
NWPEA	–	North Western Province Environmental Authority
NWS&DB	–	National Water Supply and Drainage Board
PA	–	Protected Area
PC	–	Provincial Council
PCB	–	Polychlorinated Biphenyl
PES	–	Payments for Ecosystem Services
PGIA	–	Post Graduate Institute of Agriculture

## List of Acronyms Contd.

PGRC	–	Plant Genetic Resources Centre
PIC	–	Prior Informed Consent
POP	–	Persistent Organic Pollutant
PPG	–	Project Preparation Grant
PSC	–	Public Service Commission
RDA	–	Road Development Authority
REDD	–	Reducing Emissions from Deforestation and Forest Degradation
RPRDC	–	Rice Processing Research and Development Centre
RRDI	–	Rice Research and Development Institute
RRI	–	Rubber Research Institute
SACEP	–	South Asia Co-operative Environmental Programme
SBSTTA	–	Subsidiary Body on Scientific, Technical and Technological Advice
SDD	–	Sustainable Development Division
SDGs	–	Sustainable Development Goals
SEA	–	Strategic Environmental Assessment
SEEA	–	System of Environmental-Economic Accounts
SLC	–	Sri Lanka Customs
SLINTEC	–	Sri Lanka Institute of Nano Technology
SLLR&DC	–	Sri Lanka Land Reclamation and Development Corporation
SLPA	–	Sri Lanka Ports Authority
SLPD	–	Sri Lanka Police Department
SLTDA	–	Sri Lanka Tourism Development Authority
SMA	–	Special Management Areas
TEEB	–	The Economics of Ecosystems and Biodiversity
TNA	–	Technology Needs Assessment
TRI	–	Tea Research Institute
UDA	–	Urban Development Authority
UGC	–	University Grants Commission
UNCLOS	–	United Nations Convention on the Law of the Sea
UNDP	–	United Nations Development Program
UNEP	–	United Nations Environmental Program
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
UNFCCC	–	United Nations Framework Convention on Climate Change
UoSJP	–	University of Sri Jayawardenapura
VU	–	Vulnerable
WGS	–	World Geodetic System
WHT	–	Wildlife Heritage Trust
WNPS	–	Wildlife and Nature Protection Society
WWF	–	World Wildlife Fund
YZA	–	Young Zoologists Association



*Osbeckia lanata* (Sinhala: *Kuru Bovitiya*; Tamil: No name known)  
Endemic and Endangered  
Naturally found in Horton Plains National Park,  
Central Highlands World Heritage Serial Property.  
Some species of *Osbeckia* are used in indigenous medicines in Sri Lanka.

This fledgling Black-Winged Stilt (*Himantopus himantopus*) was observed in an unprotected wetland located in northwest coast of Sri Lanka, on its first solo journey from the nest. Although it represents a single element of the environment, it already marks its place in the intricate web of life, just as this NBSAP marks its place in the arena of global biodiversity conservation.



# Chapter 1

## National Biodiversity Stocktaking and Information Management





## 1.1 The Development of Sri Lanka's Biodiversity Action Plans

Sri Lanka became a signatory to the Convention on Biological Diversity (CBD) in 1992 and ratified the Convention in 1994. Following the ratification of the CBD, Sri Lanka formulated a *Strategy for the Preparation of a Biodiversity Action Plan for Sri Lanka* (MoENR, 2007a). The purpose of this document was to identify the means by which an action plan would be developed. Following this, in 1996, as an obligation to the CBD, the Government, with the technical support of IUCN, formulated a biodiversity conservation action plan (BCAP) under the title *Biodiversity Conservation in Sri Lanka: A framework for action*, which was approved by the Cabinet of Ministers in 1998 (MoENR, 2007a). This BCAP proposed the establishment of the Biodiversity Secretariat, a National Steering Committee (NSC) and several Task Forces and described the modality by which the latter would operate to a) 'Study the BCAP recommendations for action; (b) Evaluate the current related activities in relation to these recommendations; (c) Identify priority areas for action, and to work out a programme of action assigning responsibilities for implementation; (d) Provide expert advice to the NSC on matters of relevance to their subject areas, as and when necessary; (e) Critically examine papers and recommendations prepared by experts in relation to identified issues, for the National Steering Committee; (f) Regularly monitor and review performance in relation to implementation; and (g) Undertake any other activities specified by the NSC' (MoFE, 1999).

Thus, the BCAP ensured a very wide consultative process, involving government agencies, non-governmental organizations, experts and local communities (MoFE, 1999).

The BCAP consisted of 74 recommended actions to achieve 18 specific objectives listed under four thematic areas: forests, wetlands, coastal and marine systems, and agricultural systems. (This categorization was useful not only in ecological terms but also allowed for differentiation of responsibilities to relevant organizations.) The BCAP also included a further 73 recommended actions to achieve 22 specific objectives listed under eight cross-cutting areas: Priority actions in selected bioregions, *Ex-situ* conservation, Research, Education and awareness, Biodiversity information, Legal measures, Institutional support and Valuation of biodiversity (MoFE, 1999).

The BCAP proposed a two-year inception phase, and a ten-year implementation phase. The implementation phase was divided into two phases, each of five years. The BCAP recommended that it was reviewed at the end of the first five years (MoFE, 1999).

Therefore, in 2005, the National Biodiversity Experts Committee undertook to review the BCAP as recommended. The objectives were to a) review implementation of the BCAP; b) identify gaps; c) propose actions for the 'effective implementation of the BCAP' (MoNRE, 2007a). For this purpose, 16 task forces were established, represented by more than 90 national experts, who prepared an addendum to the BCAP in 2007, comprising 16 chapters covering cross-cutting thematic areas. Each chapter comprised a status review, a gap analysis and a set of recommendations. Altogether 102 recommendations were given, which were later shortlisted to 31 high priority and 14 priority recommendations. For each of these recommendations, the institutional responsibilities, implementation arrangements and time frames were provided. Although not stated, the Addendum to the BCAP implies an implementation period of nine years, which come to an end in 2016 (MoENR, 2007a).

## 1.2 Existing Gaps

According to the Fifth National Report to the CBD, only 11 out of 74 (15%) BCAP recommended actions were achieved satisfactorily, while another 36 (49%) were achieved partially (BDS, MoERE, 2014). The remaining 27 actions (36%) were not completed in a satisfactory manner (BDS, MoERE, 2014). The level of achievement with respect to the thematic area of forests 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 was comparatively low, i.e., only 37.5 and 16.6% of recommended actions were achieved satisfactorily or partially (BDS, MoERE, 2014).

According to the Fifth National Report to the CBD only six out of the 31 (19%) priority recommendations in the Addendum have been achieved satisfactorily, while another 16 (52%) were achieved partially. The progress towards achieving the remaining nine recommendations was listed as unsatisfactory (29.0%) (BDS, MoERE, 2014).

Lack of financial resources was identified as the main barrier that has prevented the achievement of satisfactory progress for the recommendations that are listed as unsatisfactory (BDS, MoERE, 2014). There are more than 30 state institutions and 15 laws directly involved in conservation and sustainable use of biological diversity in Sri Lanka. These institutions and laws provide an important framework to support the maintenance of biodiversity into sectoral and cross-sectoral strategies, plans and programmes. However, lack of expertise; inadequacy of staff; lack of collaboration and coordination among these line agencies; and lack of adequate information were identified as the other barriers that have resulted in failure to address the recommendations listed as having shown unsatisfactory progress (BDS, MoERE, 2014). In addition, the lack of adequate integration into the plans, policies and programmes of the agencies of the development sector of mainstreaming recommended actions to the work programmes of the respective line agencies is also retarding progress (BDS, MoERE, 2014). It was also stated in the Addendum that climate change had not been adequately considered in the BCAP (MoENR, 2007a).

In order to successfully implement the current NBSAP, addressing these barriers became critically important. Actions were aligned with already developed national and sectoral plans and programmes that are either being implemented currently, or will be implemented in the future. Further, climate change considerations were integrated into various actions. In addition, Chapter 4 provides the approach that should be taken to ensure the capacity needs, communication and outreach strategy, as well as a road map for resource mobilization to overcome the capacity and financial barriers that are identified as major limitations in realization of the recommended actions of the BCAP and the addendum to BCAP. Finally, Chapter 5 outlines the approach that should be taken to coordinate and monitor the implementation of the current NBSAP.

### **1.3 Introduction to the NBSAP**

Once more, Sri Lanka must undertake to revise the NBSAP in line with emerging national and global priorities. This NBSAP will have an operational period of seven years from 2016-2022 and will provide the strategic approach needed to ensure that Sri Lanka's rich biodiversity is conserved and used in a sustainable manner. It includes national targets that are synergistic with global targets such as the Aichi Biodiversity Targets and Sustainable Development Goals (SDGs). Further, the NBSAP is also consistent with other national and sub-national policy frameworks, mainly the updated National Action Plan for *Haritha Lanka* Programme, which will have a similar operational period as the NBSAP. The NBSAP is also a guiding policy framework for provincial authorities of Sri Lanka, as well as civil society groups and private sector organizations in approaches to biodiversity conservation and ecosystems management. Therefore, during the NBSAP preparation, all these stakeholders were consulted in order to ensure that the proposed actions are acceptable to all stakeholders and can be practically implemented.

**Box 1. The Aichi Targets** (Source: CBD, 2010a)

<b>Strategic Goal A:</b> <i>Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society</i>	
	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.
	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.
	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.
	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.
<b>Strategic Goal B:</b> <i>Reduce the direct pressures on biodiversity and promote sustainable use</i>	
	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.
	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.
	By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
	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.
	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.

## Box 1. The Aichi Targets Contd.

<b>Strategic Goal C: <i>Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity</i></b>	
	By 2020, at least 17 per cent of terrestrial and inland water, 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 seascapes.
	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.
	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.
<b>Strategic Goal D: <i>Enhance the benefits to all from biodiversity and ecosystem services.</i></b>	
	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.
	By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has 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.
	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.
<b>Strategic Goal E: <i>Enhance implementation through participatory planning, knowledge management and capacity building</i></b>	
	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.
	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.
	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.
	By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 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.

**Box 2. Sustainable Development Goals (SDGs)**

(Source: UN, 2015a)

	End poverty in all its forms everywhere
	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
	Ensure healthy lives and promote well-being for all
	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
	Achieve gender equality and empower all women and girls
	Ensure access to water and sanitation for all
	Ensure access to affordable, reliable, sustainable and modern energy for all
	Promote inclusive and sustainable economic growth, employment and decent work for all
	Build resilient infrastructure, promote sustainable industrialization and foster innovation
	Reduce inequality within and among countries
	Make cities inclusive, safe, resilient and sustainable
	Ensure sustainable consumption and production patterns
	Take urgent action to combat climate change and its impacts
	Conserve and sustainably use the oceans, seas and marine resources
	Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss
	Promote just, peaceful and inclusive societies
	Revitalize the global partnership for sustainable development

The NBSAP is based on the ecosystem approach to ensure that the maintenance of ecosystem services and functions, vital for human well-being, including *inter alia*, the provision of food, water and fuel; cultural services; habitat provision; climate regulation, pollination and seed dispersal.

### Box 3. The Ecosystem Approach

'The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Application of the ecosystem approach will help to reach a balance of the three objectives of the Convention. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. *It recognizes that humans, with their cultural diversity, are an integral component of ecosystems*' (CBD, 2000, emphasis added)

At the fifth Conference of the Parties, the Ecosystem Approach was endorsed and the use of 12 principles were adopted for application (CB, 2000). The 12 principles are presented below, extracted directly from the COP V decision.

**Principle 1: The objectives of management of land, water and living resources are a matter of societal choice.** Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

**Principle 2: Management should be decentralized to the lowest appropriate level.** Management should involve all stakeholders and balance local interests with the wider public interest.

**Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.** Ecosystems do not exist in isolation and exist as mosaics of interconnected units across a heterogeneous landscape. This means that management must be at a landscape level.

**Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.** Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

**Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.** Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species

**Principle 6: Ecosystems must be managed within the limits of their functioning.** The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

**Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.** Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems. This again, emphasizes a landscape approach.

**Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long-term.** Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency of humans to favour short-term gains and immediate benefits over future ones.

### Box 3. The Ecosystem Approach Contd.

**Principle 9: Management must recognize that change is inevitable.** Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change.

**Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.** Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems.

**Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.** Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

**Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.** Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

Thus the ecosystem approach ensures that:

Humans are integral to ecosystems;

- The multiplicity of stakeholders is acknowledged;
- A landscape approach that integrates protected and non-protected areas in management is applied;
- Adaptive management is an essential aspect of management; and
- There is flexibility in the approach, requiring 'learning-by-doing and is incremental' (Shephard, 2008).

Thus, this NBSAP is a continuing process in consolidating the aspirations and actions of Sri Lanka towards a sustainable future. The NBSAP should be considered as a living, planning document that complies with national policies, laws, plans, programmes and projects. It provides a biodiversity communication, education and public awareness strategy (CEPA); a Clearing House Mechanism (CHM), which serves as a platform for information, knowledge management and networking on biodiversity to aid in policy decision-making; and an NBSAP resourcing plan to conserve and sustainably use the country's biodiversity in an equitable manner.

The NBSAP also outlines the strategy to raise public awareness and implement the Nagoya Protocol on Access to Genetic Resources and Benefit-Sharing (CBD, 2010b) — to achieve the third objective of the CBD. The country will need a systematic capacity building strategy to achieve this and thereby, protect its sovereign resources and provide benefits for all Sri Lankans.

The success of implementing the NBSAP will involve close coordination among the key line agencies in Sri Lanka mandated with biodiversity conservation and natural resources management, other economic sectors of the government and the private sector.

The NBSAP consists of five major sections:

1. the context, describing the present status of Sri Lanka's biodiversity, including threats to biodiversity, institutional arrangements for biodiversity conservation, as well as barriers and challenges faced in conservation and sustainable utilization of biodiversity;
2. the national targets of NBSAP;

3. the strategic objectives — defining the vision, priority areas and national actions to achieve the strategic objectives;
4. the implementation plan, including plans for capacity development, communication and outreach, and resource mobilization; and
5. the coordinating mechanism, monitoring system and the strategy to systematically promote the values of biodiversity through knowledge and information sharing and networking on biodiversity.

## 1.4 National Obligations under the CBD

Contracting parties are expected to fulfil the following:

1. According to Article 6 of the CBD, contracting parties should develop a National Biodiversity Strategic Action Plan (NBSAP) or an equivalent instrument, in order to integrate conservation and sustainable use of biodiversity into sectoral and cross-sectoral activities (CBD, 1992). The NBSAP is a process by which countries can plan to address the threats to their biodiversity. Hence, NBSAPs are the principal instruments for the implementation of the Convention, both at the national and global level, and they are increasingly relevant to other biodiversity-related conventions and agreements. As outlined in the previous section, Sri Lanka has fulfilled this requirement by developing the BCAP in 1998, followed by the Addendum to the BCAP in 2007 and is now in the process of developing the next review, update and revision, the NBSAP.
2. According to Article 26, contracting parties should submit national reports at intervals determined by the Conference of the Parties (COP), outlining the measures that the country has taken for the implementation of provisions of the convention and their effectiveness in meeting the objectives of the convention (CBD, 1992). Sri Lanka has submitted its national reports periodically to the COP, the most recent of which, the Fifth National Report, was submitted in 2014.

### Box 4. Other National Obligations

#### *Biocultural Community Protocols (BCPs)*

The 16<sup>th</sup> meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) deliberated on *Biocultural Community Protocols (BCPs)* as a platform for communities to engage with external actors such as government agencies, researchers, NGOs, and the private sector according to their own terms, plans, priorities, and rights and responsibilities in conserving biodiversity (Tyrrell and Alcorn, 2011). Biocultural Community Protocols are instruments that set out clear terms and conditions to governments and the private, research, and non-profit sectors for engaging with indigenous and local communities (ILCs) and accessing their local resources and knowledge. They are developed through culturally-rooted, participatory decision-making processes within the communities and are based on communities' customary norms, values, and laws (Lassen, 2012).

Community Protocols are referenced in the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization under the Convention on Biological Diversity. The Biodiversity Secretariat initiated a dialogue on BCPs in Sri Lanka. It is intended that BCPs for Sri Lanka will be developed primarily for use by indigenous peoples and local communities (IPLCs) with support from long-standing and trusted organizations, where appropriate. The toolkit developed by Community Protocols will be adopted for this purpose ([www.community-protocols.org](http://www.community-protocols.org)). REDD+ appears to be one of the potential areas for piloting BCPs in



**Box 4. Other National Obligations Contd.**

Sri Lanka, as part of the engagement of indigenous people such as the *Vedda* community and local communities such as traditional fishers, in fulfilling Free and Prior Informed Consent (FPIC). The Forest Department initiated the preparation of BCPs under its UN REDD project for the four different clans of the *Vedda* community in Sri Lanka.

*Traditional Knowledge Repatriation*

Traditional knowledge and natural resources are closely interlinked, hence, repatriation of cultural artefacts currently held in foreign countries is needed to protect traditional knowledge. The CBD Article 17.2 on repatriation of information, which is of importance to indigenous and local communities and relevant to conservation, is also addressed (IIED, 2005). Sri Lanka is believed to have lost many cultural artefacts relating to traditional knowledge in conservation during the nearly four and a half centuries of the country's external rule. Though very little work has been done on this area at present, the Biodiversity Secretariat is determined to establish necessary systems, taking guidance from the *ad-hoc* open-ended inter-sessional working group on article 8(j) and related provisions in the CBD (CBD, 2015a) to regain important cultural artefacts currently in foreign countries under the traditional knowledge repatriation provisions on the CBD.

*Ecologically or Biologically Significant Marine Areas (EBSAs)*

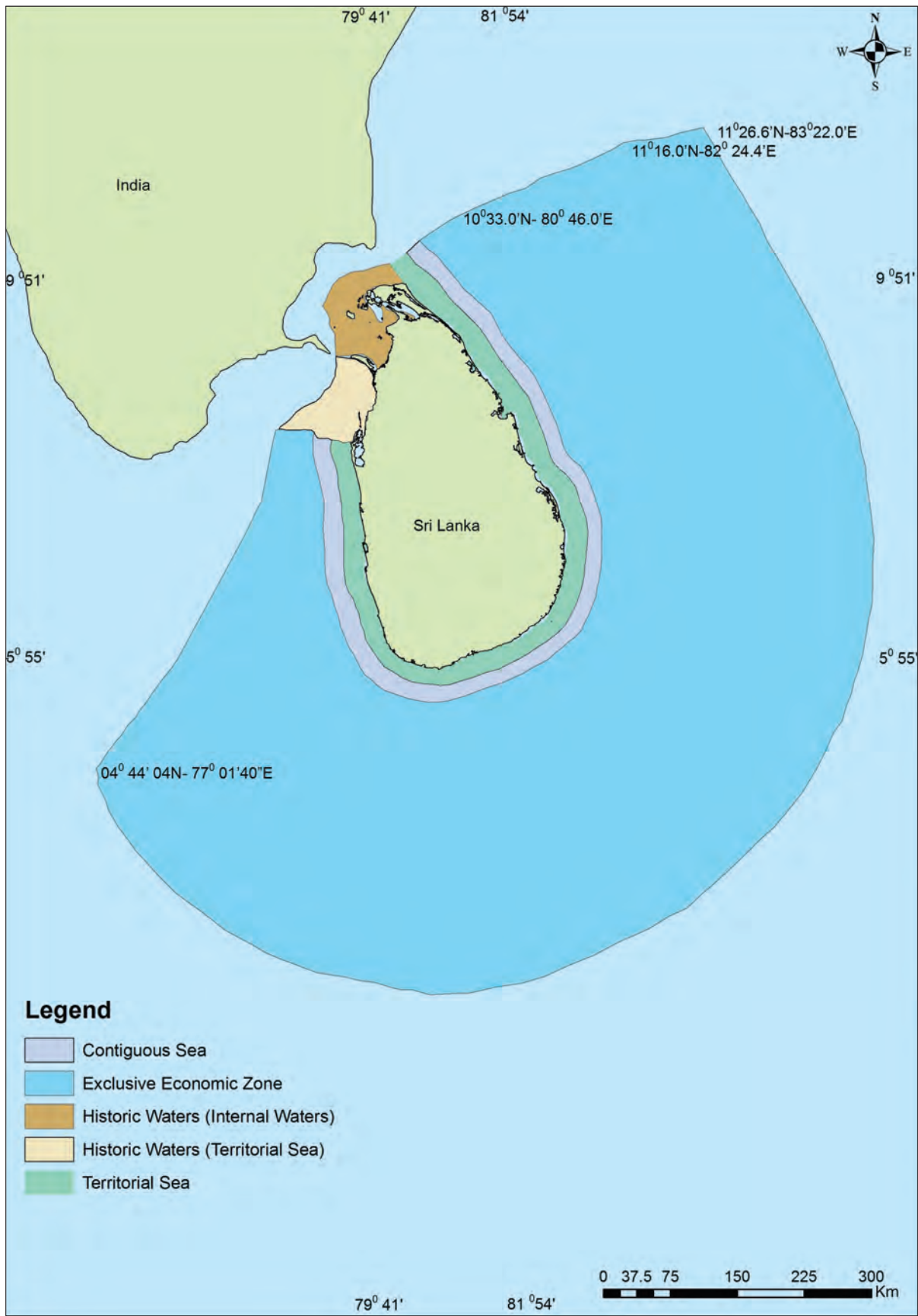
A regional workshop on 'Ecologically or Biologically Significant Marine Areas (EBSAs) in North East Indian Ocean' was held on 22<sup>nd</sup> March 2015. Scientific criteria for EBSA set out by COP decision IX/20 (CBD, 2008) were discussed and used for tentatively identifying potential areas around Sri Lanka to be considered as EBSAs. The potential list of EBSAs around Sri Lanka included the Gulf of Mannar, the southern coast and the coastal area near Trincomalee for conserving whales, dolphins, turtles and sensitive ecosystems — coral reefs, seagrass meadows and mangroves. Given that fewer marine protected areas are declared in Sri Lanka compared to their terrestrial counterparts, EBSAs are welcomed as tools for conservation and sustainable use of marine areas.

From the information note produced by the CBD (Rice, 2016; CBD, 2016a) to further enhance scientific methodologies and supporting the decision XII/22 (CBD, 2014), it is expected that required data sets will be gathered for these sites covering both scientific and traditional knowledge and related data assessed that these sites may be designated as EBSAs during the current NBSAP implementation period. Special emphasis will be given to include traditional knowledge into the process of describing EBSAs in line with the COP decision XI/17 and the training manual produced for this purpose by CBD (Tyrrell and Alcorn, 2011).

**1.5 Biodiversity of Sri Lanka, Trends and Linkages to Human Well-being****1.5.1 General Description of Sri Lanka**

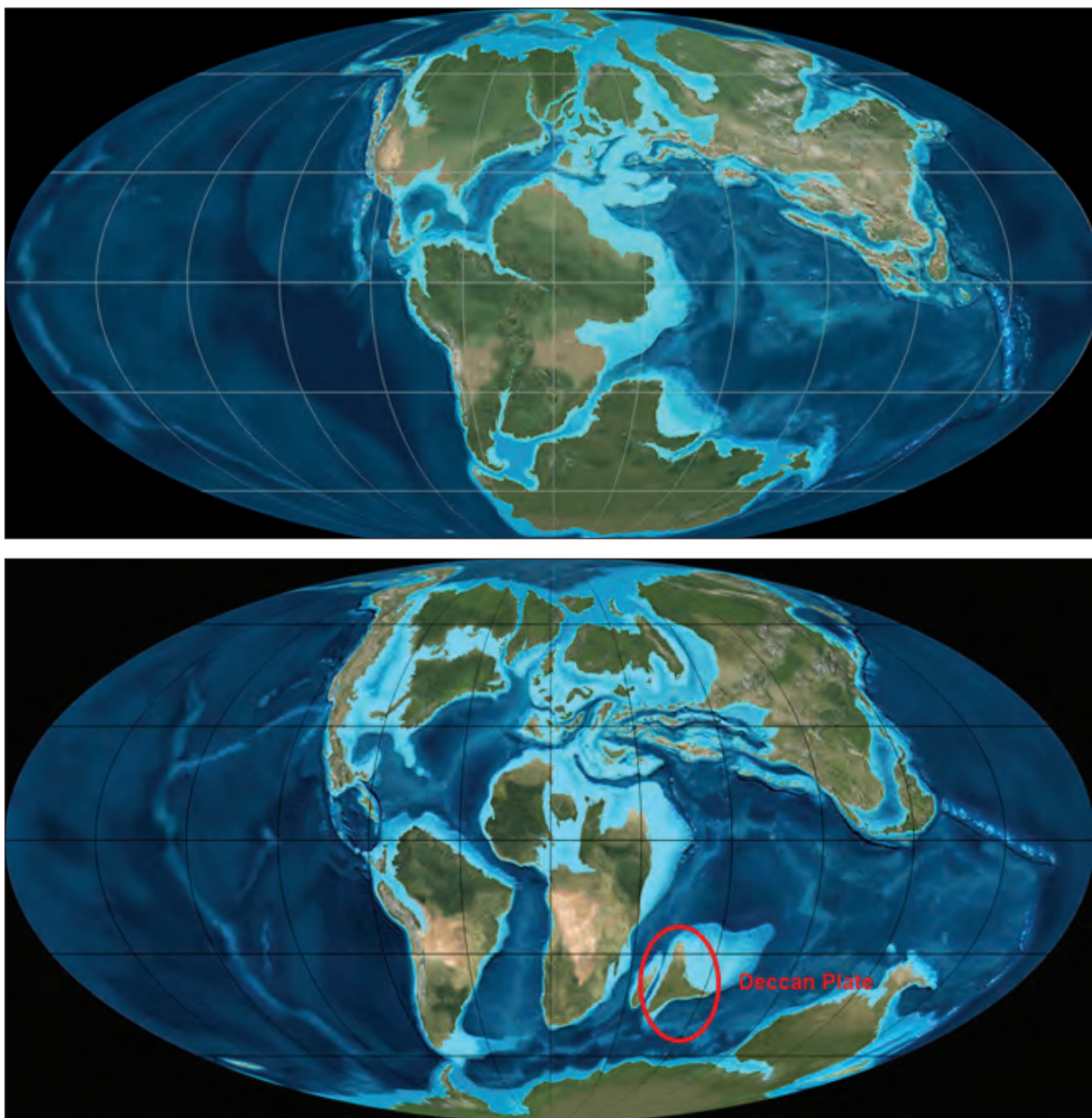
Sri Lanka is a moderate-sized, continental island, listed as the 25<sup>th</sup> largest island in the world (Calder, 2009). Sri Lanka belongs among the equatorial belt of countries, as it lies just south of the Tropic of Cancer between 5° 55' and 9° 51' North Latitude and 79° 41' and 81° 54' East Longitude. Sri Lanka is endowed with a coastline of 1,620 km. The continental shelf around the northern and northwestern part of the island is broad but the shelf ends more abruptly in the south and east of the island.

Conforming with the United Nations Convention on the Law of the Sea (UNCLOS) (1982), and the Maritime Zones Law No. 22 of 1976, Sri Lanka has different areas of national maritime jurisdiction as shown in Figure 1.



**Figure 1. Sri Lanka's Location and Exclusive Economic Zone**  
 (Source: Map prepared by NARA accessed from Joseph, 2004)

Based on the geological evidence, Sri Lanka has been in existence for nearly three billion years. From the Proterozoic era (2500-542 mya) up to the Jurassic period, Sri Lanka remained part of the Gondwana super continent (Katupotha, 2013). During the Jurassic period, approximately 158-160 mya, the Indo-Madagascar plate drifted away from East Africa, followed by the separation of the Deccan plate from Madagascar around 84-96 mya (Briggs, 2003) (Figure 2). After the separation from Madagascar, the Deccan plate underwent a period of isolation for about 30-40 million years, before colliding with the Eurasian plate around 40-50 mya. With the collision of the Deccan and Eurasian plates there was an exchange of biota between Asia and peninsular India. Consequently, the 'Biotic ferry model' was proposed, according to which the Deccan plate functioned as a raft, carrying ancient Gondwanan forms to Asia. Upon collision with Asia these Gondwanan forms dispersed out of India and into Asia (also called the 'Out-of-India' hypothesis) (Karanth, 2006). Likewise, Palaeartic mammals such as the hippopotamuses (*Hexaprotodon*), rhinoceros (*Rhinoceros*), elephants (*Palaeoloxodon*, *Hyselephas* and *Elephas*), lions and tigers (*Panthera*) dispersed into India (also called the 'Into India' hypothesis) during periods of glaciations (Prater, 1971).



**Figure 2. The Earth During the Early (above) and Late (below) Jurassic**  
(Source: Wikimedia Commons, 2015)

Therefore, the geological history of Sri Lanka can be subdivided into four phases: (i) the Pre-drift phase, during which Sri Lanka and India were part of a much larger landmass referred to as Gondwana (> 160 mybp); (ii) the Drift phase, ending with the collision of the Deccan plate and the Asiatic continent (between 50 and 40 mybp); (iii) the Miocene epoch (25 mybp), during which Sri Lanka separated from the Indian subcontinent, following a series of complex tectonic movements, which began in the Jurassic era; and (iv) the Quaternary epoch (two mybp to present), during which sea level changes driven by climate cycles, resulted in repeated formation of land bridges between India and Sri Lanka, in the Palk Strait region (Katupotha, 2013; Swan, 1983).

At present, Sri Lanka has a diverse topography that has resulted from periods of upliftment and erosion. The net result of these processes has been the creation of the central hills, with many peaks, and in cross section, a step-like arrangement referred to as peneplains. The first peneplain extends from 0 metres above sea level to 300 metres. The second peneplain rises from 301 to 1,500 metres. In this area, the land rises gently, with low, rounded hills and crests of hard rock. The third peneplain is the central mountain area consisting of plateaus, mountain chains and basins, extending from 1,501 to over 2,100 metres, with some peaks — such as Piduruthalgala (2,524 m), Kirigalpotta (2,395 m), Totapola (2,357 m), and Sri Pada (Adam's Peak) (2,243 m) — reaching elevations greater than 2,200 m (Survey Dept., 2007). The resulting landform thus has many escarpments, ridges and valleys. In the rolling first peneplain are some 'rock islands' called inselbergs, jutting out of the relatively flat terrain (Figure 3).



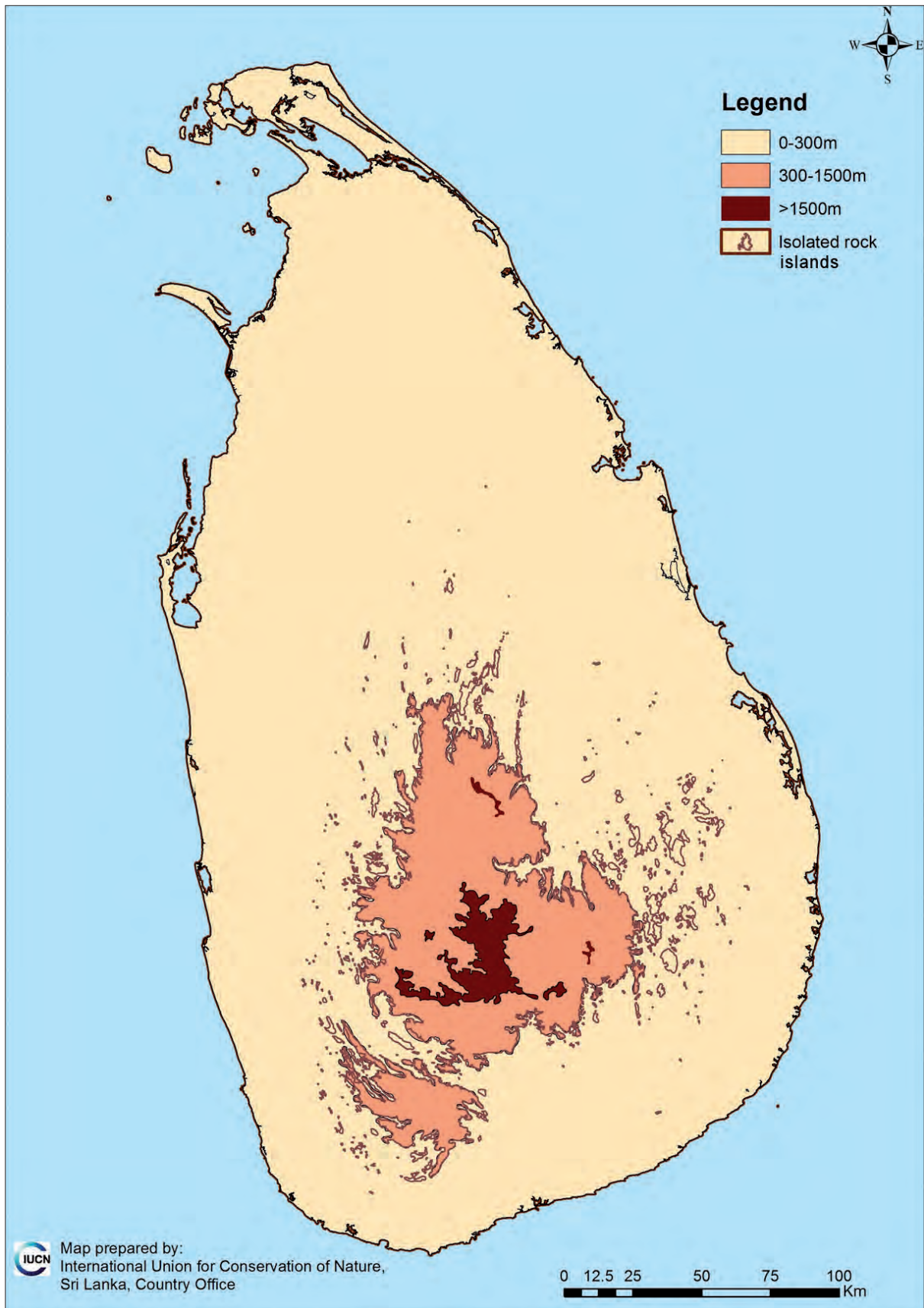
Knuckles Mountain Range, 3<sup>rd</sup> Peneplain

Naalin Perera © IUCN, Sri Lanka



Yala National Park, 1<sup>st</sup> Peneplain

Naalin Perera © IUCN, Sri Lanka



**Figure 3. The Topography of Sri Lanka**

(Source: Produced by IUCN, based on the contours given in Cooray, 1984)

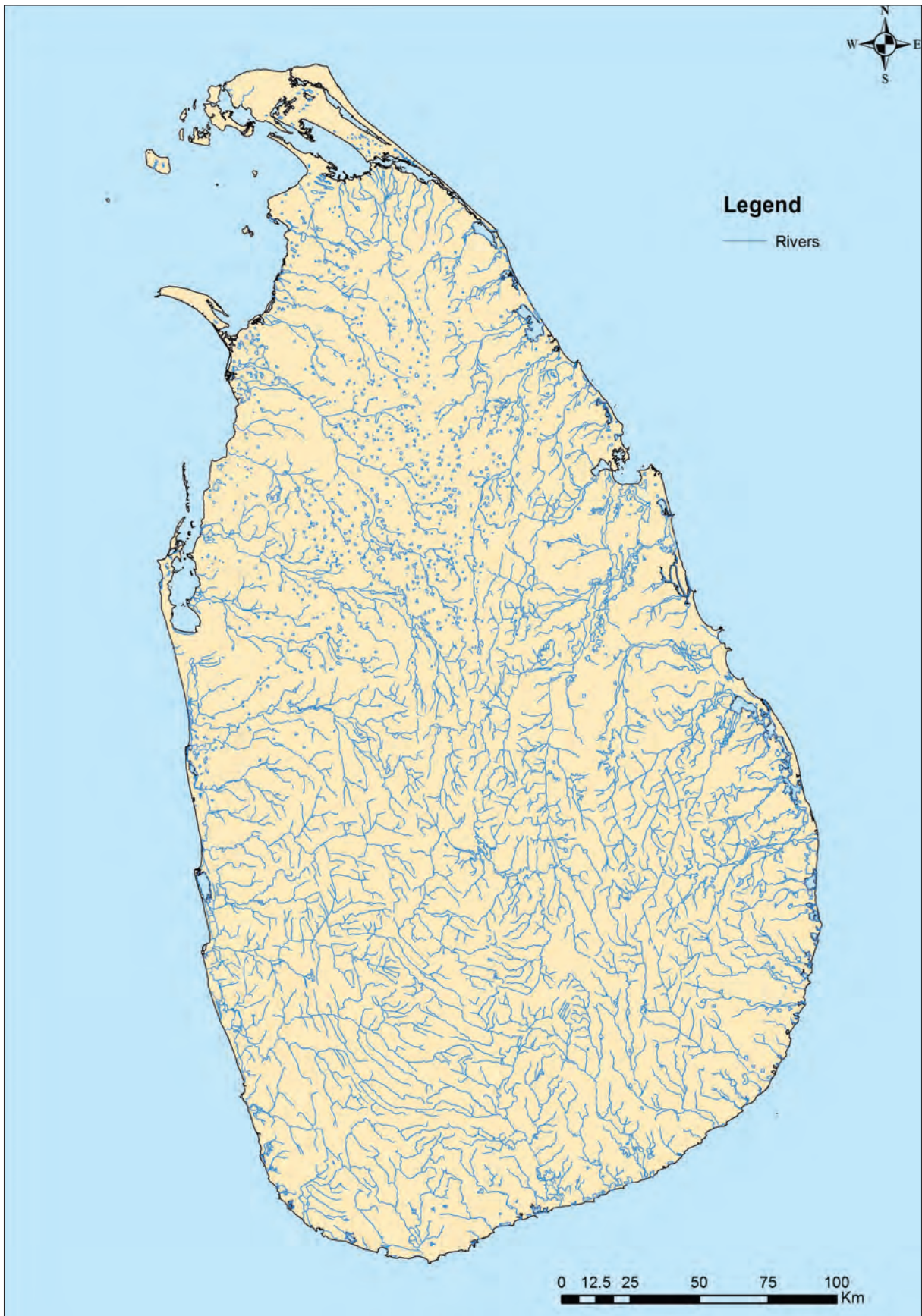
The montane region covers about three percent of the island and comprises three distinct mountain ranges that have been isolated from each other for many thousands of years and hence, harbour unique faunal and floral elements. The drainage pattern of the country is almost entirely governed by the central highlands, with all the perennial watercourses originating in the mountains. The country is dissected by 103 river basins (Figure 4). The river flow contributes to the creation of some unique ecosystems in the flood plain areas.



Naalin Perera © IUCN, Sri Lanka

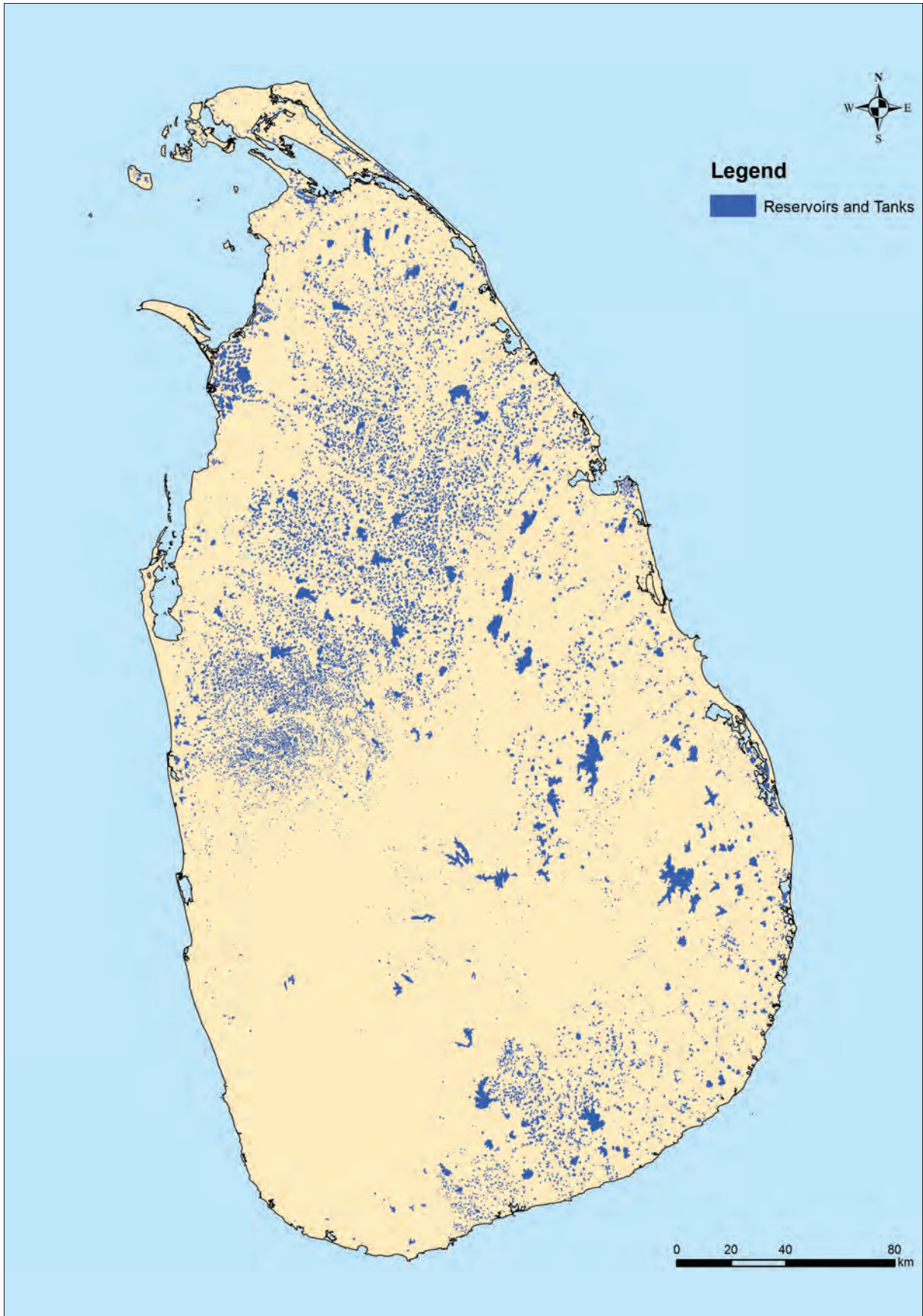
Patane Ella, Mahaweli River Basin, Knuckles Mountain Range

Although Sri Lanka has no natural lakes, the dry zone is dotted with nearly 10,000 ancient irrigation reservoirs, relics of an ancient hydraulic civilization (also called tanks from the Portuguese *tanque*), extending, in total, over nearly 60,000 ha, and providing perennial and seasonal sources of water (Survey Dept., 2007). (Figure 5.)



**Figure 4. Rivers of Sri Lanka**

(Source: Jayasuriya et al., 2006)



**Figure 5. Reservoirs of Sri Lanka**

(Source: DAD, 2011)



Sri Lanka's climate is largely governed by the monsoonal winds and affected by the central hills. The seasonality of rainfall, influenced by two distinct monsoons and convectional and cyclonic effects, as well as the rain shadow effect caused by the central mountains, has given rise to six bioclimatic zones (Wijesinghe et al., 1993). The low and mid-country wet zone extends over much of the southwest part of the island, and has a mean annual rainfall of 2,500-5,000 mm, and is stratified into low, mid and montane regions that rise to 2,500 m above msl. Because of this altitudinal variation, the mean temperature of the wet zone drops progressively from 27° C in the lowlands to around 13° C - 16° C in the montane areas, with occasional ground frosts at high elevations. Temperature plays an important role in the highland regions, where decreasing temperature at higher elevations, along with the wind has resulted in unique natural communities.

The dry zone, with a mean daily temperature of 30° C, is spread over much of the lowland plains. The rainfall of 1,250 mm - 1,900 mm per year is not spread evenly through the year, and there is a long, dry period of about five months. During these dry months, rainfall is less than 50 mm per month.

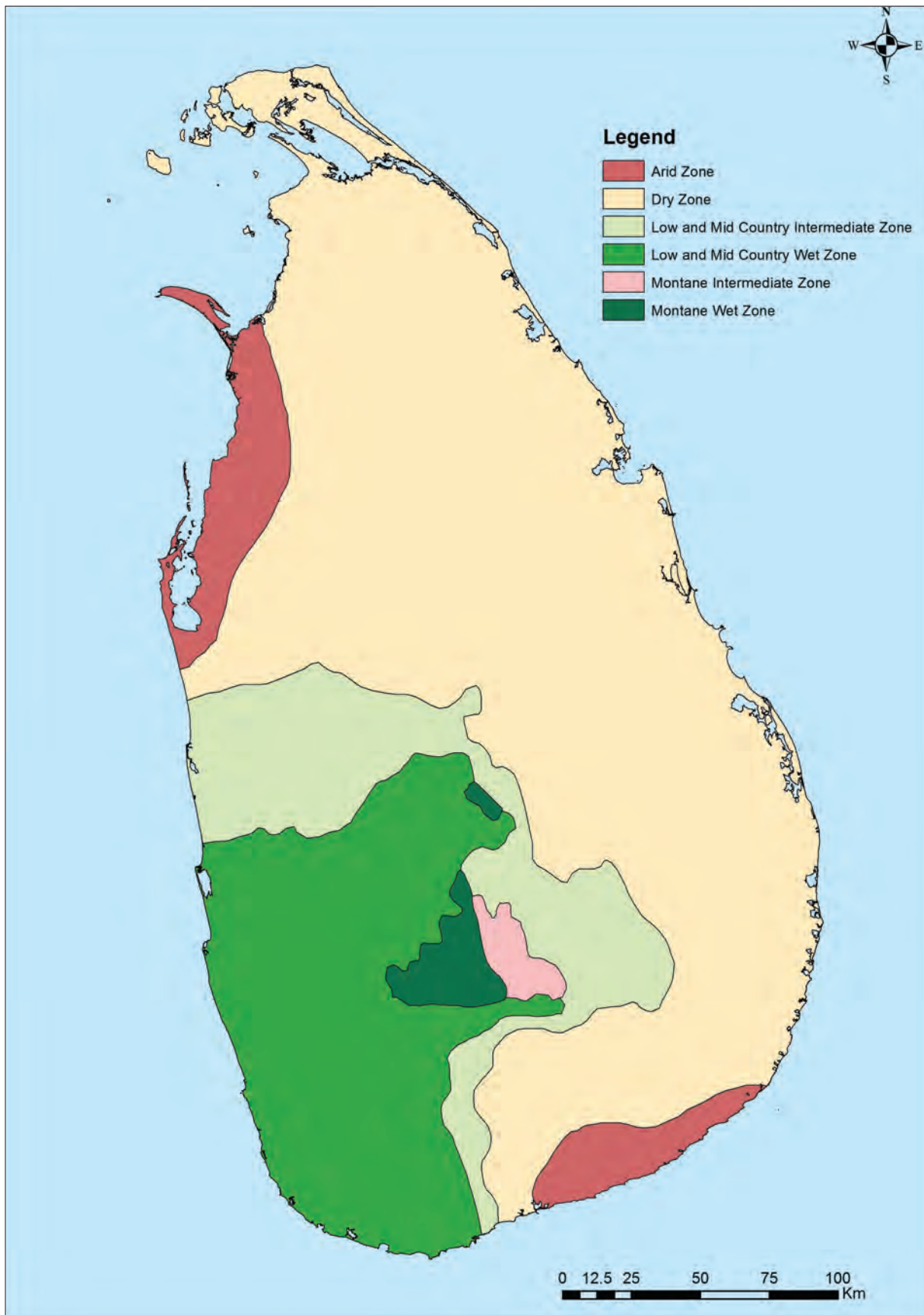
There are two extra dry coastal strips with prolonged drought periods in the northwest and southeast coastal regions, forming the arid zone, with a mean annual rainfall less than 1,250 mm.

A narrow intermediate zone, with a mean annual rainfall of 1,900 - 2,500 mm, lies between the wet and dry zones, as does the montane intermediate zone. (See Figure 6 for all of the above.)



Naalin Perera © IUCN, Sri Lanka

Wet Lowland Stream



**Figure 6. Bioclimatic Zones of Sri Lanka**  
 (Source: Wijesinghe et al., 1993)

## 1.5.2 Status of the Biodiversity of Sri Lanka

These zoogeographic, topographic, climatic and edaphic factors have resulted in a diverse array of aquatic and terrestrial ecosystems and a multitude of coastal and marine ecosystems. In addition, there are unique human-made ecosystems — such as reservoirs and agricultural landscapes. Table 1 presents an extended classification (including edaphic and anthropogenic variants) in consultation with leading ecologists. More details of this classification are presented in the Section on Trends in Ecosystems. All these ecosystems have contributed to the establishment of rich faunal and floral assemblages with some unique attributes, unusual for a moderate-sized tropical island.

**Table 1. An Overview of Sri Lanka's Ecosystem Diversity**

Major Ecosystem Types	Variants of Major Ecosystems	
	Edaphic and Other variant	Anthropogenic
<b>Forests</b> (Tree dominated)		
Lowland wet evergreen forests	Rock out crop forests	Secondary forests
Mid-elevation evergreen forests	Swamp forests	Sparse open forests
Montane evergreen forests	Swamp forests with springs	Dry deciduous thorn scrublands
Moist-mixed evergreen forests	Isolated hill forests	Forest plantations — Monoculture
Dry-mixed evergreen forests	Riverine evergreen forests	Forest plantations — Mixed culture
Arid-mixed evergreen forests	Sea shore scrublands	
	Sand dune scrublands	
	Sand dune forests	
	Palmyra woodlands	
<b>Grasslands</b> (Herb dominated)		
Montane upper wet <i>patana</i>	Montane peat bogs	Pasturelands
Montane lower wet <i>patana</i>	Intermediate upper <i>patana</i>	<i>Kekilla</i> fernlands
Humid zone dry <i>patana</i>	Intermediate lower <i>patana</i>	Wet ( <i>talava</i> ) grasslands
Summer zone dry <i>patana</i>	Dry zone grasslands	
Upland savannas	Drawdown areas of large tanks	
Lowland savannas		
Dry ( <i>damana</i> ) grasslands		
Flood plain grasslands		
<b>Caves</b>		
Above-ground caves		Abandoned mines
Below-ground caves		Railway tunnels
<b>Other Man-made ecosystems</b>		
		Public parks and gardens
		Home gardens
		Abandoned lands and road side
		Agro plantations — Mixed culture
		Agro plantations — Monoculture

<b>Lentic (standing) Water Bodies</b>		
<b>Major Ecosystem Types</b>	<b>Edaphic and Other variant</b>	<b>Anthropogenic</b>
Fresh and brackish water <i>villus</i>	River expansion lakes Mangroves Lagoons Flood plains ( <i>villu</i> ) Salt marshes Tidal flats	Reservoirs Tanks Ponds Aquaculture bodies Salterns
<b>Lotic (running) Water Bodies</b>		
<b>Major Ecosystem Types</b>	<b>Edaphic and Other variant</b>	<b>Anthropogenic</b>
Rivers and streams Springs	Estuaries Waterfalls and their spray zone	Canals
<b>Marshlands</b>		
Marshes	Thermal marshes	Paddy fields
<b>Beach</b>		
Sandy shores Rocky shores Gravelly shores Dead coral beaches	Sand Dunes	Riprap structures Breakwaters and groynes Beach landing areas
<b>Reefs</b>		
Coral reefs Sandstone reefs Rocky reefs		
<b>Shallow Marine Water (Less than 200 m)</b>		
Seagrass meadows Seaweeds Mud bottoms Sand bottoms		Ports Harbours and anchorages
<b>Deep Marine Water (More than 200 m)</b>		
Mud bottoms Sand bottoms Rocky bottoms Sandstone bottoms Open ocean		
<b>Islets</b>		
Rocky Islets Sandy islets Islets with vegetation cover		



© Sriyanie Miththapala

Lowland Wet Evergreen Forest



Naalin Perera © IUCN, Sri Lanka

Montane Evergreen Forest



Sampath de Alwis Goonatilake © IUCN, Sri Lanka

Dry-mixed Evergreen Forest



Naalin Perera © IUCN, Sri Lanka

Arid-mixed Evergreen Forest



Sampath de Alwis Goonatilake © IUCN, Sri Lanka

Palmyra Woodland



Naalin Perera © IUCN, Sri Lanka

Montane Upper Wet *Patana*



Rock out crop Forests



Below-ground Caves



Reservoirs



Rivers and Streams



Paddy Fields



Mangroves



Sampath de Alwis Goonatillake © IUCN, Sri Lanka

Dead Coral Beaches



Naalin Perera © IUCN, Sri Lanka

Rocky Shores



Sampath de Alwis Goonatillake © IUCN, Sri Lanka

Sandy Islets



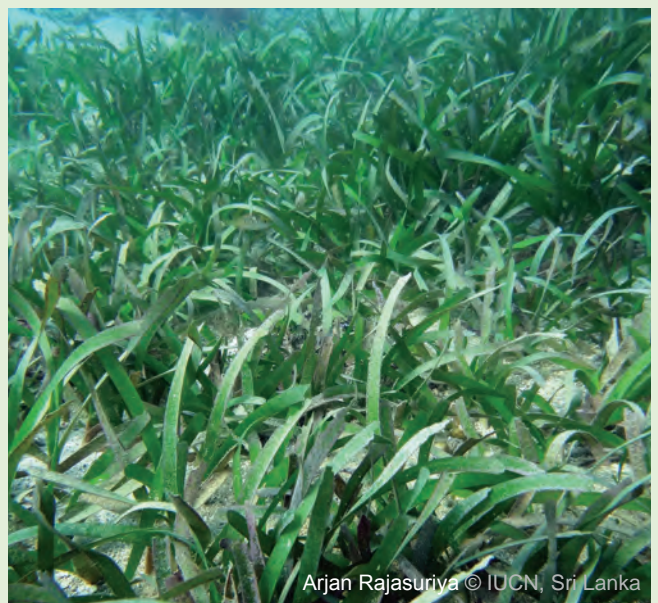
Naalin Perera © IUCN, Sri Lanka

Rocky Islets



Arjan Rajasuriya © IUCN, Sri Lanka

Coral Reefs

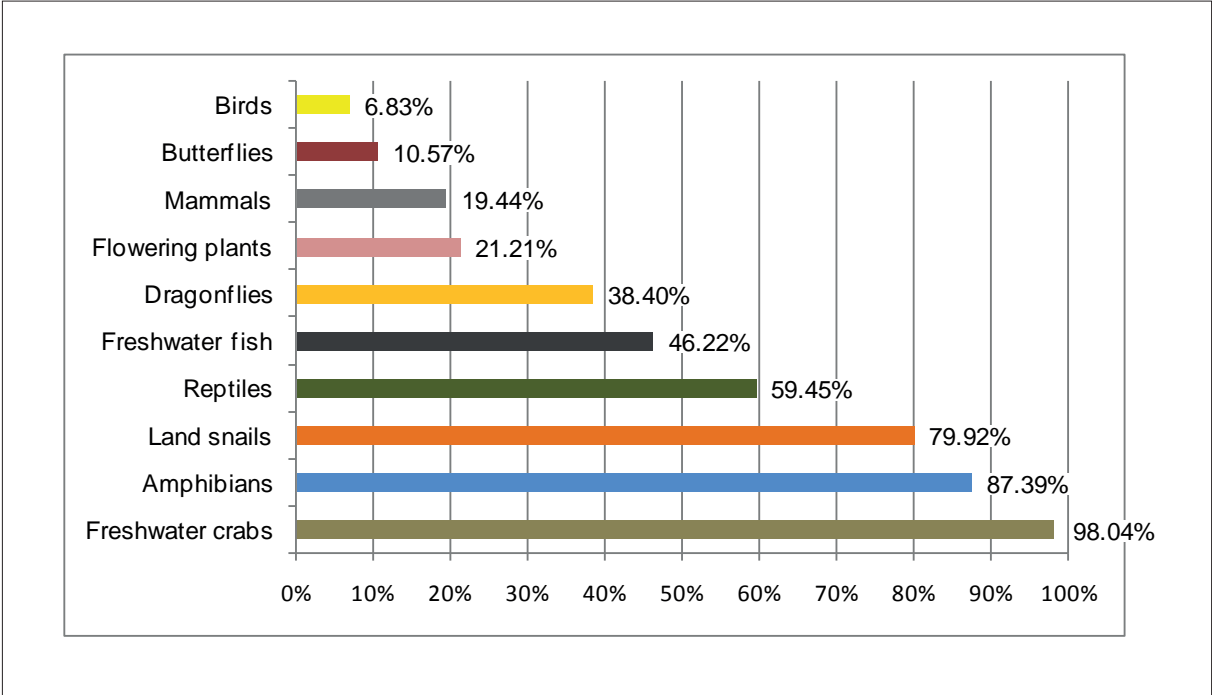


Arjan Rajasuriya © IUCN, Sri Lanka

Seagrass Meadows

The hallmark of Sri Lanka’s biodiversity is the presence of large populations of mega fauna (such as the Asian Elephant, Leopard, and Sloth Bear) that do not occur in other moderate-sized islands, as well as the presence of a large proportion of endemic species among many of the plant, vertebrate and invertebrate taxa (Table 2) (MoE, 2012a). Sri Lanka is home to the largest extant mammal in the world — the great blue whale (*Balaenoptera musculus*) — as well as the smallest known mammal by mass — the pygmy shrew (*Suncus etruscus*).

Sri Lanka, along with the Western Ghats of India, is listed as one of the 35 biodiversity hotspots of the world (CI, 2016). Designation of a biodiversity hotspot is based on two criteria, the presence of 0.5% or 1,500 species of vascular plants as endemics, and the reduction of forest cover by 70% or more, causing many of the taxa to become threatened with extinction (CI, 2016). Designation of Sri Lanka as a biodiversity hotspot is based on both of these criteria, as there is a high level of endemism in most taxonomic groups (Figure 7) and a high proportion of the species in most taxonomic groups are threatened with extinction, especially in the case of endemic species (Figure 17), primarily due to loss of habitat.



**Figure 7. Endemism Among Some of the Main Taxonomic Groups in Sri Lanka**  
(Source: MoE, 2012a)

This high level of endemism may have arisen as a result of multiple factors such as topography, climate, abundance of water, association with multiple land masses during the island’s evolutionary history and being a continental island, as opposed to a volcanic island. These factors would have contributed to repeated cycles of colonization, followed by long periods of isolation, leading to speciation and resulting in the evolution of many endemic species. In other words, almost all the evolutionary drivers appear to have operated on Sri Lanka during its evolutionary history, shaping its biodiversity.

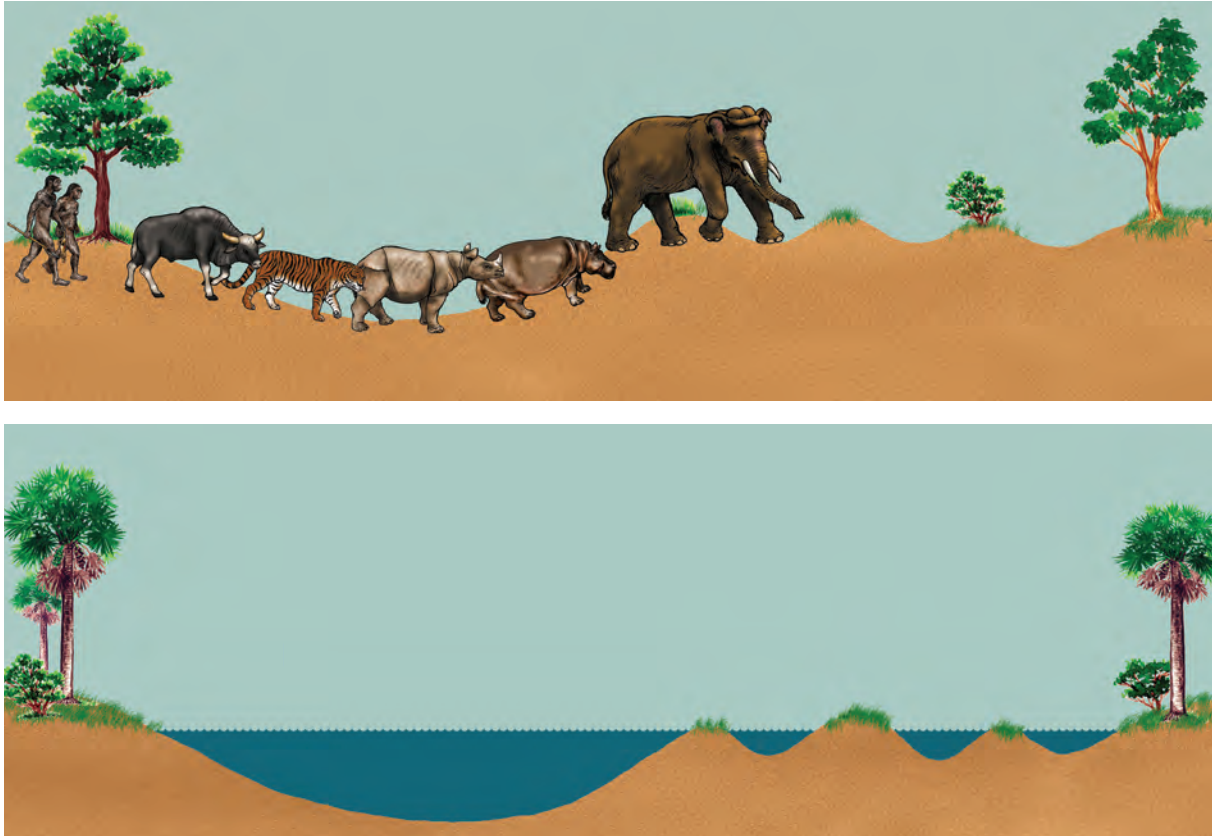


**Table 2. An Overview of Sri Lanka's Species Diversity**  
(Source: IUCN Sri Lanka database, 2016; Legend: NK — Not Known)

Taxonomic Group	Recorded from Sri Lanka					
	Total	Native	Endemic	Marine	Migrant	Exotic
Land snails	254	230	203	0	0	24
Scorpions	18	18	14	0	0	NK
Centipedes	23	23	3	0	0	NK
Dragonflies	124	124	48	0	0	0
Butterflies	245	245	26	0	0	0
Bees	130	130	NK	0	0	NK
Freshwater Crabs	51	51	50	0	0	0
Freshwater Fish	119	92	55	0	0	27
Amphibians	119	119	105	0	0	0
Reptiles	217	217	131	21	0	1
Birds	498	221	34	-	276	1
Mammals	141	129	21	33	-	12
Angiosperms	4,203+	3,103+	889+	0	0	1,100+
Gymnosperms	35+	2	0	0	0	33+
Pteridophytes	336	321	49	0	0	15+
Mosses	560+	560	66+	0	0	NK
Liverworts	222	222	NK	0	0	NK
Lichens	661	661	NK	0	0	NK
<b>Total</b>	<b>7,828</b>	<b>6,338</b>	<b>1,691</b>	<b>54</b>	<b>276</b>	<b>1,212</b>

Lowering of the sea level during the Pleistocene era made it possible for faunal groups to cross over from the Indian subcontinent to Sri Lanka across the Palk Strait using Adam's Bridge (Figure 8). This hypothesis is supported by the discovery of Tiger fossils (*Panthera tigris*) from Batadomba and Alawala caves (dated 16,700 -11,600 yr bp and 14,000-8,000 yr bp respectively), and Rhinoceros fossils from Lunugala (dated 80,000 (+20,000) yr bp) (Manamendra-Aarachchi et al., 2005; Laurie et al., 1983). Sea level changes also facilitated the movement of small vertebrates such as the ancestors of *Ceratophora* species. Long periods of isolation between interglacial periods, where the sea levels rose cutting off the land connection, appear to have led to the process of speciation allowing the evolution of many new species. A case in point is the evolution of five species of the genus *Ceratophora* at different altitudinal ranges in Sri Lanka (Erdelen, 1989).

Prehistoric humans also appeared to have immigrated to the island during this period, as evidenced by the stone tools found in the Bundala Pathirajawela (dated to 125,000 yr BP) (Deraniyagala, 1986). (Figure 8 is a schematic drawing of this process of land bridge formation and sea level rise)



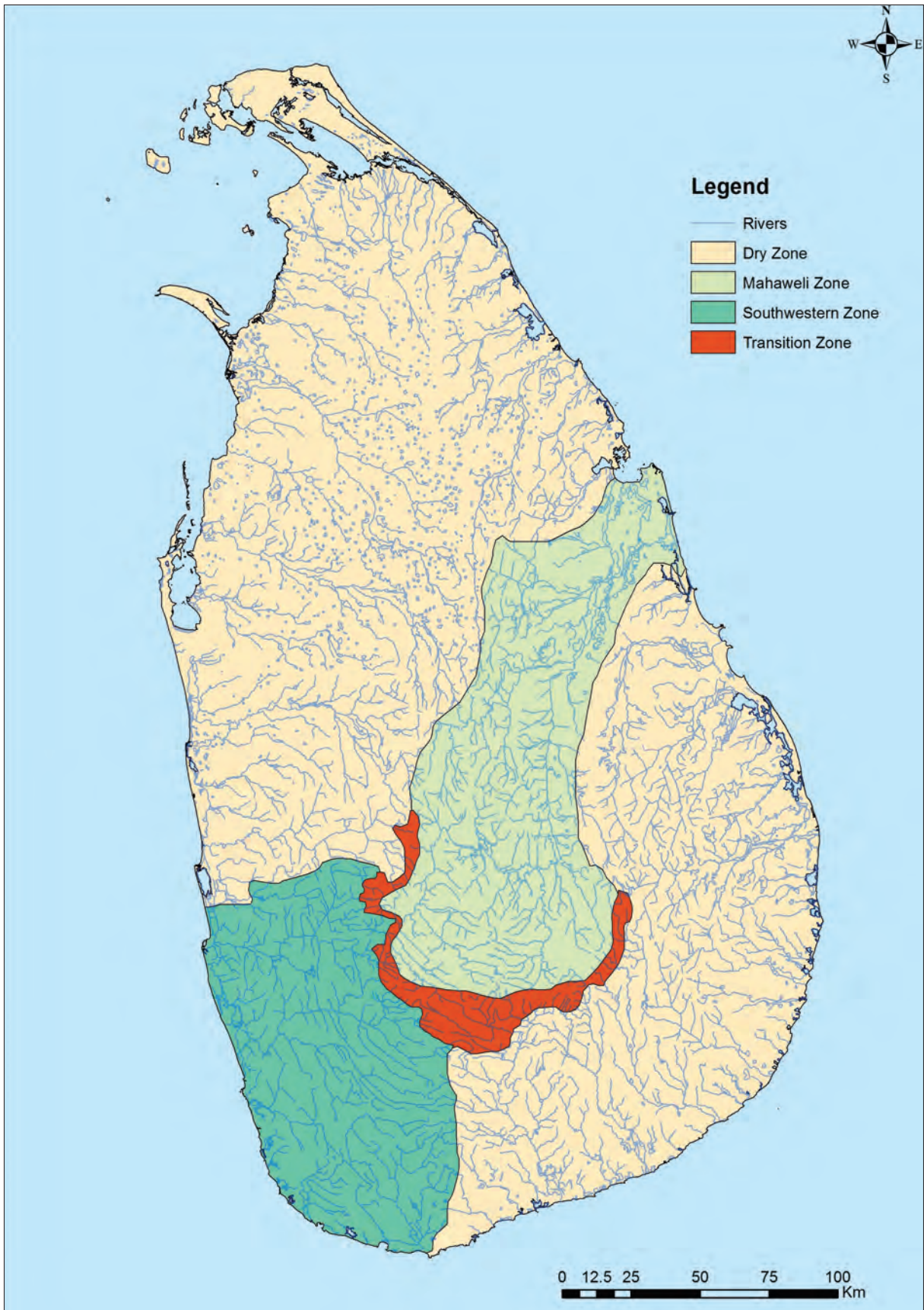
**Figure 8. a) Repeated Land Bridge Formation, due to Lowering of the Sea Level during periods of Glaciations (between 3 myrs - 3000 yr), Connected the Indian Mainland with Sri Lanka Facilitating Faunal Exchange between Sri Lanka and India. Figure 8. b) Sea Level Rise as in the Present Day Separates India from Sri Lanka. (Illustrated by Thusitha Premaratne)**

Based on the distribution of animals, several zonation patterns are recognized in Sri Lanka. Senanayake and Moyle (1982) have identified four ichthyological zones based on the distribution patterns of freshwater fish, namely: the Mahaweli Zone, dry zone, transition zone and southwestern zone. Of these four zones, the southwestern ichthyological zone supports the highest species richness and endemism (Figure 9).

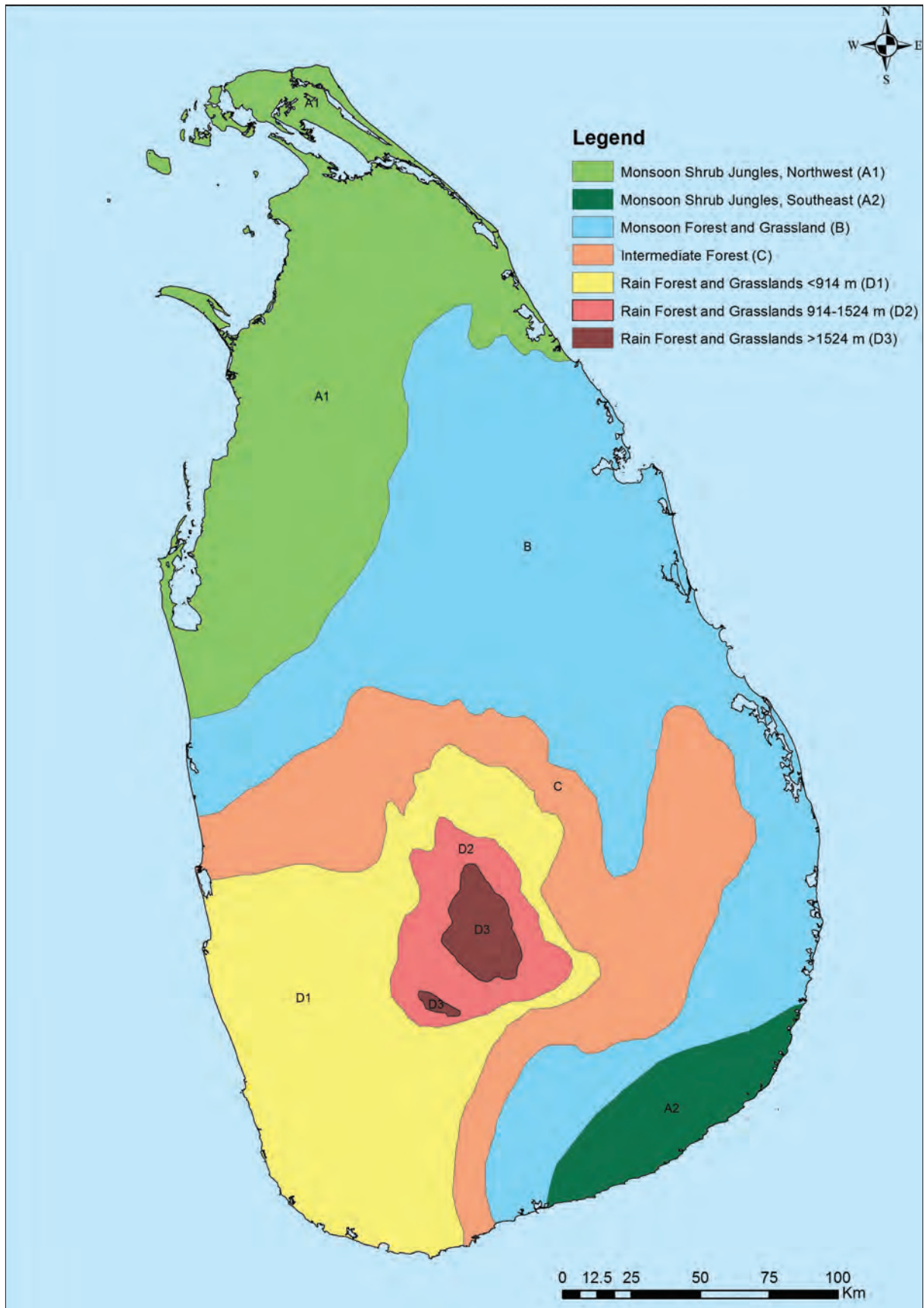
Eisenberg and McKay (1970) also proposed a system for classifying the distribution patterns of mammals in Sri Lanka based on the climate map of Muller-Dombois and Sirisena (1967), who recognized seven mammalian zones, namely: monsoon scrub jungle in the northwest (A1) and southeast (A2); monsoon forest and grassland (B); inter monsoon forest (C); rain forests and grasslands below 914.4 m (3,000 ft) (D1); between 914.4-1,524 m (3,000-5,000 ft) (D2); and above 1,524 m (>5,000 ft) (D3). Of these, most of the endemic and threatened mammals of Sri Lanka are restricted to the zones D1, D2 and D3. More than 75% of the D1 zone falls within the Western Province (Figure 10).

Kotagama (1993) has divided Sri Lanka into six avifaunal zones based on the distribution patterns of the resident bird species. These include the northern zone, low country wet zone, mid country wet zone, and hill country wet zone, dry zone and the Uva zone. As in the case of mammals, the low, mid and hill country wet zone harbours the highest species richness, as well as endemism, of birds (Figure 11).

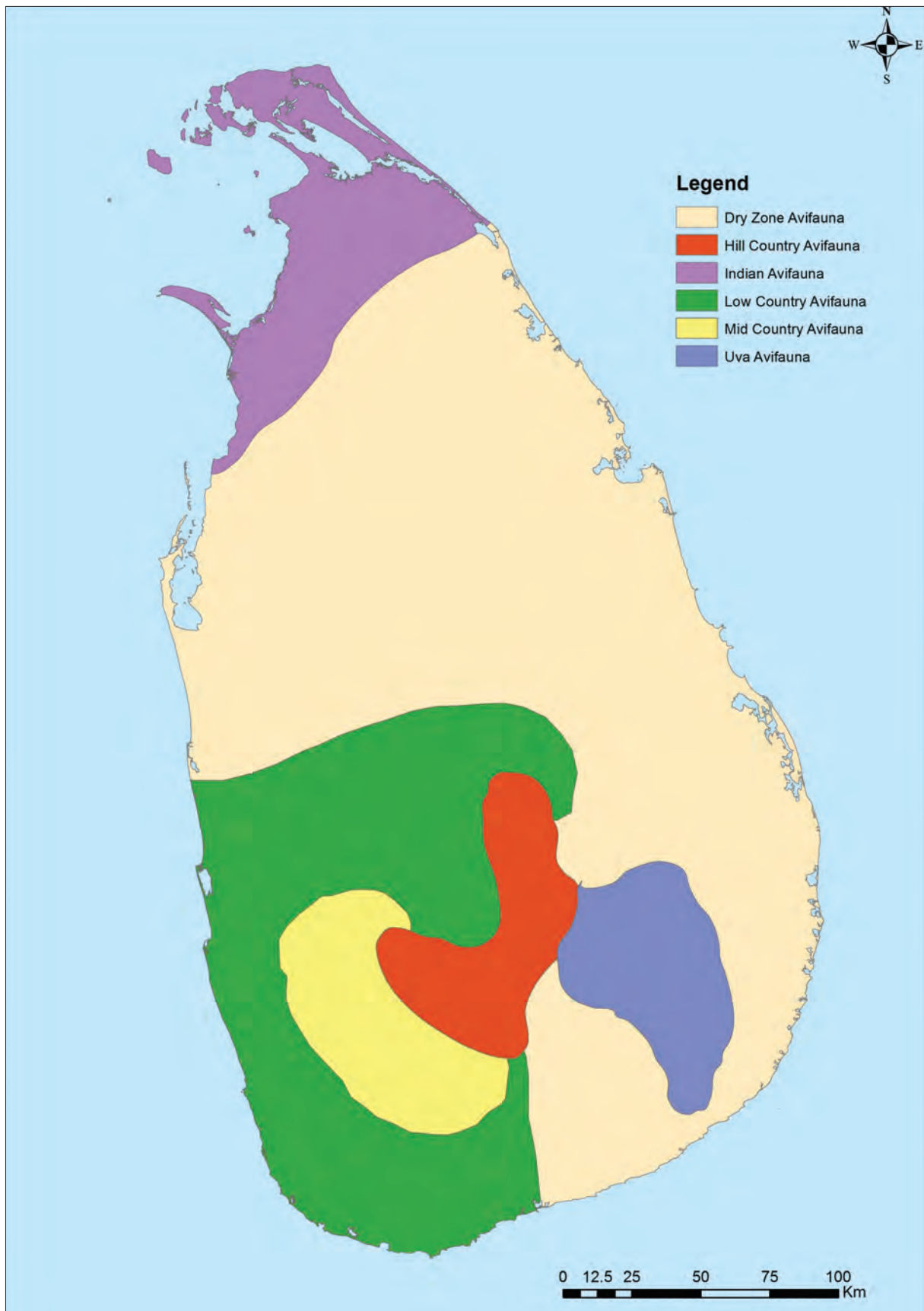
Plants also show a distinct distribution pattern. Ashton and Gunatilleke (1987), taking into consideration the trends in distribution of plants, have divided Sri Lanka into 15 floristic regions. In addition, Wijesinghe et al., (1993), assessing distribution patterns of biodiversity and climate, have defined six bioclimatic zones for Sri Lanka. Finally, the Ministry of Forestry and Environment (1999) has divided Sri Lanka into 15 bio-regions, based on climate and geo-physical classifications, the distribution patterns of fauna and flora, and the biodiversity richness of different parts of the country (Figure 12).



**Figure 9. Sri Lanka's Ichthyological Zones**  
(Source: Senanayake and Moyle, 1982).



**Figure 10. Sri Lanka's Mammalian Zones**  
 (Source: Eisenberg and Mckay, 1970)



**Figure 11. Sri Lanka's Avifaunal Zones**  
(Source: Kotagama, 1993)



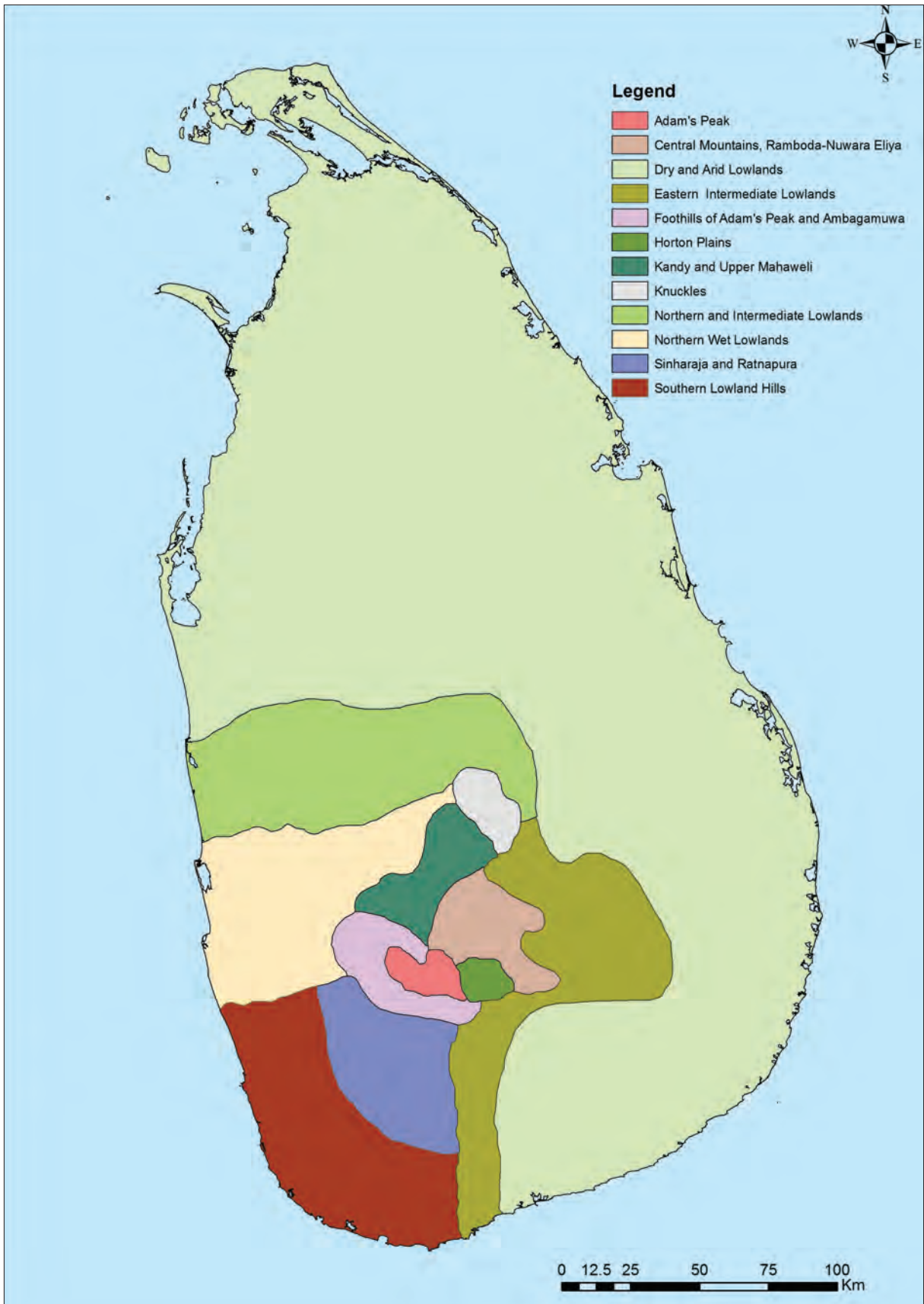
Tharanga Wijewickrama © IUCN, Sri Lanka

*Ochna jabotapita*, an Endemic of Lowland Wet Evergreen Forests



Naalin Perera © IUCN, Sri Lanka

*Cophotis dumbara*, an Endemic of Montane Evergreen Forests



**Figure 12. Sri Lanka's Vegetation Zones**  
(Source: Ashton and Gunatilleke, 1987)

More than 75% of the endemic species in Sri Lanka are restricted to the wet zone where only about 10% of the original forest cover remains (MoE, 2012a). The dry zone that contains nearly 70% of Sri Lanka's forest cover supports only a few endemic species, which show a wide distribution in Sri Lanka. The only endemics that are unique to the dry zone are found today in forests associated with inselbergs. Some examples of such species include Alwis' day gecko (*Cnemaspis alwisi*) found only in Dolukanda; Kumarasinghe's day gecko (*Cnemaspis kumarasinghei*) found only in Maragala; Small rock gecko (*Cnemaspis podihuna*) found only in Lahugala and Sri Lanka tribal rock-frog (*Nannophrys naeyakai*) found only in Kokagala and Yakunne hela. (Fernando et al., 2007; Wickramasinghe and Munindradasa, 2007). This phenomenon may have arisen as a result of the extensive changes to the dry zone forests during the hydraulic civilization that existed in the dry zone for nearly 2,500 years.

### 1.5.3 The Value of Biodiversity and Ecosystem Services in Sri Lanka

The values of nature vary according to local biophysical and ecological circumstances and the social, economic and cultural context. According to CBD guidance on Incorporating Biodiversity and Ecosystem Service Values into NBSAPs, the values can simply mean 'the regard that something is held to deserve' or 'the importance or preciousness of something'. Values, therefore, are not necessarily (and often cannot be) identified in quantitative terms. It further explains that the reference to values includes economic, cultural and social values, as well as intrinsic values of biodiversity, which can be represented in a variety of units — physical, qualitative, quantitative and monetary (UNEP-WCMC and IEEP, 2013).

Ecosystem services are the links between nature and the economy, and are the values that flow to human societies (MEA, 2005; TEEB, 2009) (Figure 13). 'They are the benefits humans derive from ecosystems' (MEA). From an economic perspective, the flow of ecosystem services can be seen as the 'dividend' that society reaps from this natural capital (TEEB, 2009). Maintaining stocks of natural capital allows the sustained provision of this flow of ecosystem services in the future.

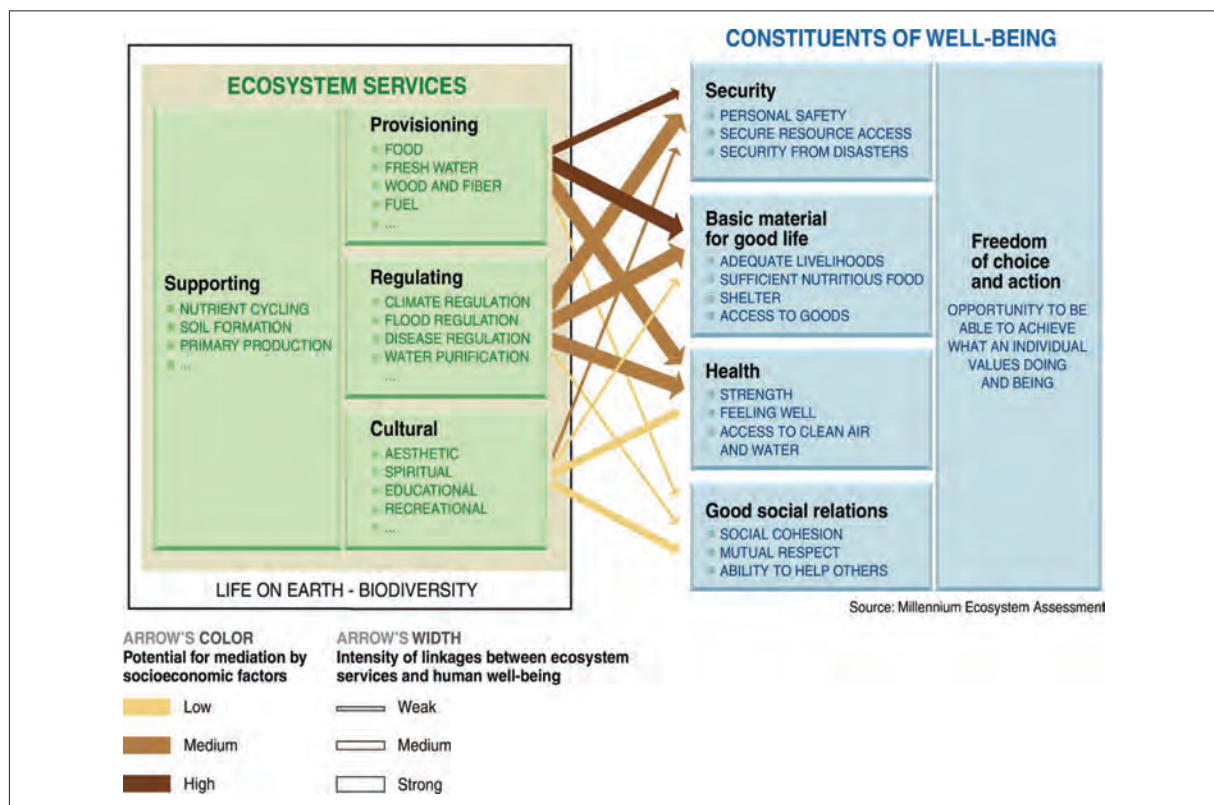


Figure 13. Ecosystem Services and Linkages to Human Well-being  
(Source: MEA, 2005)



Sri Lanka is well known for upholding these values as part of its heritage. The establishment of Mahameuna uyana as a sanctuary for animals, as early as the 3<sup>rd</sup> century BC, is a historical example. Traditional lifestyles were interwoven with nature conservation and an appreciation of biodiversity's economic, social, cultural and spiritual values. Living testimonies of this close association with nature are the *ellangawa* or small tank cascade systems and the Kandyan home garden systems. However, over time, these traditional systems have declined.

Understanding this need, the Post Graduate Institute of Agriculture (PGIA) and the Department of Agricultural Economics, University of Peradeniya, took the initiative to popularize environmental economics in Sri Lanka during the early 1990s. However, having delivered a number of pioneering outputs, the momentum of work in this field was lost gradually in Sri Lanka towards 2010. In contrast, the global interest in ecosystem services rose since the launch of the Millennium Ecosystem Assessment (MEA) in 2005. Later, 'The Economics of Ecosystems and Biodiversity' (TEEB) developed a framework for capturing ecosystem services values based on the findings of MEA. The CBD also recognized that one of the root causes for the continuous degradation of biodiversity was the lack of knowledge regarding its value (Pascual et al., 2010; CBD, 2010c).

Noting Sri Lanka's international obligations, including the Aichi targets (specifically targets 2 and 3), and recognizing the need for incorporating Biodiversity and Ecosystem Services (BES) values into the local decision-making process, the Biodiversity Secretariat of the Ministry of Environment initiated the 'Pricing the Biodiversity of the Island' Project in the year 2012. In 2013, a two-day national conference on 'Livelihoods, Biodiversity and Ecosystem Values' took place, organized by the Biodiversity Secretariat of the MoERE with technical support from IUCN. The recommendations of the conference are listed below and are relevant for incorporating biodiversity and ecosystem values into the decision-making processes in Sri Lanka (MoERE, 2013a).

#### Key recommendations of the BES Workshop

- Set up an Environmental Economics Working Group, under the chairmanship of the MoERE to provide technical advice to the Ministry on ongoing issues and in relevant policy analysis, using environmental economic tools.
- Determine the agenda for environmental economics within the 'Pricing the Biodiversity of the Island Project' and beyond, using the TEEB framework to address the obligations of Sri Lanka under conventions such as the CBD.
- Design and implement an island-wide capacity enhancement programme on the application of environmental economics tools in development decision-making. Engage universities to produce valuation studies according to the framework and guidance given by the MoERE.
- Identify the top ten environmental issues and conduct appropriate environmental economic analyses and produce policy briefs on those, with appropriate instruments to make a change for the better. Disseminate the findings widely, covering policy and decision-makers and the public.
- Conduct case studies to demonstrate ecosystems and livelihoods values in sustainable management of natural resources in Sri Lanka and widely disseminate the findings.

In addition to the above recommendations, the Haritha Lanka Programme proposed strategic actions for establishing biodiversity conservation financing mechanisms through biodiversity valuation and economics of conservation. These actions have been used in formulating targets and strategic actions to identify and incorporate biodiversity and ecosystem values in the NBSAP revision.

### 1.5.4 Contribution of Biodiversity and Ecosystem Services to Human Well-being

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being (MEA, 2005). Some ecosystem processes provide direct benefits to humans, but many of them provide benefits primarily *via* indirect interactions. The schematic in Figure 14 shows the extent of services provided by ecosystems in Sri Lanka.

The contribution of biodiversity and ecosystem services to social well-being in Sri Lankan society can be understood by examining some of the provisioning services that they provide. In the year 2014, the fisheries sector (both inland and marine) contributed 1.8% of GDP. A total of 217,140 active fishers engaged in fishing in 2014, to provide rupees 176,239 million as value-added revenue from ecosystem services (MoFARD, 2015). A forestry sector assessment conducted by the Ministry of Environment estimated that annual cattle grazing related benefits accrued by local communities were worth rupees 214 million. The contribution of hydropower to electricity generation in Sri Lanka is about 35% according to CEB reports, and the value of electricity generated in 2011 was rupees 4.6 billion.



Fishermen in Batticaloa Lagoon



Randenigala Dam



**Figure 14. Schematic Illustration of Ecosystem Services in Sri Lanka**

(This is merely a schematic illustration meant to show selected ecosystem services. It is not an exhaustive map of ecosystem services. For a more detailed list of services provided by ecosystems see Table 4.)

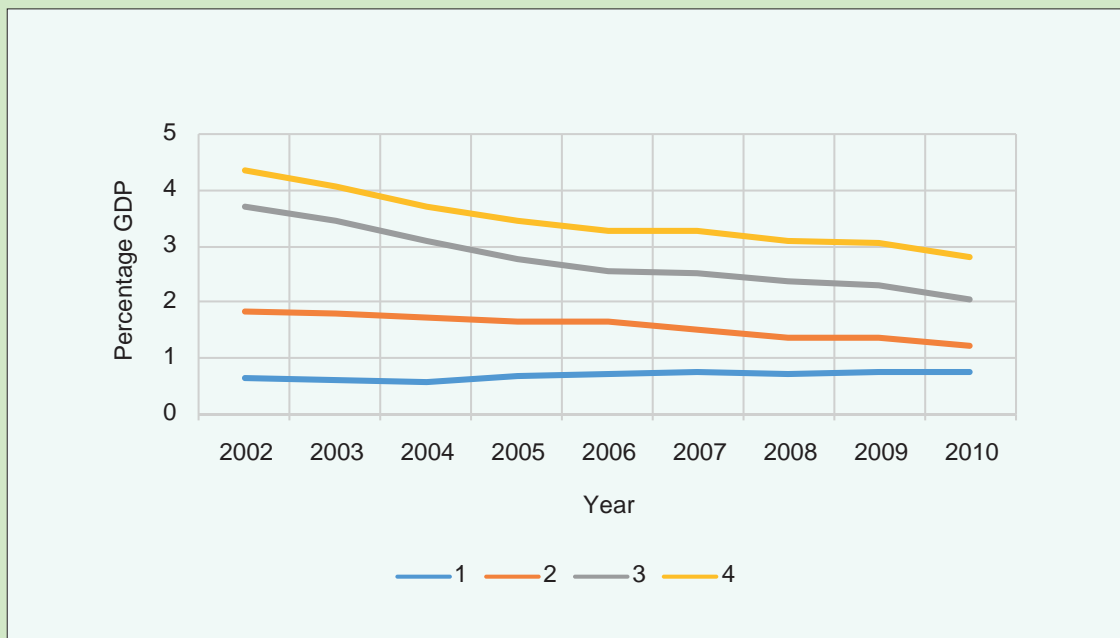
(© IUCN Sri Lanka, 2016; illustrated by Dinuk Senapatiratne)

### Box 5. The Contribution of the Forestry Sector to the National Economy of Sri Lanka

Forests play a significant role in providing various benefits in terms of goods and services to people. These benefits vary, depending on the interactions and the proximity of the beneficiaries to the given forest. Forestry benefits can range from natural resources that forest-dwelling communities obtain from the forest, to resources which neighbouring local communities and global communities obtain from the same forest. Traditionally, the contribution from the forestry sector to the national accounts (i.e., to the Gross Domestic Product — GDP) were under-represented, as only a few of values — such as the value of timber, which has a market value — were accounted for. Therefore, in the past, the true value of forests was not reflected adequately to guide decision-making for development.

To address this weakness, in 2010, the Sustainable Development Division of the then Ministry of Environment commissioned a study titled 'Integration of the Forestry Sector Contribution to the System of National Accounts in Sri Lanka'. The study assessed non-conventional values of Sri Lankan forests — such as non-timber forest products, recreational values, contribution of mangroves for fish breeding, and the value of carbon stocks, livestock grazing, pollination and watershed protection. These estimates are referred to as the forestry sector contribution from a green accounting perspective.

This study has demonstrated that between 2002 and 2010, the conventional value of forestry remained around 0.6% to the GDP, whereas with green accounting included, estimates of forestry sector contribution to GDP has increased to 2.7 - 4.9% (Figure 15). These changes indicate that the forestry sector contributes much more to the national economy than is reflected in conventional accounting (SDD, MoMD&E, undated).



**Figure 15. Forestry Sector Contribution to GDP**

(Source: SDD, MoMD&E, undated; Legend: 1) Percentage share of forestry sector contribution from conventional estimates to GDP — before revisions; 2) Percentage share of forestry sector contribution from conventional estimates to GDP — after revisions and new estimates; 3) Percentage share of forestry net contribution from Green Accounting estimates to GDP; 4) Percentage share of forestry sector total contribution from conventional and Green Accounting to GDP)

## Box 5. Contd.

The study further provides detailed estimates for Sri Lankan forests as of 2010 (Table 3).

**Table 3. Contribution to the National Economy by the Forestry Sector**

(Source: SDD, MoMD&E, undated)

	<b>Benefit/cost</b>	<b>Value (in Rs. Mn)</b>
1	Forestry conventional accounts	52,917
2	Non timber forest products	4,777
3	Recreation	694 (fee) + 4,100 (consumer surplus)
4	Contribution of mangroves for fish breeding	1,260
5	Mangrove non-use, option and erosion control benefits	518
6	Net carbon gain	17,273
7	Cattle grazing	214
8	Pollination	46,692
9	Watershed protection	1,704
10	Non-use values of visiting Sinharaja forest, Yala National Park, dry zone forests and watching leopards	9,711
11	Pharmaceutical prospecting	102,816
12	Depletion of trees from logging and planned development activities	(5,874)
	<b>Total</b>	<b>236,802</b>

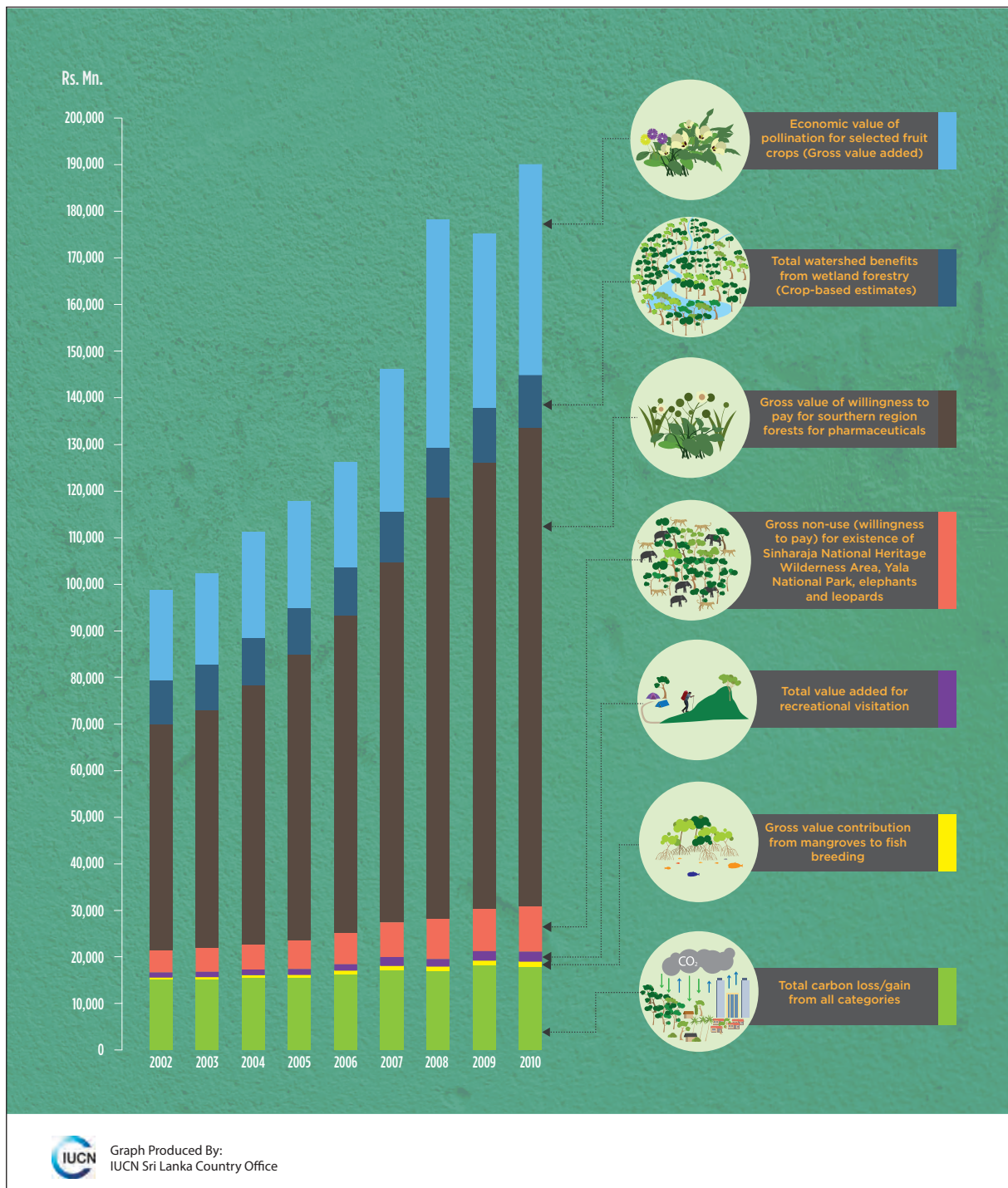
The infographic in Figure 16 graphically depicts these values.

This pioneering study by the MoMD&E of estimating the contribution of the forestry sector to the national accounts of Sri Lanka addresses one of the root causes for biodiversity degradation — the lack of knowledge of the monetary value of biodiversity. This study demonstrates how valuable forests are for the national economy. This is one of the first steps towards the establishment of a Green Accounting mechanism for Sri Lanka.



Naalin Peera © IUCN, Sri Lanka

Pollination by a Hawkmoth



**Figure 16. Forestry Sector Contributions to the Sri Lankan Economy**

(Source: MoMD&E, undated; illustrated by Dinuk Senapatiratne)

Table 4 presents a summary of ecosystem services provided by Sri Lankan ecosystems.

**Table 4. Summary of Ecosystem Services Provided by Sri Lankan Ecosystems**

(Sources MEA, 2005; McVittie and Hussain, 2013; BDS, MoERE, 2014; Perera, 2012; Kathriarachchi, 2012; Wijesundara, 2012; Miththapala, 2008b, 2008c, 2008d, 2013a and 2013b)

Services		Natural Ecosystems	Man-made
Provisioning	Food	Lowland wet evergreen forest; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; fresh and brackish water villus; river expansion lakes; mangroves; lagoons; fresh and brackish water <i>villus</i> ; flood plains ( <i>villu</i> ); salt marshes; tidal flats; rivers and streams; estuaries; coral reefs; sandstone reefs; rocky reefs; seagrass meadows; seaweeds; mud bottoms; sand bottoms; open ocean.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; home gardens; agro-plantations; paddy fields; reservoirs; aquaculture bodies.
	Fodder	Montane upper wet <i>patana</i> ; montane lower wet <i>patana</i> ; humid zone dry <i>patana</i> ; summer zone dry <i>patana</i> ; dry ( <i>damana</i> ) grasslands; flood plain grasslands; upland savannas; lowland savannas.	Pasturelands; wet ( <i>talava</i> ) grasslands.
	Water supply	Rivers and streams; fresh and brackish water <i>villus</i> .	Reservoirs; tanks; ponds.
	Fibre, timber	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; marshes.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; wet ( <i>talava</i> ) grasslands.
	Genetic resources	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves; coral reefs; fresh and brackish water <i>villus</i> .	Tanks.
	Medicinal resources	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves; coral reefs, fresh and brackish water <i>villus</i> ; marshes.	Home gardens; agro plantations — mixed culture.
	Ornamental resources	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves; coral reefs, rivers and streams.	Home gardens; reservoirs.

Services		Natural Ecosystems	Man-made
Regulating Services	Air quality regulation	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens.
	Water purification	Mangroves; sea grasses; marshes.	Tanks.
	Water regulation	Lowland wet evergreen forest; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; marshes; mangroves; lagoons; flood plains ( <i>villu</i> ); salt marshes; tidal flats; estuaries.	Tanks.
	Erosion regulation	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves; lagoons; flood plains ( <i>villu</i> ); salt marshes; tidal flats; estuaries; sand dunes coral reefs; sandstone reefs; rocky reefs.	Tanks; agro-plantations
	Climate regulation	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves.	Tanks; reservoirs; agro-plantations; forest plantations; public parks and gardens; home gardens.
	Carbon sequestration	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas; mangroves; salt marshes; seagrass meadows.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens.
	Pollination (providing habitats for pollinators)	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens; agro plantations; paddy fields.



Table 4. Contd.

Services		Natural Ecosystems	Man-made
	Pest and disease regulation (providing habitats for natural enemies of pests and vectors)	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas.	Home gardens.
	Soil formation	All natural tree-dominated forests mentioned in Table 1. Mangroves, tidal flats, marshes trap sediments.	Tanks trap sediments.
Supporting Services	Primary production	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas, mangroves; salt marshes; seagrass meadows.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens; agro plantations; paddy fields.
	Nutrient cycling	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas, mangroves; marshes.	Secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens ; agro plantations; paddy fields.
	Water cycling	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; dry-mixed evergreen forests; arid-mixed evergreen forests; upland savannas; lowland savannas, mangroves; salt marshes; seagrass meadows.	Tanks, reservoirs; secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations; public parks and gardens, home gardens ; agro plantations; paddy fields.
	Provisioning of habitats	All of the ecosystems listed in Table 1.	Botanical and zoological gardens; public parks and gardens; home gardens; agro plantations; secondary forests; sparse open forests; dry deciduous thorn scrublands; forest plantations, tanks.

Services		Natural Ecosystems	Man-made
Cultural services	Spiritual and religious services	Montane evergreen forests (Peak Wilderness); Isolated hill forests (Ritigala Monastery, Dolukanda ruins site);swamp forests (Kiriamma <i>ulpota</i> ); Moist-mixed evergreen forest (Arankele Monastery).	
	Aesthetic value	Lowland wet evergreen forests; mid-elevation evergreen forests; montane evergreen forests; moist-mixed evergreen forests; montane upper wet <i>patana</i> ; mangroves; lagoons; flats; rivers and streams; estuaries; coral reefs; sandstone reefs; rocky reefs; open ocean.	Agricultural croplands; pasturelands; some forest plantations; tanks and reservoirs.
	Recreation and ecotourism	Lowland wet evergreen forests (for example, Sinharaja Natural Heritage Wilderness Area); mid-elevation evergreen forests (for example, Peak Wilderness Nature Reserve); montane evergreen forests (for example, Pidurutalagala) dry-mixed evergreen forests (for example, Yala National Park, Minneriya National Park); montane upper wet <i>patana</i> (for example, Horton Plains National Park); mangroves (for example, Muthurajawela EPA); lagoons (for example, Negombo Lagoon); flood plains ( <i>villu</i> ) (for example, Wilpattu National Park); rivers and streams (for example, Kithulgala); estuaries; coral reefs (for example, Bar Reef Marine Sanctuary, Hikkaduwa and Pigeon Island National Parks); sandstone reefs; rocky reefs.	Botanic and zoological gardens; public parks and gardens; tanks; reservoirs.
	Knowledge system and educational services	All of the ecosystems listed in Table 1	Agricultural croplands; pasturelands; forest plantations

## 1.5.5 Trends of Biodiversity in Sri Lanka

### Trends in Ecosystems

Even though it is a small island, Sri Lanka shows a broad spatio-temporal variation in climatic, topographic, edaphic and zoogeographic factors that has resulted in the formation of a diverse array of terrestrial, aquatic, coastal and marine ecosystems.

The protection of these ecosystems is largely effected by the main *in-situ* custodians of Sri Lanka, the Department of Wildlife Conservation and the Forest Department.

Since 2007, there has been an increase in the number of protected areas, which is very encouraging. Seven national parks, one nature reserve and two sanctuaries have been declared by the Department of Wildlife Conservation, since 2007 (DWC, 2016).

The amendment of the Forest Ordinance in 1995 (No. 23 of 1995) established a new category of forests called Conservation Forests. Under this category all the forests of the wet zone are protected as Conservation Forests (See section on *In-situ* Conservation). This protection afforded to the wet zone forests reduced large-scale loss, but habitat degradation, in many forms still continues due to weak enforcement in some areas (See section on Habitat-related Drivers).

Mangroves were also protected as Conservation Forests, but destruction continues unabated due to weak enforcement in some areas.

In general, coastal ecosystems continue to be under considerable threat from anthropogenic activities in coastal zone, where 25% of the island's population is concentrated (CZMP, 2006). Urbanization, increasing tourism, industries, ports and harbours, oil exploration, coal power plants, fisheries, aquaculture and agriculture place heavy pressures on coastal ecosystems (BOBLME, 2013).

After the three-decade long civil unrest, focus has now shifted to the North and East, where various dry zone forest types are now being threatened by habitat loss for socio-economic development projects (Perera, 2014).

Over the years many attempts have been made to classify Sri Lanka's ecosystems mainly based on vegetation characteristics (Ashton and Gunatilleke, 1987; Chapman, 1947; De Rosayro, 1950; Gausson et al., 1964; Greller and Balasubramaniam, 1980; Holmes, 1956; Legg and Jewell, 1995; Koelmeyer, 1957 & 1958; Mueller-Dombois, 1968; Perera, 1975; Pemadasa, 1995 and Werner, 1984). During the Protected Area gap analysis Jayasuriya et al., (2006) proposed a classification system taking into consideration all these classification systems. With each classification the new ecosystem types were added onto the list of ecosystem types of Sri Lanka. However, many of these focus only on terrestrial ecosystems and have not considered the many edaphic and anthropogenic variations of these major ecosystems that support unique species assemblages. Further, ecosystems such as caves rock outcrops have not been listed in any of these classification systems, even though they are unique ecosystems. Therefore, if these variants are not given due consideration as unique ecosystems, they are likely to be excluded from conservation planning. Because many of these variants have small extents, if they are not given proper conservation attention, they are likely to be lost forever.

Therefore, during the preparation of the NBSAP, a new ecosystem classification system has been developed in consultation with several leading ecologists in Sri Lanka and is presented in Table 1. However, this ecosystem classification should be subjected to a broader stakeholder consultation before being adopted and therefore, this is included as Action 1 under Target 1 to be achieved during the implementation of the present NBSAP.

### Trends in Species

Exploration of the island's species has always been excellent, but taxonomic exploration has blossomed in the new millennium (Table 5).

**Table 5. New Species of Fauna Recorded since 2007 in Sri Lanka**  
(Source: IUCN Sri Lanka database, 2016)

Animal Group	New description	New records	Update to species level	Validation	Total
Scorpions	4	1	0	0	5
Dragonflies	13	0	0	0	13
Butterflies	0	2	0	1	3
Freshwater Fish	4	0	7	0	11
Amphibians	16	0	0	0	16
Reptiles	37	0	1	0	38
Birds	0	7	2	0	9
Mammals	2	0	3	0	5
<b>Total</b>	<b>76</b>	<b>10</b>	<b>13</b>	<b>1</b>	<b>100</b>



Sri Lanka Red-finned Barb (*Pethia reval*)

*Cyathea sinuata*, the only known tree ferns in the world, with simple leaves

Four-toed Snakeskink (*Chalcidoseps thwaites*)



Entire groups — such as ants, bees, spiders and bryophytes, pteridophytes were assessed and included in the last revision of the Red List™ (MoE, 2012a).

Yet, the distressing corollary is many of these species are threatened by various anthropogenic activities. A total of 487 species are considered Critically Endangered, and another 196, Possibly Extinct (MoE, 2012a) (Table 6).

**Table 6. Conservation Status of Nationally Assessed Taxa of Sri Lanka**  
(Source, MoE, 2012a)

Taxonomic Group	National Conservation Status								
	Total	Native	Endemic	CR (PE)	CR	EN	VU	NT	DD
Land snails	254	230	203	0	76	66	21	7	57
Scorpions	18	18	14	NK	NK	NK	NK	NK	NK
Centipedes	23	23	3	NK	NK	NK	NK	NK	NK
Dragonflies	124	124	48	0	26	19	15	17	10
Butterflies	245	245	26	0	21	37	23	23	7
Bees	130	130	NK	0	48	38	20	12	0
Freshwater Crabs	51	51	50	0	32	13	1	5	0
Freshwater Fish	119	92	55	2	18	19	6	5	9
Amphibians	119	119	105	1	42	28	10	3	3
Reptiles	217	217	129	0	42	48	20	15	26
Birds	498	221	34	0	8	17	30	36	0
Mammals	141	129	21	0	11	28	19	10	19
Angiosperms	4,203+	3,103+	889+	172	210	536	613	348	144
Gymnosperms	35+	2	0	0	1	0	1	0	0
Pteridophytes	336	321	49	21	42	88	70	40	12
Mosses	560+	560	66+	0	NE	NE	NE	NE	NE
Liverworts	222	222	NK	0	NE	NE	NE	NE	NE
Lichens	661	661	NK	0	NE	NE	NE	NE	NE
<b>Total</b>	<b>7,827+</b>	<b>6,337+</b>	<b>1,689+</b>	<b>196</b>	<b>487</b>	<b>899</b>	<b>829</b>	<b>509</b>	<b>287</b>

## Box 6. The National Red List

The historical record shows that life on Earth has gone through five mass extinctions during the last 600 million years. Available data indicate that we are currently living through the sixth mass extinction of the Earth. Unlike the past mass extinctions that were caused by natural phenomena, the current extinction event is almost entirely caused by humans.

In 1962, Sir Peter Scott came up with the idea of compiling a list of plants and animals that were facing a high risk of extinction to draw attention to the biodiversity crisis, and this became popularly known as the Red Data Book. In 1964, IUCN took over the preparation of the list of threatened species. In 2015, IUCN celebrated 50 years of Red Listing.

The Red List™ provides an assessment of the extinction risk faced by a species by assigning a Red List™ category based on a five-criteria system. Any species assigned to one of the three categories — Critically Endangered, Endangered or Vulnerable — is listed as a threatened species. The Red List™ therefore, provides a basis for prioritization of species for conservation action. However, it should be noted that Red Listing only provides a diagnosis of the status of the species, and this must be followed with a planned programme to reverse the drivers that have caused the species to become threatened.

The Red List™ can also be used for raising awareness, motivating people for conservation, monitoring conservation action and also provides a objective basis for preparing lists of species that are protected under national or international law.

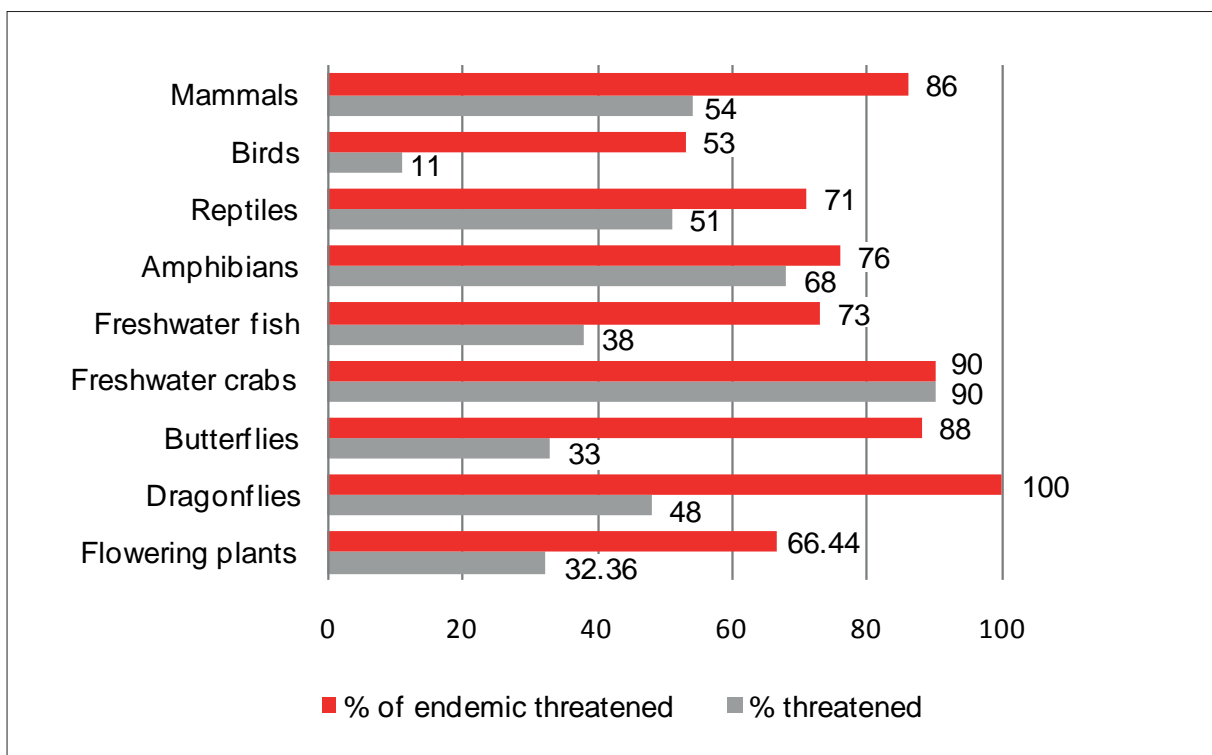
Even though the IUCN Red List™ provides a basis for conservation planning, there are several drawbacks in using it for national conservation priority setting. Firstly, the Global Red List™ is heavily biased towards vertebrate taxa and most invertebrate groups are either partially assessed or not assessed at all. Secondly, Sri Lanka is poorly represented in the global Red List, and many endemic species are not listed at all. Finally, some of the species that are listed globally as threatened have healthy populations in Sri Lanka, for example, Sambar (*Rusa unicolor*) and Mahseer (*Tor khudree*). In contrast, some species that are listed as Least Concern globally have extremely small populations in Sri Lanka, for example, Indian Courser (*Cursorius coromandelicus*) and Crab Plover (*Dromas ardeola*).

Therefore, it is essential to have a National Red List in order to identify national conservation priorities. The first list of nationally threatened species of Sri Lanka was prepared in 1987, which was subsequently updated 1993, 1999, 2007 and 2012. The first three national lists were prepared using national criteria, while the latter two lists were prepared using the IUCN Red List™ criteria. Updating the national species assessments at regular intervals is extremely important for updating species conservation plans for Sri Lanka and therefore, this has been included as one of the activities of the present NBSAP.

Further, as stated earlier, Red Listing should be followed up with a number of actions such as the preparation and implementation of recovery plans for at least Critically Endangered species; the updating of lists of protected species; and for research prioritization. Therefore, some of these follow up actions have also been included as activities under the current NBSAP.

(Source: MoE, 2012a)

It should be noted that a high proportion of the threatened species are endemics (Figure 17). This situation has arisen due to several reasons. Firstly, more than 75% of the threatened endemic species in Sri Lanka are habitat specialists restricted to the wet zone forests (MOE, 2012a) where the forest cover has undergone a marked decline over the last 150 years due to cultivation and expansion of human settlements, resulting in large-scale loss of habitats for many of the endemic species. According to the latest forest cover assessment carried out in 2010 (Edirisinghe et al., 2012), the proportion of natural forest cover in the wet zone accounts for only 15.5% of the extent of the wet zone or 3% of the extent of Sri Lanka. Secondly, the remaining forests in the wet zone exist as small forest fragments, which are continuing to decline in extent due to encroachment, which results in local extinction of endemic species from these habitat fragments. Thirdly, the habitat quality of the remaining forest fragments in the wet zone has declined rapidly, resulting in reduction of their carrying capacity for endemic species. Finally, many of the endemic species are exploited by the ornamental trade, which has resulted in rapid decline in their population sizes. These factors have contributed to many of the endemic species becoming threatened.



**Figure 17. A High Proportion of the Species in Most Taxonomic Groups seen in Sri Lanka are Listed as Threatened**

(Source: MoE, 2012a; Legend: Red bars — % of endemic threatened; Grey bars — % threatened species).

*Gordonia speciosa*, an Endemic and Endangered Plant found in Montane-Evergreen Forests



Sampath de Alwis Goonatilake © IUCN, Sri Lanka

### **Box 7. The Conservation History of the Critically Endangered (CR), Point-endemic Freshwater Fish, Bandula Barb (*Pethia bandula*): a success story**

Conservation of the Bandula Barb (*Pethia bandula*) is a good example of a multi-stakeholder biodiversity conservation initiative.

The Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment (MoMD&E), Department of Wildlife Conservation (DWC), Forest Department (FD), Sri Lanka Police Department (SLPD), Divisional Secretariat of Warakapola, IUCN, Young Zoologists Association (YZA), Wildlife Heritage Trust (WHT), Community Camp Programme C-CAMP-P, University of Colombo, print and electronic media, scientists, conservation professionals and community members all contributed to this programme.

Bandula Barb is a point-endemic species, which is found naturally only in the 2.5 km stretch of stream that flows through the Galapitamada area of the Kegalle District in Sri Lanka. It is a critically endangered fish species found totally outside the protected area network of Sri Lanka. The stream, in which this brilliantly coloured fish lives, flows through human settlements, as well as paddy fields, rubber plantations and home gardens.

When this species was first identified in 1991, the population was estimated to be around 2,000 individuals (Pethiyagoda 1991). However, within a decade, this population decreased at an alarming rate to 200-300 individuals. The reasons attributed to this decline were illegal collection for the ornamental fish trade, extensive use of agrochemicals in paddy fields and changes in land use (Wickramasinghe 2008).

Within this context, the Ministry of Environment, proposed a resolution 'Conservation of Bandula Barb in Sri Lanka — resolution 3.117' — as a special conservation effort, passed at the 2004 IUCN World Conservation Congress held in Bangkok.

In response to the above resolution, a Conservation Action Plan for the Bandula Barb was developed in 2008 by the Ministry of Environment and some of the initial actions presented there in were implemented by the Ministry itself, including the establishment of a second population of Bandula Barb inside a protected area managed by the Forest Department.

In 2013, the Sri Lanka Office of IUCN initiated a project to implement the Bandula Barb Conservation Action Plan, with financial support from the Toyota Environmental Activities Grant Program of the Toyota Motor Corporation.

This project employed a variety of approaches, including creation of awareness, engagement of youth, deployment of nature-based solutions and participatory community decision-making in conservation activities. IUCN worked with key local stakeholders, including the Hapugoda, Rubbidigala and Alpitiya community-based organizations, C-CAMP-P (a traditional and organic farming organization in Warakapola), the FD and the DWC, to implement this project.

Through the project, the second population of the Bandula Barb was augmented by the introduction of a few more individuals, with permission from the DWC.

A decade after the passing of the resolution 'Conservation of Bandula Barb in Sri Lanka' at the IUCN World Conservation Congress, the Bandula Barb population in 2015 was estimated to be 1,500 individuals.

(Main source: IUCN Sri Lanka, 2015; Muthunayake et. al., 2012)





Sampath de Alwis Goonatilake © IUCN, Sri Lanka

**Bandula barb (*Pethia bandula*)**



Naalin Perera © IUCN, Sri Lanka

**Habitat of the Bandula barb**

### ***Trends in In-situ Conservation — Protected and other Managed Areas***

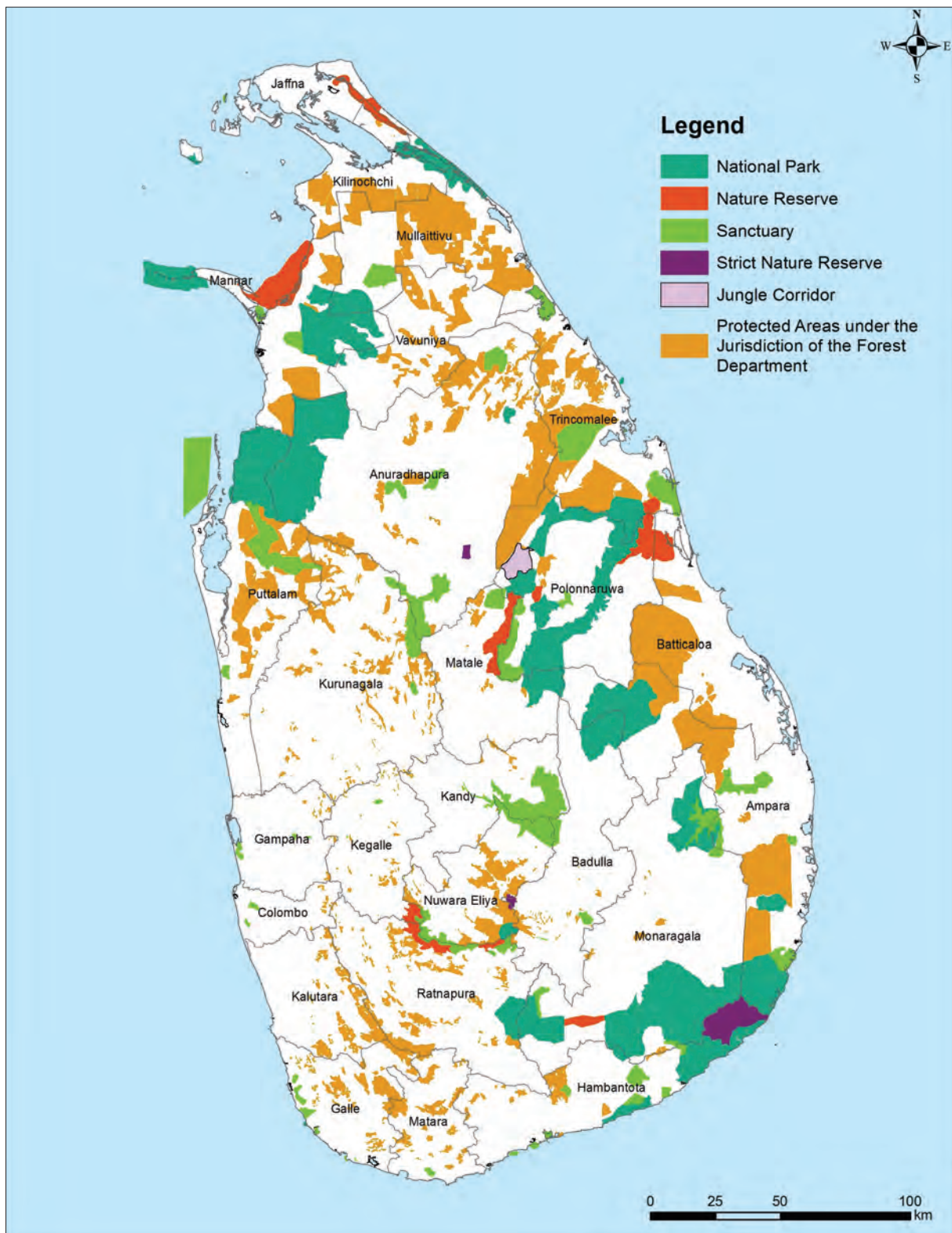
At present (2016), the total area declared as protected areas in Sri Lanka is around 2.3 million ha, representing about 35% of the total land area (DWC, FD, 2016) (Table 7). It should be noted that this figure needs to be verified and was calculated on data provided by the DWC and FD. These protected areas are declared under the Fauna and Flora Protection Ordinance and the Forest Conservation Ordinance. Some of these lands are privately owned (for example, sanctuaries), therefore the entire 35% declared cannot be considered as 'protected'.

Three types of protected areas, namely National Reserves, Sanctuaries and Managed Elephant Reserves have been declared under the Fauna and Flora Protection Ordinance. National Reserves can be declared only on state (government) land and the entry in to these areas is restricted according to the category. There are seven categories recognized under the National Reserves, namely Strict Nature Reserves (3), National Parks (24), Nature Reserves (7), Jungle Corridors (1), Marine National Parks (2), Refuges and Buffer Zones. Sanctuaries (61) and Managed Elephant Reserves (1) can have both state and private land within their areas and there are certain controls and restrictions on activities that are permitted in private lands that falls within these areas (FFPO, 2009) (Figure 18).

Three types of protected areas — Conservation Forests (134), Reserved Forests (Forest Reserves) (524) and Village Forests — have been declared under the Forest Conservation Ordinance. All these can be declared only on state land. The Conservation Forests have the highest degree of protection under this enactment and entry is restricted to non-extractive practices. Reserved Forests are also protected, but in this type of forests limited extraction of certain forest resources is allowed under a permit system. The type known as Village Forests is declared to cover an area that is used for different uses by a community or several communities and certain kinds of extractive practices are allowed to be carried out inside such areas. However, these are very small in extent, and not always clearly demarcated and mapped. A very important feature in this enactment is that it provides protection to all state lands within Sri Lanka that are not declared as protected areas by this or by another enactment. Hence, this provision allows these areas to enjoy a certain degree of protection by regulating some of the activities that can be carried out in such lands (FCO, 2009).



The Largest Asian Elephant gathering in Asia, Minneriya National Park



**Figure 18. Protected Areas of Sri Lanka (under the Jurisdiction of the Forest Department and Department of Wildlife Conservation)**

(Source for PAs under the jurisdiction of the FD: MoE, 2012a; source for PAs under the jurisdiction of the DWC: DWC, 2015)

**Table 7. Current Coverage of Protected Areas in Sri Lanka**

(Source, DWC, FD, 2016)

Protected Area Category	Extent (ha)	% of Sri Lanka	% of PA Extent
Department of Wildlife Conservation			
Strict Natural Reserve	31,574	0.5	1
National Parks (Land)	685,979	10	30
National Parks (Marine)	19,563	0.3	1
Nature Reserve	65,485	1	3
Sanctuary	262,911	4	11
Jungle Corridor	8,777	0.1	0
<b>Total</b>	<b>1,074,290</b>	<b>16</b>	<b>47</b>
Forest Department			
Conservation Forests	134,307	2	6
Reserved Forests	1,092,700	17	47
Village forests			
<b>Total</b>	<b>1,227,007</b>	<b>19</b>	<b>53</b>

In addition, other areas have been declared under the National Heritage Wilderness Areas Act, the Fisheries and Aquatic Resources Act and the National Environmental Act.

The National Heritage Wilderness Areas Act allows declaration of areas of high biodiversity value such as habitats of rare and endangered species, important watershed areas and areas that have special aesthetic value as National Heritage Wilderness areas. So far, only the Sinharaja National Heritage Wilderness Area has been declared under this act.

The Fisheries and Aquatic Resources act has provisions to declare areas for management, regulation, development and the conservation of fisheries and aquatic resources and to prohibit the import of any species that can have an adverse impact on aquatic organisms. There are two types of areas that can be declared under this enactment, Fisheries Management Areas and Fisheries Reserves. The former are declared for the sustainable management of a particular area, while the latter is intended to protect a particular resource or the resources that are found in a particular area by restricting and controlling the activities that are allowed in such an area. This provision can be made use of to protect the spawning areas of aquatic animals and to ensure the sustainable use of fisheries resources.

The Coast Conservation and Coastal Resource Management Department (CC&CRMD) has recognized the need for an integrated approach to coastal zone management that includes local level involvement and collaboration. Therefore, they have declared Special Management Areas (SMA) sites which recognize a set of issues within defined and manageable boundaries. The CC&CRMD is in the process of developing ecological profiles and SMA plans with the involvement of communities in these areas. The overall planning process and plan implementation of SMAs are coordinated by the Special Area Management Coordinating Committees headed by the Divisional Secretaries of the area. Thus far, CC&CRMD have 15 operational SMA sites and 30 proposed SMA sites (CC&CRMD, person.comm.).

Figure 19 presents managed areas under the Jurisdiction of the Department of Fisheries and the Coast Conservation and Coastal Resource Management Department.



**Figure 19. Other Managed Areas of Sri Lanka (under the Jurisdiction of the Department of Fisheries and the Coast Conservation and Coastal Resource Management Department)**

(Source: BOBLME, 2011 and additions from gazette notifications; © IUCN, 2016)

The National Environmental Act also has provisions to designate areas as Environmental Protection Areas based on the biodiversity value of a particular area. An important feature of this act is that there can be regulations to prohibit, restrict, regulate and approve certain types of activities within such areas and these are effected through regulations.

### **Box 8. Environmental Protection Areas (EPAs) for the Conservation of Biodiversity**

With the overall guidance of the Ministry of Mahaweli Development and Environment and the Ministry of Sustainable Development and Wildlife, the Forest Department and the Department of Wildlife Conservation are the main organizations mandated to conserve, *in-situ*, the biodiversity in Sri Lanka. Together, these two departments have declared about 35% of terrestrial land as protected areas (PAs) (DWC, FD, 2016). (This figure is provisional and needs verification.)

However, there are some ecologically sensitive areas outside of the purview of these two departments, and there has been no mechanism to regulate activities in such areas. Since 2006, the Central Environmental Authority has started designating some of those areas as Environmental Protection Areas (EPAs), with some regulatory power over activities in these areas without necessitating a change in land ownership. EPAs address a conservation gap in Sri Lankan context by bringing ecologically important but relatively small areas under the purview of the CEA, without the need for land acquisition. Management plans for declared EPAs are prepared consultatively for their management. There are a number of new areas being assessed to be included in the list of EPAs.

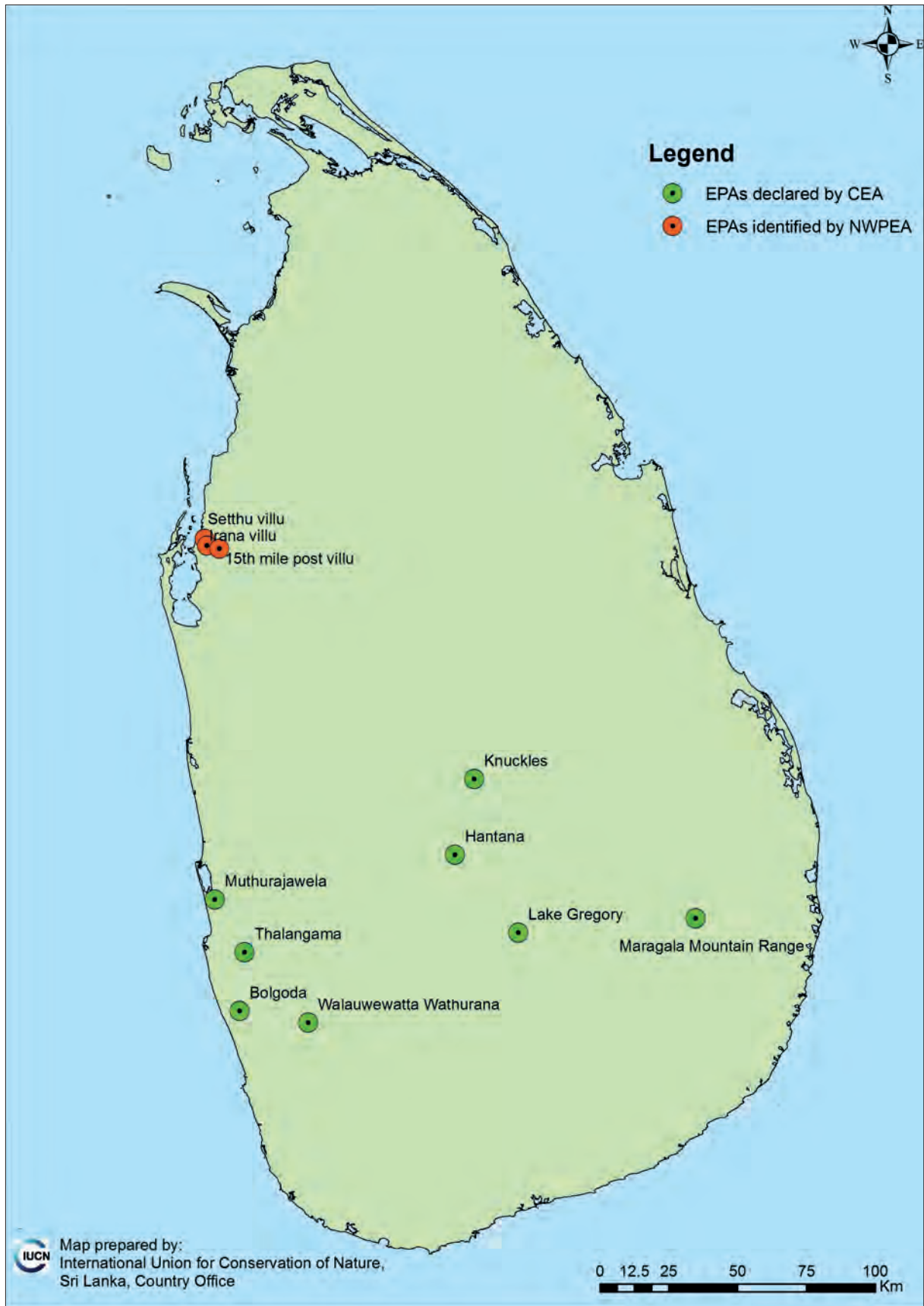
The National Environmental Act No. 47 of 1980 and its amendments have provisions under Sections 24 C and 24 D, which allow the Central Environmental Authority to declare specific areas as Environmental Protection Areas through an order published by gazette. Once the CEA declares an area as an Environmental Protection Area, any planning scheme or project in the protection area under the provision of any law, which is in conflict with any provision of the National Environmental Act, ceases to operate in that area.

To date, eight EPAs have been declared. They are;

1. Muthurajawela Environmental Protection area  
(Gazette Notification No. 1466/26 of 13th October 2006)
2. Thalagama Environmental Protection Area  
(Gazette Notification No. 1487/10 of 5th March 2007).
3. Lake Gregory Environmental Protection Area  
(Gazette Notification No. 1487/10 of 5th March 2007).
4. Knuckles Environmental Protection Area  
(Gazette Notification No. 1507/9 of 23rd July 2007).
5. Maragala Mountain Range Environmental Protection Area  
(Gazette Notification No. 1560/26 of 01st August 2008).
6. Walawwewatta Wathurana Environmental Protection Area  
(Gazette Notification No. 1598/21 of 24th April 2009).
7. Bolgoda Environmental Protection Area  
(Gazette Notification No. 1634/23 of 30th December 2009).
8. Hantana Environmental Protection Area  
(Gazette Notification No. 1641/28 of 17th February 2010).

In addition, three Environmental Protection Areas have been identified by the NWPEA (Figure 20).

(Source: CEA, 2013)



**Figure 20. Environmental Protection Areas (EPAs) under the Jurisdiction of the CEA and NWPEA**  
(Source: © IUCN, 2016 based on CEA, 2015 and Gazette Extraordinary 1685/11 of 21<sup>st</sup> December 2010)

In addition, Sri Lanka has ten globally important, internationally recognised sites classed under three categories: World Heritage Sites, Biosphere Reserves and Ramsar Wetlands. These are described in section 1.5.7.

In 2008, at COP 9 of the CBD, several criteria were adopted for the identification of Ecologically or Biologically Significant Marine Areas (EBSAs) (CBD, 2008). These are a) uniqueness or rarity; b) special importance for life history stages of species; c) importance for threatened, endangered or declining species and/or habitats; d) vulnerability, fragility, sensitivity, or slow recovery; e) biological productivity; f) biological diversity; and g) naturalness. At the Northeast Indian Ocean Regional Workshop to Facilitate the Description of EBSAs, three areas of Sri Lanka were identified and agreed upon in plenary: the southern coastal and offshore waters of Sri Lanka between Galle and Yala National Park; coastal and offshore area of the Gulf of Mannar; and Trincomalee Bay and associated ecosystems (CBD, 2015b).

### **Trends in Ex-situ Conservation**

As highlighted in CBD Article 9, Sri Lanka is focusing primarily on conserving its biological heritage through *in-situ* conservation. However, many *ex-situ* conservation measures have also been adopted to conserve elements of biodiversity.

As with protected areas, the number of *ex-situ* conservation areas has increased. (See Figure 21.) The Department of National Zoological Gardens and Department of National Botanical Gardens are the main agencies responsible for *ex-situ* conservation of animals and plants of Sri Lanka, respectively. The National Zoological Gardens now has three zoological gardens in Dehiwela, Pinnawala and Ridiyagama, while the Department of National Botanical Gardens has five botanical gardens in Peradeniya, Hakgala, Gampaha, Avissawella and Mirijjawila.

The Department of National Museums and the National Herbarium of Peradeniya maintain the national repositories of preserved fauna and flora, respectively.

Apart from above, the Department of Wildlife Conservation, Department of Ayurveda and the Plant Genetic Resources Centre are also contributing to the *ex-situ* conservation of biological diversity.

Although *ex-situ* conservation of plant and animals by the private sector and communities are not mainstreamed in Sri Lanka, there are a few privately-owned arboreta, which are maintained by non-governmental organizations.

Under the guidance of Department of Wildlife Conservation, *ex-situ* conservation of marine turtles' eggs has been undertaken by community-level organizations in southern Sri Lanka.

Although it has not been adequately documented, members of civil society, IPLCs and Community Based Organizations (CBOs) voluntarily conserve indigenous varieties of seeds, yams, vegetables, spices and poultry, all of which can be considered vital components of the agrobiodiversity of Sri Lanka.



National Zoological Gardens, Dehiwala



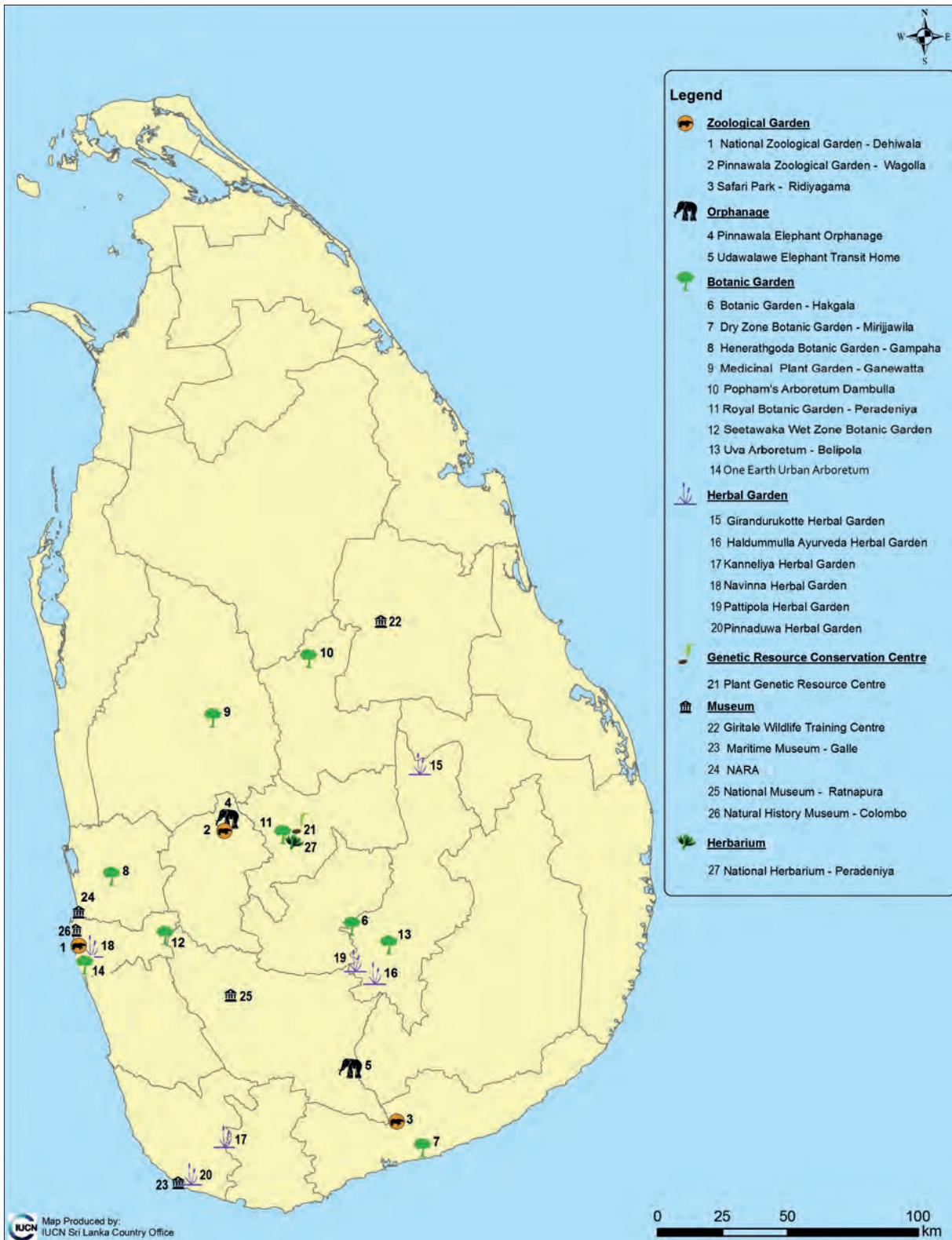


Figure 21. Ex-situ Conservation Centres and National Repositories of Sri Lanka

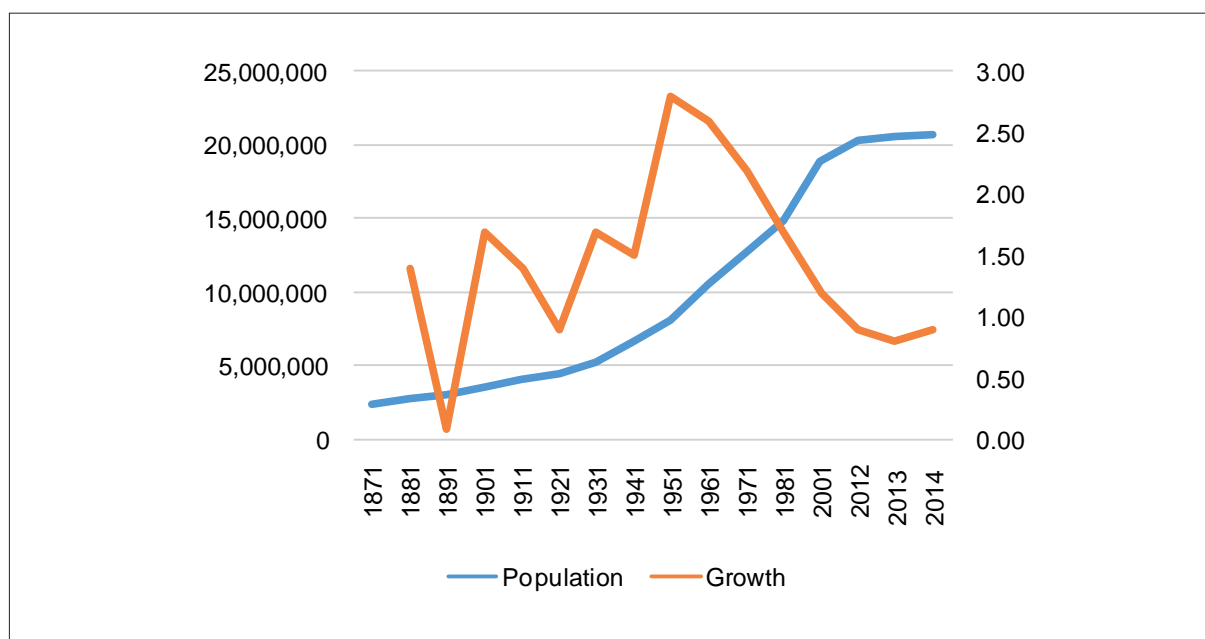
(Source: © IUCN, 2016)

## 1.5.6 Causes and Consequences of Biodiversity Loss

### Causes

#### *Underlying Driver:*

The main indirect driver of ecosystem change, of course, is Sri Lanka's population, which although currently not growing, increased rapidly in the second half of the last century (Figure 22).



**Figure 22. Sri Lanka's Population and Growth in the last 150 years**

(Source: Department of Census and Statistics, 2015)

Sri Lanka is one of the most densely populated nations of Asia, with 323 persons/km<sup>2</sup> (Dept. of Census and Statistics, 2013). This dense population has placed enormous pressures on species and ecosystems.

#### *Habitat-related Drivers*

Plants and animals are less resilient to external pressures when the ecological communities of which they are a part shrink (habitat loss), or components of the ecological communities are removed partly or wholly disrupting their balance (habitat degradation) or when populations become isolated from each other (habitat fragmentation). Habitat loss, degradation and fragmentation affect the well-being and survival of individual populations, as well as entire species and if continued, may affect the functioning of entire ecosystems. Direct causes of habitat loss, degradation and fragmentation include clearing of native vegetation and pollution of land, waterways and marine areas (MEA, 2005).

Sri Lanka has a rich history that dates back to 500 BC. As Sri Lanka's civilization is based on agriculture, there has been extensive re-shaping of natural habitats during this long history, first in the dry zone, during the height of the hydraulic civilization, then in the wet zone during the colonial period. Much of the plantations established in the British colonial era focused on the 3<sup>rd</sup> peneplain, where the climate was appropriate initially for the cultivation of coffee and then for tea. The forests of the 2<sup>nd</sup> peneplain — the mid country — fell to rubber plantations.

After independence in 1948, the focus shifted again to the dry zone, initially, when the Mahaweli Development Programme commenced. After the cessation of civil unrest, the focus is again on development in the North and East.

In the wet zone, human population is more than triple the national average (~ 1,000 persons/km<sup>2</sup>) the current forest cover (lowland, montane and sub-montane) is only approximately 1,976.66 km<sup>2</sup> (4.7%) (BDS, MoENR, 2009; MoE, 2012a). In addition, forests left in the wet zone, excepting the patches of Sinharaja, the Kanneliya-Dediyagala-Nakiyadeniya complex and Peak Wilderness, are small, discrete, isolated patches, comprising as many as 100 different fragments (Gunatilleke and Gunatilleke, 1991 in litt. Kathriarachchi, 2012). Currently, about half the human population of Sri Lanka is crammed into about a quarter of the land area in the wet zone. Therefore, each fragment of wet zone forest, is surrounded by dense human habitation (BDS, MoENR, 2009).

Coastal ecosystems are also threatened by habitat loss.



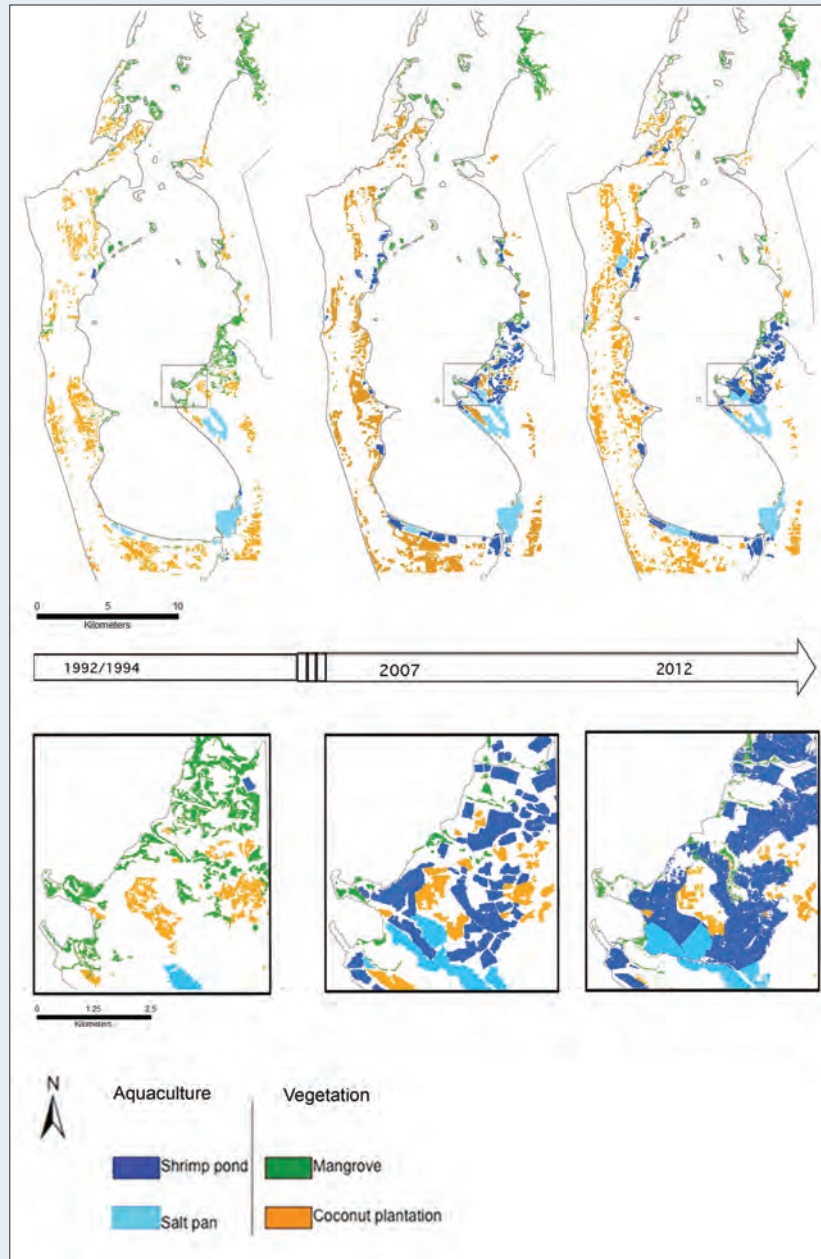
Deforestation in a Lowland Wet Evergreen Forest



Mangrove Destruction in Puttalam Lagoon

### Box 9. Loss of Mangroves and Salt Marshes around Puttalam Lagoon

Mangroves around the Puttalam Lagoon are under severe threat from habitat loss. Senarath and Visvanathan (2001) reported a decrease of 64% in the extent of mangroves in the area between 1981 and 1992. Bournazel et al. (2015) reveal that about 34% has been further lost, largely as a consequence of shrimp farming. During this period, the area occupied by shrimp farms and salt pans expanded by 2,777% and 60% respectively (Bournazel et al., 2015) (Figure 23).



**Figure 23. Mangrove Destruction around Puttalam Lagoon**

(Top series: Mangrove destruction and concurrent increase in shrimp farms and salt pans; bottom series: close up of the Mi Oya Estuary; Source: Bournazel et al., 2015)

Salt marshes also fell prey to shrimp farms in Puttalam. Dayaratne et al (1997) reported that about 50% of the salt marshes around Puttalam lagoon area were lost within a decade (1981-1992).

In the western province, there has been extensive reclamation of wetlands for development (MoFE, 1999). Coral reefs have also been subject to habitat loss, through blast fishing, that destroys reefs or creates gaps (habitat fragmentation). This has been observed from Ambalangoda to Hikkaduwa, Koggala, Midigama, Polhena, Rekawa, Passikudah, Kuchchaveli and Nilaweli (CZMP, 2006).

Habitat degradation is much more insidious.

Pollution, in any form, degrades habitats. Water pollution, from point and non-point sources, is a major problem for many coastal ecosystems such as lagoons, estuaries, rivers, tanks and other inland water bodies (Joseph, 2004). Much of this pollution comes from excessive use of agro-chemicals. In rural areas, overuse of agro-chemicals has contributed to polluting surface water (Imbulana et al. 2006). Nutrient-related pollution has been reported in many reservoirs, such as the Kotmale Reservoir, Beira Lake, Kandy Lake, Lake Gregory, Nuwara wewa and Tissawewa (Imbulana et al. 2006). Beira Lake and Kotmale Reservoir have experienced eutrophication (Sivapalan, 1991). Synthetic fertilizers used in the montane zone for tea and other plantations results in water pollution downstream (Imbulana et al. 2006). Such pollution not only diminishes the quality of services provided by ecosystems, but also threatens the survival of species such as amphibians, freshwater crabs and land snails, many of which are found nowhere else in the world (MoE, 2012a).

Solid waste management also is a problem. Studies show that, daily, 3,700 tonnes of municipal solid waste is generated in Sri Lanka (Menikpura and Basnayake, 2009). Much of this is dumped in open sites, not only causing health hazards but also degrading ecosystems.



Solid Waste Dumping near a Wetland

## Box 10. The National *Pilisaru* Programme

In 2008, the Government of Sri Lanka launched the *Pilisaru* Project with the goal of recycling waste and discarding the rest in an environmentally friendly manner. The project objectives were to i) prepare a national policy on waste management; ii) build the capacity of and create awareness among people involved in solid waste management; iii) provide technical assistance to local authorities to improve waste management; iv) provide necessary facilities to implement solid waste management projects v) monitor the programme; and vi) strengthen the legal framework for solid waste management.

By 2014,

- 120 compost sites had been established;
- 22 bio gas plants in hospitals and other government organizations;
- Equipment for local authorities — such as 151 tractors, 161 tractor trailers, 54 siever machines, skid steer loaders, one excavator and four compactors — were provided to local authorities;
- 30,000 compost bins have been provided at low cost to local authorities;
- Local government authorities and the general public were educated through awareness programmes.

(Source: Fernando, undated; CEA, undated)

Other examples of habitat degradation include

- *Gem mining* which scars stream beds causing changes in the depth of water columns and siltation;
- *Sand mining* in rivers upstream that increases siltation, salt water intrusion and diminishes the sediment replenishment so needed for coastal ecosystems such as mangroves, tidal flats and beaches. For example, the CZMP (2006) reports extensive river sand mining in the Nilwala Ganga, Gin Ganga, Kalu Ganga, Maha Oya and Deduru Oya (CZMP, 2006); the supply of sand from Maha Oya has decreased by 75% of the original, and that of the Kelani Ganga is one third of the original supply (CZMP, 2006);
- *Beach sand mining*: this has been observed in Panadura, Lunawa, Angulana and Paliyawatte (CZMP, 2006);
- Both river sand mining and beach sand mining result in *erosion* on beaches, lagoon, estuarine and river banks;
- *Encroachment of forests* — this is very common around wet zone forests;
- *Chena cultivation* — dry zone forests degraded in this manner grow into scrub forests;
- *Cardamom cultivation* — which destroys the understoreys of mid-elevation evergreen forests;
- *Poor slope management in the hill country* with dire consequences downstream of siltation and landslides;
- *Earthworks* — large areas cut open and left to erode resulting in greatly increased siltation and erosion;
- *Dams and diversions* — which alter the quantity of water reaching downstream: changing water flow from fast to slow, depth from shallow to deep.

In coastal systems, extensive changes occur with hydrological changes, for example, changes to inflow or outflow.

A summary of habitat-related threats to ecosystems listed in Table 1 is presented in Table 8.



Naalin Perera © IUCN, Sri Lanka

Solid Waste Pollution in Castlereigh Reservoir

Use of Agro-chemicals

Poor Slope Management in the Hill Country



Naalin Perera © IUCN, Sri Lanka



Sampath de Alwis Goonatilake © IUCN, Sri Lanka

**Table 8. Summary of Habitat-related Threats to Sri Lanka's Ecosystems**

(Sources: BDS, MoERE, 2014; Perera, 2012; Kathriarachchi, 2012; Wijesundara, 2012; Miththapala, 2008b, 2008c, 2008d, 2013a and 2013b)

Ecosystem	Habitat-related drivers
Lowland wet evergreen forests	Deforestation fragmentation, degradation such as encroachment, gem mining, solid waste pollution, slash and burn cultivation practices, construction of dams for hydropower.
Mid-elevation evergreen forests	Deforestation, fragmentation, degradation encroachment, gem mining, cardamom cultivation.
Montane evergreen forests	Deforestation, fragmentation, degradation, such as forest die-back, encroachment, gem mining, pollution, construction of large dams, high altitude timber plantations, cardamom cultivation.
Moist-mixed evergreen forests	Deforestation, fragmentation, degradation such as earthworks, dams and diversions.
Dry-mixed evergreen forests	Deforestation, fragmentation, degradation such as slash-and-burn cultivation, earthworks, encroachment, forest to pasture conversion, over-grazing of livestock, forest-die back.
Arid-mixed evergreen forests	Deforestation, fragmentation, degradation such as slash-and-burn cultivation, pollution through irresponsible tourism.
Montane upper wet <i>patana</i>	Fragmentation, degradation through forest fires, agriculture, pollution due to irresponsible tourism.
Montane lower wet <i>patana</i>	Degradation through forest fires agriculture, pollution.
Humid zone dry <i>patana</i>	Habitat degradation through intensive forest fires.
Summer zone dry <i>patana</i>	Habitat degradation through forest fires.
Upland savannas	Habitat loss; degradation through intensive forest fires, agriculture.
Lowland savannas	Habitat loss; habitat degradation through intensive forest fires; over-grazing of livestock.
Dry ( <i>damana</i> ) grasslands	Habitat loss; degradation through forest fires; over-grazing of livestock.
Flood plain grasslands	Habitat degradation such as increased sedimentation through upland erosion; over-grazing of livestock; agriculture.
Above-ground caves	Not known.
Below-ground caves	Not known.
Fresh and brackish water <i>villus</i>	Not known.
Mangroves	Habitat loss for shrimp farms, other aquaculture, salt pans, development (including tourism) and agriculture; fragmentation; degradation by over-intrusion of freshwater due to irrigation projects.



Table 8. Contd.

Ecosystem	Habitat-related drivers
Flood plains ( <i>villu</i> )	Hydrological alterations; changes in sedimentation, point and non-point pollution, encroachment.
Lagoons	Reclamation for agriculture, aquaculture and infrastructure; point and non-point pollution, eutrophication, changes in sedimentation, hydrological changes, use of illegal fishing methods that damages the system; erosion of banks; destructive fishing practices.
Estuaries	Same as for lagoons.
Salt marshes	Habitat loss and fragmentation for aquaculture and development; degradation by point and non-point pollution, changes in sedimentation.
Tidal flats	Habitat loss and fragmentation for aquaculture and development; degradation by point and non-point pollution, changes in sedimentation.
Rivers and streams	Habitat degradation through point and non-point pollution; siltation; river sand mining; dams and diversions, especially mini hydropower projects; erosion of banks; channelization of rivers running through urban areas.
Marshes	Reclamation for flood retention, industrial uses and housing etc. Habitat degradation through point and non-point pollution; destructive fishing practices.
Sandy shores	Habitat loss and degradation by encroachment for infrastructure development; beach sand mining; solid waste pollution.
Rocky shores	Encroachment for infrastructure development; solid waste pollution.
Gravelly shores	Not known.
Dead coral beaches	Not known.
Sand dunes	Habitat loss by levelling for infrastructure development; beach sand mining; habitat degradation by solid waste pollution; irresponsible tourism.
Seagrass meadows	Habitat degradation by point and non-point pollution; and destructive fishing methods; irresponsible tourism; habitat loss for construction of erosion defence structures, harbours, ports and marinas.
Seaweeds	Not known.
Mud bottoms	Not known.
Sand bottoms	Not known.
Coral reefs	Habitat loss and fragmentation through blast fishing; point and non-point pollution; changes in sedimentation.
Sandstone reefs	Same as above.
Rocky reefs	Same as above.
Rocky Islets	Habitat degradation by encroachment.
Sandy islets	Encroachment.
Islets with vegetation cover	Not known.
Open Ocean	Marine pollution.

The resulting loss and fragmentation of habitat have been the major drivers of species extinction. Many of Sri Lanka's endemic species are concentrated in the wet zone — the lowlands, midlands and hill country. Nearly 1/3<sup>rd</sup> of Sri Lanka's resident birds are forest dwellers, including all the endemics; of the endemics 60% are restricted to the forests of the wet zone (Weerakoon and Gunawardana, 2012).

Migratory species — such as many of the 276 species of migrant birds and marine turtles — are severely affected by the loss and degradation of coastal and other ecosystems.

### Box 11. Habitat Loss = Loss of Carbon Sequestration

Another major consequence of habitat loss is that with their loss, the ability of these ecosystems to sequester carbon is also lost. Mattson et al. (2012) presented data of 17 Mt CO<sub>2</sub> baseline deforestation emissions in Sri Lanka between the period of 1992 and 1996, although they qualified their calculation with the statement 'it is challenging for Sri Lanka to produce a robust and accurate reference level due to the lack of nationally based inventories'.

Mangroves also sequester carbon. Perera et al. (2012) estimated that mangroves in the estuaries of Kala Oya, Malwathu Oya and the Batticaloa Lagoon have carbon stocks of 204, 165 and 150 t/ha respectively.

It has been estimated that the amount of carbon sequestered in the sediments of many coastal ecosystems is as much as 50 times higher than carbon stored in land sinks (CI in litt. Simon, 2012). In many of these ecosystems, these sediments have been building for many thousand years (World Bank, IUCN, ESA and PWA, 2010). Although some coastal ecosystems emit methane and others may be carbon sources (giving out more carbon that they absorb), coastal wetlands are net sinks for greenhouse gases (World Bank, IUCN, ESA and PWA, 2010).

A dramatic difference between carbon absorption in coastal marine and terrestrial ecosystems is the capacity in coastal ecosystems for long-term carbon sequestration in their sediments.

This immense service of different ecosystems is foregone as a consequence of habitat loss.



Sarath Ekanayake © IUCN, Sri Lanka

*Chena* Cultivation

### Species-related Drivers

Overexploitation, introduction of invasive alien species and human-wildlife conflict are three major drivers that contribute to loss of biodiversity in Sri Lanka. Overexploitation mainly affects marine fin fish and shellfish resources; trees with commercial value such as timber trees; medicinal plants; as well as fish and plants that are used in the aquarium industry.

Harvest data for the Puttalam Lagoon in 2010 showed that the lagoon fishery was already 1.5 times the maximum sustainable yield (IUCN, 2011b). For shrimps, the stocks in the Lagoon and associated coastal seas are reported to be exploited heavily (Sanders and Jayasinghe, 2009 in litt. CENARA 2010).

Sea cucumbers are exported to the Far East for medicinal purposes. This fishery is now considered unsustainable (Long et al., 2010). The medicinal plant *Salacia reticulata* (Sinhala: *Kothala Himbutu*; Tamil: No name known) is threatened by overexploitation because it is known to be effective in the treatment of diabetes (Dhanasiri et al., 2013; MoE, 2012).

Although all orchids are afforded protection under the Fauna and Flora Protection Ordinance (FCO, 2009), species such as fox-tail orchids (*Rhynchosstylis retusa*) — found in the dry, lowland savannas — and jewel orchids (such as *Zeuxine regia*) found in the low and mid-country evergreen forests, are collected illegally for ornamental purposes (Fernando, 2012). Species of aquatic ornamental plants such as *Cryptocoryne*, *Aponogeton* and *Lagenandra* are also under threat from overexploitation (Yakandalwala, 2012).

The chank fishery (dating back to the early 19<sup>th</sup> century) — harvested for ornamental purposes — is also now unsustainable (Long et al., 2010).

A study of the export of native freshwater fish revealed that 53 species were being exported, of which 18 were endemics, and concluded that the commercial harvest of endemic freshwater fish is highly unsustainable (Gunasekara, 2011).

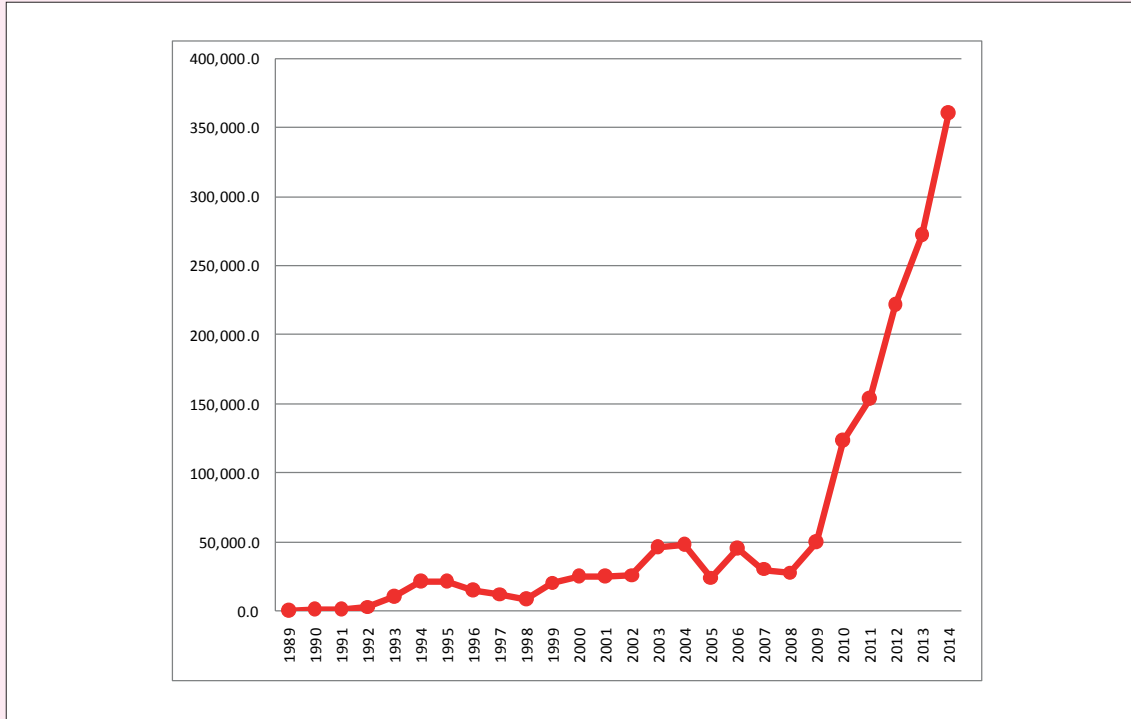
Species such as Ebony (*Diospyros ebenum*; Sinhala: *Kaluwara*; Tamil: *Karunkali*), Calamander (*Diospyros quaesita*; Sinhala: *Kalu-Mediriya*; Tamil: No name known) Nedun wood (*Pericopsis mooniana*; Sinhala: *Nedun*; Tamil: No name known) are threatened by overexploitation for use as valued timber (MoE, 2012a; MALF, 1995).

Invasion by non-native species is considered today to be one of the greatest threats to the world's biodiversity (Burgiel and Muir, 2010). Sri Lanka is an island, with a high proportion of endemic plants and animals due to its long geographic isolation that limits immigration of new species, allowing established species to evolve in the absence of strong competitors and predators. Many of these endemic species are highly specialized to the habitats they have evolved in and their continued existence depends on availability of habitat, as well as quality of the habitat. Therefore, invasive alien species, introduced as a consequence of human activities, have a dramatic effect on such isolated ecosystems, where they can become the leading cause of species extinctions (Burgiel and Muir, 2010).

In addition, islands often have ecological niches that have not been filled because of the distance from colonizing populations, which further increases the probability of successful invasions. Also, because of their isolated nature and limited resource availability, islands have to interact more with the outside world and the present trends in globalization have led to increased trade, tourism and transportation that are responsible for many accidental introductions of potentially invasive species.

## Box 12. Over-visitation

Over-visitation is a form of over-use. After the cessation of the civil unrest, the number of foreign and local tourists visiting national parks has increased (SLTDA, 2014) (Figure 24). For Yala National Park, the increase in just a decade is more than sevenfold (SLTDA, 2014). However, the carrying capacity of the park for visitors has not changed, resulting in over-crowding of the park that is extensively mentioned in the media, during the peak tourist season.



**Figure 24. Increase in Visitors to Yala National Park**

(Source: SLTDA, 2014)

Adding to this over-crowding, is an emerging threat of irresponsible tourism. Yala has seen the death of leopards and jungle cats, which have been run over by vehicles, speeding within the park.

In other areas — such as Pitawala Patana in Knuckles — frequented by local tourists, the Marbled Rock Frog (*Nannophrys marmorata*) is threatened by the loss of their restricted habitat of the crevices of moist rock surfaces. Tourists damage this habitat by trampling these stones or moving them.

Another alarming consequence of irresponsible tourism has been seen in a small spatial shift in blue whale sightings off the southern coast of Sri Lanka, in a short space of two years. In 2008-2009, whales were observed along the nearshore continental shelf, while in 2011, sightings were mainly near the international shipping lane. The study infers that this spatial shift is consequence of unregulated whale watching (Illangakoon, 2012).

The role that tourism plays in the conservation of biodiversity is, therefore, addressed in this NBSAP.

**Table 9. Summary of Species-related Threats to Sri Lanka's Ecosystems**

(Sources: BDS, MoERE, 2014; Perera, 2012; Kathriarachchi, 2012; Wijesundara, 2012; Miththapala, 2008b, 2008c, 2008d, 2013a and 2013b)

Ecosystem	Species-related threat(s)
Lowland wet evergreen forests	<ul style="list-style-type: none"> <li>Continued overexploitation of some resources such as <i>Coscinium fenestratum</i>, <i>Gyrinops walla</i>, <i>Dipterocarpus glandulosus</i>;</li> <li>Hunting of selected animal species;</li> <li>Spread of IAS such as <i>Alstonia macrophylla</i>, <i>Clidemia hirta</i>, and <i>Dillenia suffruticosa</i>.</li> </ul>
Mid-elevation evergreen forests	<ul style="list-style-type: none"> <li>Overexploitation of some resources such as fuelwood;</li> <li>Poaching and hunting for species such as <i>Muntiacus muntjak</i>;</li> <li>Spread of IAS such as <i>Miconia calvescens</i>, and <i>Clusia rosea</i>.</li> </ul>
Montane evergreen forests	<ul style="list-style-type: none"> <li>Over-visitation (for example, Peak Wilderness and Horton Plains National Park);</li> <li>Overexploitation of selected species for firewood, fencing etc.</li> <li>Spread of IAS such as <i>Ageratina riparia</i>, <i>Austro eupatorium inulifolium</i> and <i>Cestrum aurantiacum</i>.</li> </ul>
Moist-mixed evergreen forests	<ul style="list-style-type: none"> <li>Selected removal of valuable species such as <i>Munronia pinnata</i>;</li> <li>Unsustainable harvesting of fruits of <i>Dialium ovoideum</i>;</li> <li>Spread of IAS such as <i>Leucaena leucocephala</i>.</li> </ul>
Dry-mixed evergreen forests	<ul style="list-style-type: none"> <li>Selected logging of <i>Diospyros ebenum</i> and <i>Manilkara hexandra</i>, <i>Chloroxylon swietenia</i> unsustainable harvesting of fruits of <i>Dialium ovoideum</i> and <i>M. hexandra</i>;</li> <li>Hunting of <i>Axis axis</i>, <i>Rusa unicolor</i>;</li> <li>Over-visitation (Yala, Minneriya);</li> <li>Spread of IAS such as <i>Leucaena leucocephala</i>.</li> </ul>
Arid-mixed evergreen forests	<ul style="list-style-type: none"> <li>Overexploitation of species such as <i>Salvadora persica</i>;</li> <li>Spread of IAS such as <i>Prosopis juliflora</i> and <i>Opuntia stricta</i>.</li> </ul>
Montane upper wet <i>patana</i>	<ul style="list-style-type: none"> <li>Selected unsustainable removal of species such as <i>Ipsea speciosa</i>;</li> <li>Spread of IAS such as <i>Austro eupatorium inulifolium</i>, <i>Ulex europaeus</i>.</li> </ul>
Montane lower wet <i>patana</i>	<ul style="list-style-type: none"> <li>Spread of IAS such as <i>Aristea ecklonii</i>, <i>Pennisetum clandestinum</i>.</li> </ul>
Humid zone dry <i>patana</i>	<ul style="list-style-type: none"> <li>Spread of IAS such as <i>Austro eupatorium inulifolium</i>.</li> </ul>
Summer zone dry <i>patana</i>	<ul style="list-style-type: none"> <li>Removal of species such as <i>Brachystelma lankana</i>;</li> <li>Spread of IAS such as <i>Austrolopathorium inulifolium</i>.</li> </ul>
Upland savannas	<ul style="list-style-type: none"> <li>Selected removal of valuable species;</li> <li>Spread of IAS such as <i>Austro eupatorium inulifolium</i>.</li> </ul>

Lowland savannas	<ul style="list-style-type: none"> <li>Selected unsustainable removal of species such as fruits of <i>Terminalia bellirica</i>, <i>T. chebula</i>, and <i>Phyllanthus emblica</i>; leaves of <i>Diospyros melanoxylon</i>;</li> <li>Spread of IAS such as <i>Lantana camara</i> and <i>Panicum maximum</i>.</li> </ul>
Dry ( <i>damana</i> ) grasslands	<ul style="list-style-type: none"> <li>Hunting of <i>Axis axis</i> and <i>Sus scrofa</i>;</li> <li>Spread of IAS such as <i>Panicum maximum</i> and <i>Lantana camara</i>.</li> </ul>
Flood plain grasslands	<ul style="list-style-type: none"> <li>Spread of IAS such as <i>Xanthium indicum</i>;</li> <li>Hunting of <i>Axis axis</i> and <i>Sus scrofa</i>.</li> </ul>
Above-ground caves	<ul style="list-style-type: none"> <li>Small-scale hunting of cave-dwelling bats;</li> <li>Over-visitation in selected sites.</li> </ul>
Below-ground caves	<ul style="list-style-type: none"> <li>Small-scale hunting of cave-dwelling bats;</li> <li>Over-visitation in selected sites.</li> </ul>
Fresh and Brackish water villus	<ul style="list-style-type: none"> <li>Hunting of selected species;</li> <li>Spread of IAS such as <i>Oreochromis mossambicus</i>.</li> </ul>
Mangroves	<ul style="list-style-type: none"> <li>Unsustainable harvesting of mangrove trees for traditional fishing;</li> <li>Spread of IAS such as <i>Annona glabra</i>.</li> </ul>
Lagoons	<ul style="list-style-type: none"> <li>Overexploitation of fisheries resources;</li> <li>Spread of IAS such as <i>Eichhornia crassipes</i> and <i>Salvinia molesta</i>.</li> </ul>
Flood plains ( <i>villu</i> )	<ul style="list-style-type: none"> <li>Spread of IAS such as <i>Xanthium indicum</i>, <i>Eichhornia crassipes</i>, <i>Salvinia molesta</i>, <i>Oreochromis mossambicus</i>, <i>Pterygoplichthys disjunctivus</i>, <i>P. pardalis</i>.</li> </ul>
Estuaries	<ul style="list-style-type: none"> <li>Same as for lagoons.</li> </ul>
Salt marshes	<ul style="list-style-type: none"> <li>Not known.</li> </ul>
Tidal flats	<ul style="list-style-type: none"> <li>Not known.</li> </ul>
Rivers and streams	<ul style="list-style-type: none"> <li>Collection of fish and aquatic plants for the ornamental trade;</li> <li>Destructive fishing such as poisoning and dynamiting;</li> <li>Spread of IAS such as <i>Oreochromis mossambicus</i>, <i>Chitala ornata</i> and <i>Eichhornia crassipes</i>.</li> </ul>
Marshes	<ul style="list-style-type: none"> <li>Collection of fish and aquatic plants for the ornamental trade;</li> <li>Destructive fishing such as poisoning;</li> <li>Spread of IAS <i>Oreochromis mossambicus</i>, <i>Chitala ornata</i>, <i>Eichhornia crassipes</i>, <i>Salvinia molesta</i>, <i>Pterygoplichthys disjunctivus</i> and <i>P. pardalis</i>.</li> </ul>
Sandy shores	<ul style="list-style-type: none"> <li>Overexploitation of sand resources;</li> <li>Spread of IAS such as <i>Opuntia stricta</i>.</li> </ul>
Rocky shores	<ul style="list-style-type: none"> <li>Not known.</li> </ul>
Gravelly shores	<ul style="list-style-type: none"> <li>Not known.</li> </ul>
Dead coral beaches	<ul style="list-style-type: none"> <li>Not known.</li> </ul>
Seagrass meadows	<ul style="list-style-type: none"> <li>Bottom trawling, anchoring that damages populations of species;</li> <li>Unsustainable collection of sea cucumbers.</li> </ul>
Seaweeds	<ul style="list-style-type: none"> <li>Not known.</li> </ul>

Table 9. Contd.

Mud bottoms	<ul style="list-style-type: none"> <li>• Bottom trawling, anchoring that damages populations of species.</li> </ul>
Sand bottoms	<ul style="list-style-type: none"> <li>• Bottom trawling, anchoring that damages populations of species.</li> </ul>
Coral reefs	<ul style="list-style-type: none"> <li>• Overexploitation of all types of edible species;</li> <li>• Overexploitation for the ornamental fish and trinket trade; destructive fishing;</li> <li>• Spread of invasive species such as Crown-of thorns starfish; Spread of <i>Halimeda</i>, encrusting sponges, tunicates.</li> </ul>
Sandstone reefs	<ul style="list-style-type: none"> <li>• Same as above.</li> </ul>
Rocky reefs	<ul style="list-style-type: none"> <li>• Same as above.</li> </ul>
Rocky Islets	<ul style="list-style-type: none"> <li>• Collection of bird eggs.</li> </ul>
Sandy islets	<ul style="list-style-type: none"> <li>• Collection of bird eggs.</li> </ul>
Islets with vegetation cover	<ul style="list-style-type: none"> <li>• Loss of vegetation cover, by overexploitation.</li> </ul>
Open Ocean	<ul style="list-style-type: none"> <li>• Overexploitation of marine resources (for example, over-fishing);</li> <li>• By-catch of dolphins and sea turtles; harpooning of dolphins and hunting of sea turtles, collection of jellyfish;</li> <li>• Lack of implementation of whale-watching regulations that leads to irresponsible tourism.</li> </ul>

### Box 13. Strengthening Capacity for Managing Invasive Alien Species (IAS) in Sri Lanka

Invasive Alien Species (IAS) affect natural (terrestrial, aquatic and marine) and agro-ecosystems of Sri Lanka, impacting biological diversity and food security. Open economic policies that have facilitated international trade, travel and transport, and natural and man-made disasters supporting the free movement of international aid have seen an increase, over the past several decades, of IAS, through either deliberate or accidental introductions (MoE, 2012b).

In recognition of the spread of IAS as a major species-related driver of biodiversity loss, the Ministry of Mahaweli Development and Environment (MoMD&E) has taken important steps to strengthen the national capacity to manage IAS in Sri Lanka. A key initiative is the Global Environmental Facility (GEF) funded project on 'Strengthening Capacity to Control the Introduction and Spread of Invasive Alien Species in Sri Lanka' executed by the Biodiversity Secretariat.

The GEF IAS project is in the final stages of successful implementation towards meeting three outcomes listed below.

1. A comprehensive national regulatory framework for the control of IAS in Sri Lanka is in place;
2. A well-coordinated institutional mechanism is in place for integrated planning and decision making at national and local levels with greater access to information on the status, threats and means of controlling IAS; and

3. Decision-makers at national and local levels are aware of cost-effective IAS controls being implemented at national and local levels, best practices are shared and stakeholders' capacities strengthened.

Some of the notable outputs of the project includes the following:

- A comprehensive National IAS Policy;
- A finalized National IAS Strategy and Action Plan;
- A National IAS Control Act is being formulated;
- A National IAS Communication Strategy has been introduced and dialogue on IAS control enhanced;
- A National Invasive Species Specialist Group (NISSG) has been established and is functional, advising the Government of Sri Lanka on IAS control;
- A National Focal Point (NFP) and an institutional coordinating mechanism for IAS control have been established;
- IAS pre-entry and post-entry Risk Assessment Protocols have been developed;
- National lists of IAS fauna and flora for Sri Lanka are being updated (potential lists and black lists);
- A web-based, interactive and user-friendly National IAS Database is being developed and plans are in place for its regular updating; and
- IAS education and communications materials have been prepared (catalogues, identification guides, fact sheets and posters of IAS of Sri Lanka).

Through this project, IAS management related institutional aspects have also been supported, for example, customs agencies are better able to detect IAS and apply IAS control techniques. Capacity building is a key requirement, for increasing technical knowledge, better enforcement, control and management. In addition to customs agencies, politicians, senior management, secondary school children, the general public and the media have been made more aware of the status, threats and control of IAS in Sri Lanka.

Financial incentives to support IAS control, and disincentives to prevent entry have also been developed and endorsed by the Government for use. Site-specific, cost-effective, best practice toolkits have been developed for four cases, each of priority invasive alien fauna and flora, and have been piloted at selected sites through public-private-NGO partnerships.

(Source MoE, 2012b)





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Over-fishing



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Unsustainable Collection of *Veniwal*



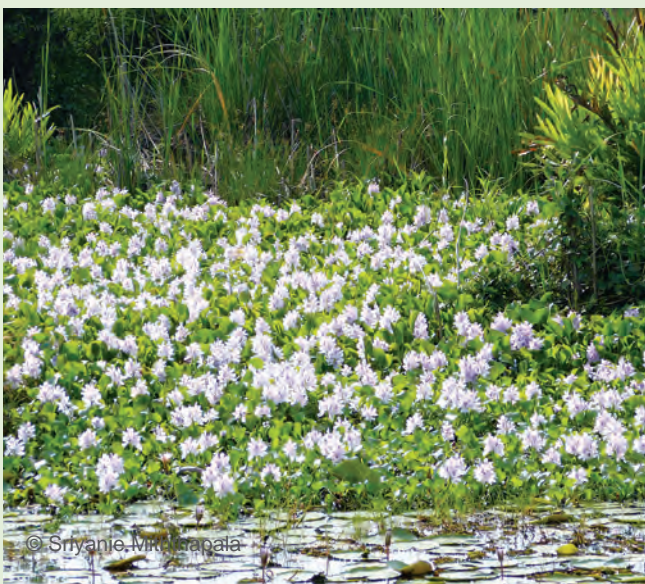
Naalin Perera © IUCN, Sri Lanka

Illegal Logging



Naalin Perera © IUCN, Sri Lanka

A Road Kill: Jungle Cat



© Sriyanie Miththapala

Water Hyacinth, an Invasive Alien Species



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Human-Wildlife Conflict — Purple-faced Leaf Langur

Another species-related driver is human wildlife conflict. Human-wildlife conflict refers to negative interactions between humans and wildlife. Such conflicts occur worldwide in developing regions of the world, as well as in more developed areas and affects both rich and poor alike. As the human population expands and natural habitats shrink, people and animals are increasingly coming into conflict over living space and food. Judging by the current trends of human population growth and land use patterns, it can be predicted that human-wildlife conflicts will continue to increase and will become one of the most significant impediments to conservation of endangered species.

Human-wildlife conflict has many manifestations. These include

- Conflict due to crop losses: the majority of human-wildlife conflicts belongs to this category. Wild animals can attack various crops such as grain [for example, Scaly-breasted Munia (*Lonchura punctulata*), White-rumped Munia (*Lonchura striata*)]; vegetables [for example, Alexandrine Parakeet (*Psittacula eupatria*), Rose-ringed Parakeet (*Psittacula krameri*), Indian Peafowl (*Pavo cristatus*)], tubers [for example, Wild boar (*Sus scrofa*)], fruits [for example, Flying fox (*Pteropus giganteus*), Fulvous fruit bat (*Rousettus leschenaultia*), Short-nosed fruit bat (*Cynopterus sphinx*)] and perennial crops such as coconut [for example, Porcupine (*Hystrix indica*), and Giant squirrel (*Ratufa macroura*)];
- Conflicts due to damage to stored grain [for example, Common rat (*Rattus rattus*), Indian house mouse (*Mus musculus*); and Indian Palm Squirrel (*Funambulus palmarum*)];
- Conflict due to attacks on livestock [for example, Leopard (*Panthera pardus*) or poultry [for example, Fishing cat (*Prionailurus viverrinus*) and Palm civet (*Paradoxurus hermaphoditus*)];
- Conflicts arising due to impacts on infrastructure such as roofs [for example, Grey langur (*Semnopithecus priam*), and Purple-faced leaf monkey (*Semnopithecus vetulus*)];
- Conflicts arising due to damage to home gardens [for example, Mole rat (*Bandicota bengalensis*), and Malabar bandicoot (*Bandicota indica*)];
- Conflicts due to roosting and nesting in urban centres and thereby becoming a public nuisance [for example Rock Pigeon (*Columba livia*) and House Crow (*Corvus splendens*)]; and
- Conflicts arising due to injury or death caused to people by wild animals [for example, Asian Elephant (*Elephas maximus*), Saltwater Crocodile (*Crocodylus porosus*) and Sri Lanka toque monkey (*Macaca sinica*)].

Many of the animals that cause conflict are already threatened species [for example the Asian Elephant, Leopard and Giant flying squirrel (*Petaurista philippensis*); and they are often killed by people in retaliation or to 'prevent' future conflicts. This drives these species further towards the brink of extinction.

Habitat loss and habitat fragmentation are the main drivers that have contributed to the escalation of human-wildlife conflicts. This has resulted in animals coming into close contact with human use areas leading to the development of such conflict.

In addition, some human activities such as open dumping of garbage and public feeding of animals can also attract many of these conflict-causing animals to close proximity to humans. When people feed wild animals directly or indirectly, animals come to perceive humans as a source of food. Over time, this can lead to habituation, where the animals become increasingly comfortable around humans and do not view them as a threat. While some people would see this as a positive outcome, in contrast, this increases the probability of occurrence of negative interactions. When animals have a healthy fear of people, they keep their distance and negative interactions are less frequent, only occurring during rare, chance encounters.

Even though human-wildlife conflicts involves many species of wild animals, a concerted effort has been made to address only the human-elephant conflict. In recent times, the Department of Wildlife Conservation has also taken a keen interest in solving human-monkey conflicts, that are escalating due to rapid urban expansion.

Therefore, the need to develop management plans for at least all the threatened animals that are causing conflict has been recognized and included as an action in this NBSAP.

Within species, the loss of genetic diversity limits their ability to adapt to environmental changes. Habitat loss and fragmentation, overexploitation of species and invasive alien species that reduce population sizes drive the loss of genetic diversity.

Nowhere is this more critical than in the field of agriculture. Within the crops, genetic diversity is rapidly being depleted. Since the 1900s, globally 75% crop genetic diversity has been lost through the adoption of high-yielding, genetically similar varieties; six breeds of livestock are now lost each month (FAO, 1999). This decline in agrobiodiversity — a critical subset of biodiversity, developed and actively managed by farmers — is attributed to the Green Revolution and subsequent increase in what is termed 'industrial agriculture', where agriculture became intensive, driven by use of high-yielding crop varieties, increased irrigation and mechanization, as well as intensive use of fertilizers and pesticides (Burney et al., 2010). In this process, much fewer crop varieties were cultivated as monocultures, while the number of livestock breeds also decreased rapidly, resulting in monocultures that were highly susceptible to disease and environmental changes (FAO, 1999).

Such vulnerability will be exacerbated by climate change.

Also worsening the results of the intensification of agriculture are globalization and marketing, in turn, driving agriculture to the selection of a few varieties and breeds (FAO, 1999).

As a consequence, the world is currently fed by about 150 plant species, of which, 12 species, comprise 75% of the world's food. Of this 12 species, more than 50% of the world's food supply comes from just three species: rice, wheat, and maize (IDRC, 2016). The diet breadth of humans has drastically shrunk.

Sri Lanka has not escaped the impacts of agricultural intensification and market globalization. Before the Green Revolution, Sri Lanka grew long-lived, single-season indigenous varieties of rice with organic fertilizers (Jayawardena, 2003). Currently, about 95% of the extent of rice cultivated lands, are sown with new improved varieties and a loss of about 600 traditional varieties (Jayawardena, 2003).

The conservation of Sri Lanka's agrobiodiversity has, therefore, become a priority and is one of this NBSAPs strategic objectives, with a specific target and actions allocated to address the issue.



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Coastal Erosion

### *Climate Change-related Drivers*

The global climate is changing rapidly. Climate change magnifies existing threats, for example by potentially increasing the distribution and abundance of introduced plants and pest animals already present in an area (Burgiel and Muir, 2010), a concern that has been raised by Iqbal et al. (2014) for Sri Lanka.

It is also likely to bring with it new threats, including long-term changes in rainfall and temperature patterns rising sea levels, ocean acidity and changes to the frequency and severity of extreme events such as fires, floods and droughts. These changes bring a high risk of an accelerating wave of extinctions and disruptions to ecological processes throughout the 21<sup>st</sup> century and beyond.

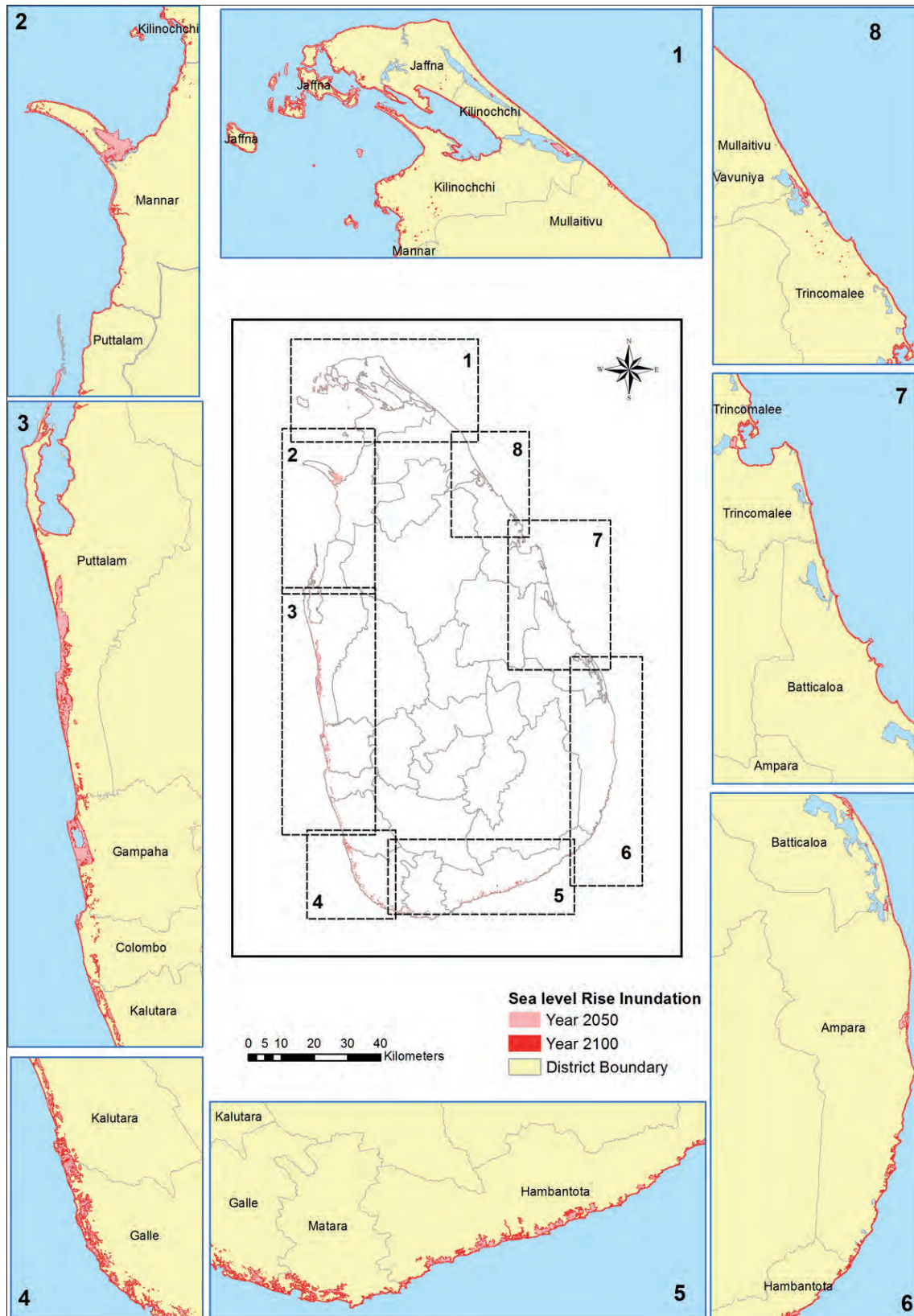
Changes in sea level have been predicted in various parts of the island as shown in Figure 25.



Floods in the Kelani River — May 2014



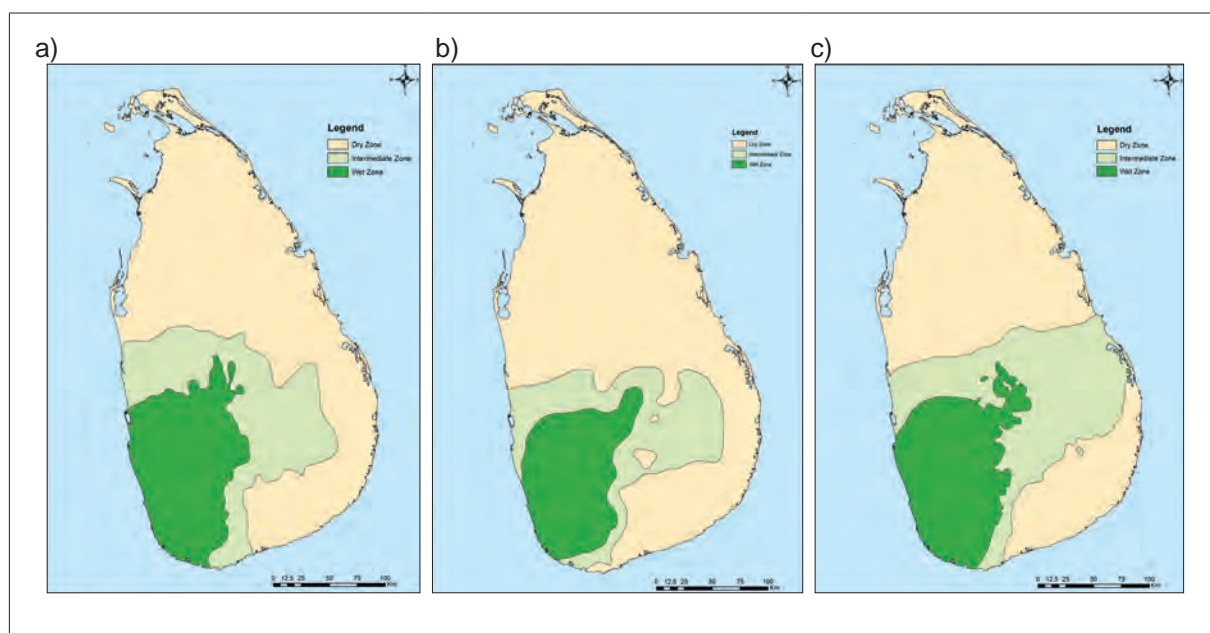
Coral Bleaching in Bar reef — May 2016



**Figure 25. Projected Sea Level Rise in Sri Lanka**

(Source: Hazard profile of Sri Lanka, DMC, 2012. IPCC 2007 temperature predictions for the B2 scenario and elevation data from Improved Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER) were processed in a GIS system using 1984 WGS datum to estimate the sea level rise in 2025, 2050 and 2100 years. Respective coastal inundations were estimated using the Bruun rule using estimate sea level rise.)

Climatic changes in both temperature and rainfall have been observed in Sri Lanka (Basnayake et al., 2002; Chandrapala, 1996). The familiar baseline climate map has now changed, as shown by Muthuwatta and Liyanage (2013), who used baseline rainfall data from 1970-2000 to analyze a climate model projection to 2050, to show significant changes (Figure 26).



**Figure 26. Changes in Climate Boundaries in 2050**

(a) baseline map; b) current map (based on observed data from 1971-2000 from the Met Dept.); c) projected change in 2050 (using the UK Hadley Centre for Climate Prediction and Research Model, HadCm3, applied on the IPCC Scenario A1B)  
(Source Muthuwatta and Liyanage, 2013)

**Table 10. Current and Projected Areas under Three Major Climatic Zones**

(Source Muthuwatta and Liyanage, 2013)

Zone	Current (km <sup>2</sup> )	Baseline (km <sup>2</sup> )	Projected (km <sup>2</sup> )	% change between predicted and current map
Dry	38,627	43,734	35,492	-8.1
Intermediate	14,212	11,866	17,312	21.8
Wet	12,696	10,278	12,793	0.03

Muthuwatta and Liyanage's study reveals that by 2050 (compared to the period between 1970 and 2000), average rainfall will increase by 155 mm (7%). This increase will impact most the south and southeastern areas of the island. While the dry zone decreases in size, the intermediate zone will increase (Muthuwatta and Liyanage, 2013) (Table 10).

Their study focused on agro-ecological zones, and their results reveal that variability in rainfall in 11 out of 48 agro-ecological zones exceeds the baseline (Muthuwatta and Liyanage, 2013).

No work has been carried out yet about the impacts of these projected changes on the biodiversity. Folden et al. 2013 listed five biological traits that will make species vulnerable to climate change: 1) specialized habitat and/or microhabitat requirements; 2) narrow environmental tolerances or thresholds that are likely to be exceeded due to climate change at any stage in the life cycle; 3) dependence on specific environmental triggers or cues that are likely to be disrupted by climate change; 4) dependence on interspecific interactions that are likely to be disrupted by climate change; and 5) poor ability to

disperse to or colonize a new or more suitable range. Their global study analyzed 16,857 species of birds, amphibians and corals, and pinpointed species which were most vulnerable to climate change and the geographic areas in which these species were most vulnerable. Similar studies for Sri Lanka are needed urgently, where many of the amphibian, reptile and bird endemics of the country have very specialized habitat requirements.

A study to predictively model the distribution of the endemic birds of Sri Lanka (Perera, 2014) reveals that the most important predictors were average annual precipitation, and seasonality of precipitation, indicating that the above changes could have profound effects on species with restricted ranges.

In relation to ecosystems, climate change is likely to have profound impacts as listed in the table below.

**Table 11. Impact of Climate Change on Ecosystems**

(Source: extracted from Miththapala, 2008a, 2008b, 2008c, 2008d, 2013a and 2013b)

Effect of climate change	Ecosystem	Impact on ecosystem
Coastal flooding as a consequence of sea level rise	Mangroves, lagoons, estuaries, salt marshes, tidal flats, sandy shores, sand dunes, rocky shores, gravelly shores, rivers, seagrass meadows, agro-ecosystems	Habitat loss by inundation — Loss of mangroves, tidal flats, seagrasses, dunes. In turn, there is the loss of carbon stocks, as some of these ecosystems sequester carbon.
Salinity intrusion as a consequence of sea level rise	Coastal ecosystems (such as mangroves, lagoons estuaries, salt marshes, tidal flats, sandy shores, rocky shores, gravelly shores, rivers, seagrass meadows)	Changes in species composition, inability for some species to complete their life cycles, both of which could affect commercially important species, such as fin and shell fish for food, as well as the functioning of these ecosystems, which could affect other services.
Ocean acidification	Open ocean, coral reefs,	There could be profound changes in marine food webs, affecting food security — such as slowing down of calcification critical for coral growth, coral bleaching; ocean acidity is corrosive to marine shelled organisms. This will worsen the impact of other effects such as temperature.
Changes in ocean wave currents	Open ocean, coral reefs, seagrasses	There could be profound changes in marine food webs, affecting food security; hypoxic zones form; there is nutrient mixing including upwelling of nutrients from deep waters.

Effect of climate change	Ecosystem	Impact on ecosystem
Changes in rainfall patterns	Mangroves, terrestrial forests, grasslands, floodplains, <i>villus</i> , lagoons, estuaries, rivers and streams.	<p>Changes in species composition in mangroves, terrestrial forests, grasslands; land degradation due to erosion; increasing landslides; affects soil formation and soil quality; changes in the soil-water environment.</p> <p>Changes in rainfall will affect inflow (either an increase or decrease) into floodplains, <i>villus</i>, lagoons, estuaries, rivers and streams, changing their natural hydrological patterns.</p>
Changes in temperature on land	<p>Terrestrial ecosystems will be affected, but ecosystems such as montane evergreen forests are likely to be profoundly impacted.</p> <p>Aquatic ecosystems</p> <p>Open ocean</p>	<p>Changes in species composition because of changes in photosynthesis and other biological reactions; decrease in species populations due to disruption of life cycles and change in behavioural patterns; heat waves and related impacts; fires; changes in oxygen balance.</p> <p>Evaporation would increase in aquatic systems such as rivers, reservoirs, lagoons and estuaries. In coastal brackish-water systems, salinity could increase.</p> <p>Changes in wave currents.</p>
Changes in ocean temperature	<p>Coral reefs (El Niño events),</p> <p>Open ocean</p> <p>Seagrasses</p>	<p>Coral bleaching, damaging the whole ecosystem.</p> <p>Changes in ocean oxygen levels, wave currents, nutrient cycling.</p> <p>Ocean stratification resulting phytoplankton booms and reduction in productivity.</p> <p>Higher water temperatures will affect directly growth, reproduction and general metabolism of seagrasses.</p>
Increase in extreme weather events (such tropical cyclones, droughts, flash floods, landslides, forest fires, heat waves)	All ecosystems	Physical damage and increased erosion in coastal ecosystems; salinity increase in coastal ecosystems and paddy fields; habitat loss and decrease in species populations.



As a tropical island, Sri Lanka is extremely vulnerable to the predicted climate change related impacts such as sea level rise, salt water intrusion leading to increased salinization of low-lying areas, rising ocean temperatures and ambient temperatures, ocean acidity, changes in rainfall patterns and increased frequency of storms and other natural hazards such as floods and landslides. These changes will have a significant effect on Sri Lanka's biodiversity, especially the distribution of species, composition of ecological communities and biological processes such as flowering, fruiting, reproduction and migration.

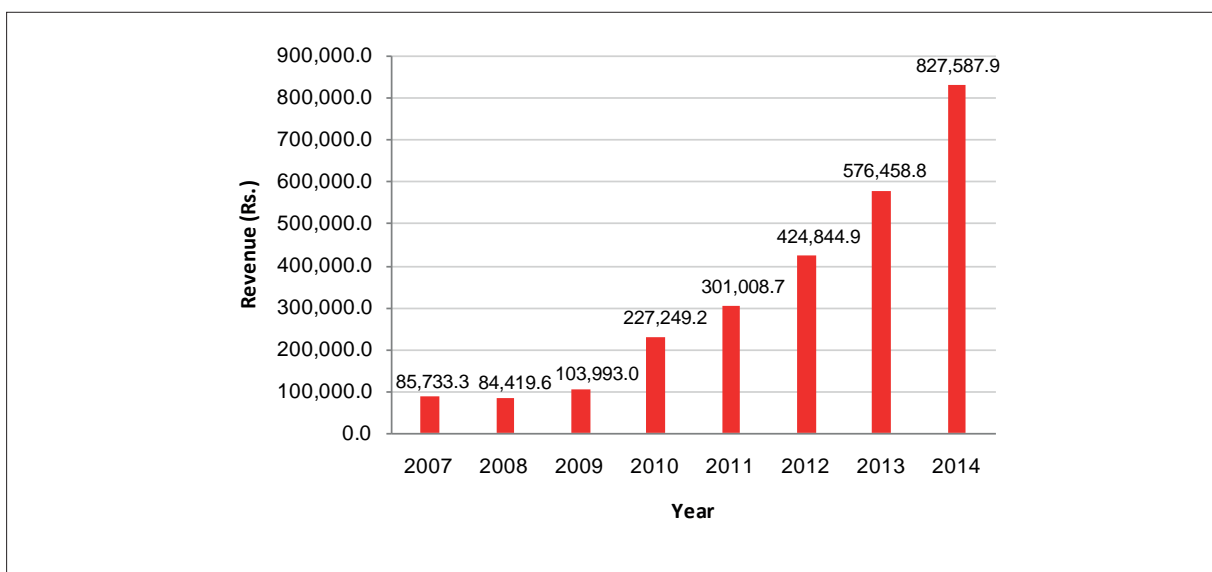
### Consequences

Biodiversity loss has impacts on ecosystem functioning and in turn, damage or reduction to ecosystem functioning impacts ecosystem services. Two decades of research on the impact of biodiversity loss on ecosystem functioning reveal clear evidence that loss of biodiversity negatively impacts a) the efficiency by which communities in ecosystems capture resources and convert them to biomass; b) decreases temporal stability of ecosystem functions; c) because ecosystem processes are non-linear, change accelerates with biodiversity loss (Cardinale et al., 2012). In addition, loss of biodiversity across trophic levels impacts ecosystem functioning more than loss within trophic levels; and key species have disproportionate influence on ecosystem functioning (Cardinale et al., 2012).

Loss of ecosystem functioning, in turn, leads to the reduction and even loss of services provided by ecosystems (MEA, 2005). In addition, loss of ecosystem functioning decreases the resilience of ecosystems to withstand changes in the environment, especially the predicted changes of climate change. The values of ecosystems services of just the forestry sector were discussed in Table 3 and Figure 15 and show the likely economic losses from the loss of ecosystem services.

All of the above, will, ultimately have a significant impact on human well-being, and livelihoods. For example, lagoons and estuaries found along the coastline of Sri Lanka support the livelihoods of some 500,000 people (2% of the population of Sri Lanka) and the income from fisheries from these lagoons and estuaries is estimated to be more than five billion rupees (Samarakoon and Samarawickrama, 2012). Both lagoons and estuaries face many anthropogenic threats, such as siltation, sand mining upstream, hydrological alterations, and overexploitation (see Table 8 and 9), placing the well-being of 500,000 people at risk.

Further, Sri Lanka plans to expand its tourism industry, which is currently the third largest foreign exchange earner (SLTDA, 2014). The graph below shows the increasing revenue from tourists (both local and foreign) visiting four national parks (Yala, Udawalawe, Wilpattu and Kumana) since 2007.



**Figure 27. Increasing Revenue from Visitation to Four National Parks (2007-2014)**

(Source: SLTDA)

The table below presents a breakdown of visitor to different national parks in 2014.

**Table 12. Breakdown of Tourist Visitation and Revenue by National Park**  
(Source: SLTDA, 2014)

National Park	Total visitors	Total revenue
Yala	413,434	374,967,271.47
Wilpattu	54,782	28,525,657.24
Kumana	20,470	5,250,810.00
Udawalawe	134,702	115,409,624.35
Horton Plains	268,253	141,729,103.93
Bundala	18,500	12,154,301.85
Wasgamuwa	18,481	1,812,540.65
Minneriya	146,089	137,146,428.37
Kaudulla	47,163	32,692,110.00
Lunugamwehera	10,212	5,212,182.00
Gal Oya	3,512	301,820.00
Horagolla	4,859	203,135.00
Maduru Oya	873	186,804.80
Angamedilla	1,838	74,430.00
Galway's Land	1,753	167,960.00
Lahugala	216	27,520.00
Pigeon Island Marine	58,877	14,074,888.00
Hikkaduwa Marine	37,398	367,361.50
Bar Reef Marine	11,287	2,908,300.00
<b>Total</b>	<b>1,252,699</b>	<b>873,212,249.16</b>

The graph on the previous page and the table above show how heavily Sri Lankan tourism depends on natural capital. Loss or degradation of such natural capital will, therefore, also affect the attractiveness of Sri Lanka as a tourism destination.

Loss of biodiversity will also have an impact on future benefits that can be accrued from biological resources — such as the development of new drugs and improving crop varieties using emerging innovations of biotechnology.



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Over-visitation of Horton Plains National Park

### 1.5.7 Existing Institutional, Legal and Policy Framework for Biodiversity Conservation

The biological resources of Sri Lanka are protected by the constitution of Sri Lanka and several ordinances, acts, regulations and policies. The Ministry of Mahaweli Development and Environment and the Ministry of Sustainable Development and Wildlife are the ministries directly responsible for biodiversity conservation, while several other ministries indirectly contribute to the sustainable management of biological resources. Apart from the government sector, international and national non-government organizations, community-based organizations and the corporate sector also play key roles in biodiversity conservation.

According to Article 27 (14) of the Sri Lankan Constitution, 'The State shall protect, preserve and improve the environment for the benefit of the community.' Article 28 (f) reinforces this by stating that every person has a duty 'to protect nature and conserve its riches.' These were written into the Constitution in 1978 (Silva in UNEP, 2009).

#### Policies

Several national policies and action plans have been established to protect biodiversity either at ecosystems or species level. For example, the national forest policy and wildlife policy has been developed for habitat or ecosystem level conservation, while an elephant policy targets species level conservation. A policy, strategy and action plan for invasive alien species have been formulated; and a policy for mangroves has been drafted.

Another policy on access and benefit sharing is being finalized.

Some of these policies are listed in the following table.

**Table 13. A Selection of Policies and Plans that have a Bearing on Biodiversity**

(Sources: CZMP, 2006; FD, 2016; MoE, 2006; MoENR, 2010; UNEP, 2009; taken directly from the policies.)

Policy	Aim
The National Conservation Strategy of 1988	Soon after the Global Biodiversity Strategy was published, Sri Lanka prepared a National Conservation Strategy (NCS). It was one of the first countries in Asia to do so. The strategy was a preliminary attempt deal with key issues of environmental degradation and biodiversity loss in the country.
National Environmental Action Plan in 1991	Based on the recommendations of the NCS, a National Environmental Action Plan (NEAP) was adopted for a five-year period (1992–1996). Implementation led to a revised NEAP, in 1994, for the period 1995–98. Over the years, these environmental policy frameworks have helped shape several generations of sectoral and national development strategies (MoEPA, 1991; MoEPA, 1993; MoFE, 1998).
Coastal Zone Management Plan (CZMP) 2006	Initially prepared in 1991, this is updated periodically by the CC&CRMD, the last published iteration being in 2006. Another revision is currently under review.

Policy	Aim
National Forest Policy of 1995	The policy was drawn up to provide clear directions for safeguarding the remaining natural forests of the country in order to conserve biodiversity, soil and water resources. In accordance with the policy, the forests under the jurisdiction of the FD have been reclassified and placed under four management systems ranging from protection, non-extractive use, management of multiple use forests for sustainable production of wood and management of forests with community participation.
Forestry Sector Master Plan of 1995 covering 1995-2020	The Forestry Sector Master Plan 'puts particular emphasis on: conserving the remaining natural forests to maintain biological resources (flora and fauna) as reservoirs of biodiversity; empowering people and rural communities to manage and protect multiple use forests mainly for their own benefit; building partnerships in forestry development activities; developing home garden and other agro-forestry systems as well as forest plantations to meet peoples basic needs and to supply industrial wood; policy and legal reforms; and developing and strengthening forestry institutions, both state and NGOs'.
National Wildlife Policy of 2000	The policy renews the commitment of the government to conserve wildlife resources through promoting conservation, maintaining ecological processes and life sustaining systems, managing genetic diversity and ensuring sustainable utilization and sharing of equitable benefits arising from biodiversity. It emphasizes the need for effective protected area management with the participation of local communities.
National Oil Spill Contingency Plan (NOSCOP) of 2000	Provides a guide and control on how to deal with an oil spill contingency.
National Policy on Solid Waste Management of 2002	The main objectives of the policy are (a) to ensure environmental accountability and social responsibility of all waste generators, waste managers and service providers (b) to actively involve individuals and all institutions in integrated and environmentally sound solid waste management practices (c) to maximize resource recovery with a view to minimize the amount of waste for disposal and (d) to minimize adverse environmental impacts due to waste disposal to ensure health and well-being of the people and on ecosystems.
The National Environmental Policy of 2003	The policy aims to promote the sound management of the environment while balancing social and economic development needs. It aims to manage the environment by linking together the activities, interests and perspectives of different stakeholders with equitable sharing of benefits and costs. The policy supports securing land tenure rights including use rights on state land and long-term tenure for <i>chena</i> farmers. It is open to alternative mechanisms and policy tools to provide incentives while minimizing compliance costs to benefit the environment, the society and the economy. It emphasizes participation, transparency and public accountability in the management of natural resources.

Table 13. Contd.

Policy	Aim
National Watershed Management Policy of 2004	This policy aims to conserve, protect, rehabilitate, sustainably use and manage the watersheds while managing their environmental characteristics with the involvement of communities.
National Wetlands Policy of 2004	This policy seeks to give effect to the National Environment Policy and other relevant national policies, while respecting national commitments towards relevant international conventions, protocols, treaties and agreements to which Sri Lanka is a party.
National Biosafety Policy of 2005	The policy on biosafety set the overall framework in which adequate safety measures will be developed and put into force to minimize possible risks to human health and the environment while extracting maximum benefits from any potential that modern bio technology may offer.
National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants of 2006	The NIP details several activities to control and manage POPs in Sri Lanka. Capacity building and institutional strengthening as well as awareness raising on the detrimental effects of POPs are areas of high priority for the successful implementation of the NIP.
National Policy on Elephant Conservation and Management of 2006	The elephant has been so closely associated with Sri Lanka's history, culture, religions, mythology and even politics that it would be difficult to imagine the island without it. Therefore the present policy was developed to ensure the long-term survival of the elephant in the wild in Sri Lanka through the mitigation of the human-elephant conflict.
National Land Use Policy of 2007	This Policy aims to ensure proper land use, food security, economic development and the maintenance of the productivity of the land at a higher level. It also provides a path for the protection, conservation and sustainable use of the land resource of the country and offers an appropriate and ideal framework that will best meet the needs of the present generation while safeguarding the land resource for the future generation as well.
National Policy on Climate Change 2012	This Policy aims to adapt to and mitigate the impacts of climate change within a framework of sustainable development. One of its objectives is ensuring ecosystem stability.
National Policy on Sand as a Resource for the Construction Industry 2006	This Policy aims to manage sand resources in a sustainable manner, minimizing environmental impacts, while sustaining economic benefits, thereby developing a dual approach to the management of sand resources. This will be achieved through a system of policing backed by a framework of regulations; granting incentives for alternative employment. However, one of the Policy's objectives are to prioritize environmental concerns over commercial concerns.

## Legislation

Several key acts and regulations exist in Sri Lanka that directly and indirectly protect biodiversity. Sri Lanka has conservation laws that date back to colonial times and a number of new laws have emerged to address modern challenges. A selection of these laws is presented in the table below.

**Table 14. A Selection of Acts and Ordinances that Directly or Indirectly Affect Biodiversity**  
(Some taken directly from: UNEP, 2009; BDS, MoENR, 2009).

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Fauna and Flora Protection Ordinance, No. 02 of 1937	Act No. 22 of 2009	DWC; has empowered the SLPD and FD also to implement.	Directly protects habitats and species.
<p><b>Provisions</b></p> <p>This enactment plays the major role in affording protection to indigenous species of animals and plants. It has been amended several times and the latest amendments are by Act No. 22 of 2009. The intention of this enactment is ‘to provide for the protection of and conservation of the fauna and flora of Sri Lanka and their habitats, for the prevention of commercial and other misuse of the fauna and flora and their habitats and for the conservation of biodiversity of Sri Lanka’. The provisions of this ordinance are broad and wide, cover the protection of both habitats and species, as well as the regulation of the import and export of animals.</p> <p>The protection of habitats is effected by making them parts of a protected area or declaring the habitat as a protected area. Three types of protected areas, namely National Reserves, Sanctuaries and Managed Elephant Reserves can be declared under this ordinance. National Reserves can only be declared on state (government) land and the entry in to these areas is restricted according to the category, and there are seven categories under which a National Reserve can be made. These are: Strict Nature Reserves; National Parks; Nature Reserves; Jungle Corridors; Marine National Parks; Refuges; and Buffer Zones. Sanctuaries and Managed Elephant Reserves can have both state and private land within their areas, and there are certain controls and restrictions on activities that are permitted in private lands that fall within these areas. The concept of declaring Managed Elephant Reserves covering both state and private lands is to ensure that both human beings and elephants can live in harmony and not in conflict with each other. They are intended to strike a balance between different needs, rather than acquiring such lands to resettle people and declare National Reserves.</p> <p>The protection of species under this enactment saw a major new development through the latest amendment which brought in a new category of protected species known as Strictly Protected Species for mammals, reptiles and birds. Elephants are provided with a special degree of protection because of their ecological, cultural, social and economic importance and because they are under severe pressure and threat. A special feature in the protection afforded to elephants is the provisions that allow people to keep tame elephants and to keep the tusks of dead elephants in their possession, both being old and traditional practices that are allowed under the law, by regulations and through a process of registration and permits. There are 20 species of mammals, 16 species of reptiles and 63 species of birds that are listed as Strictly Protected Species. These are given a higher degree of protection by increasing the punishments provided for offences against these species. The protection of birds cover all the migrants (including vagrants and stragglers) that come within the area belonging to Sri Lanka and has been afforded in a manner that any new species that is seen within Sri Lanka will automatically be protected by law. It is noteworthy that all other migrant species belonging to different categories in addition to birds — such as reptiles, mammals and even dragonflies — are enjoying protected status in Sri Lanka.</p>			

Table 14. Contd.

<p>However, domestic animals are not protected under this ordinance and have been excluded from being provided protection. This enactment also excludes providing protection to exotic or alien species of animals, although the entry of such species is regulated by making it mandatory to import them only under a permit issued by the DWC.</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Forest Ordinance, No 16 of 1907, now Forest Conservation Ordinance, after its last amendment	Act No.65 of 2009.	The Conservator-General of Forests is responsible for the enforcement of the provisions of the FCO	Directly protects forests and species within these forests.
<p><b>Provisions</b></p> <p>This amendment changed the hitherto used short title of the enactment (Forest Ordinance) to the Forest Conservation Ordinance. The intention of the FCO is to 'consolidate and amend the law relating to the conservation, protection and the sustainable management of the forest resources and the utilization of forest produce'.</p> <p>It can be used both to provide protection to habitats and regulate and maintain the sustainable use of plant species through a system of permits. This enactment provides for the declaration of three types of protected areas, namely, Conservation Forests, Reserved Forests (Forest Reserves) and Village Forests. All these can be declared on state land only. The Conservation Forests have the highest degree of protection under this enactment and entry is restricted for non-extractive practices only. The type known as Village Forests is declared to cover an area that is used for different purposes by a community or several communities and certain kinds of extractive practices are permitted inside such areas. A very important feature of this enactment is that it provides protection to all state lands within Sri Lanka that are not declared as protected areas by this or by another enactment. Hence, this provision allows these areas to enjoy a certain degree of protection by regulating some of the activities that can be carried out in such lands.</p> <p>The other important feature in the Forest Conservation Ordinance is that it allows the extractive use of flora under a regulatory system. This is effected through the issue of permits to collect different parts of plants which are grouped under the broad category known as 'Forest Produce'. This category is divided into two, namely Major Forest Products and Minor Forest Products. The former includes timber, while the latter includes parts of plants, as well as medicinal herbs. This system, which has been in place for more than a century, ensures the sustainable use of forest resources. The permit system is geared to ensure the sustainable use of biological material that falls within the category of Forest Products.</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
The National Heritage Wilderness areas Act, No 03 of 1988	None	The Conservator-General of Forests is the competent authority	Directly protects habitats.
<p><b>Provisions</b></p> <p>The intention is to provide protection to habitats that are important in terms of biodiversity, as well as for other aspects such as aesthetic values, and geological and hydrological importance of such</p>			

areas. It does not have provisions to provide any direct protection to species. This enactment is unique in having provisions to afford protected status to an area for reasons other than the value of biodiversity. Therefore, this enactment enables the declaration of areas with special biodiversity values — such as habitats of rare and endangered species — as well as for the protection of wilderness areas for their importance as watersheds and areas that have special aesthetic value. The protection provided to an area declared under this act permits the entry into such areas and allows only non-extractive uses such as tourism and recreation. This act has been used to declare only one National Heritage Wilderness Area to date, the Sinharaja National Heritage Wilderness Area. However, it has the potential to afford much needed protection to places that have high biodiversity value.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
The National Environmental Act, No.47 of 1980	Act. No. 53 of 2000	The Central Environmental Authority (CEA) is responsible for the enforcement of the provisions of this Act.	Supports biodiversity conservation by controlling pollution and requiring mitigatory measures for development projects through mandatory EIAs.

#### Provisions

The intention of this enactment is to provide for the protection, management and enhancement of the environment and for the prevention, abatement and control of pollution. The main activities under this enactment are the protection of the physical environment by regulating the discharge of substances that may cause pollution to the environment, through a process of licensing. It also has provisions for environmental approval for certain types of new ventures and projects and this approval has to be preceded by an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA) report. The subject matter that is evaluated under these reports includes the biodiversity of the areas that will be affected by the proposed activities and proposed mitigation measures. Thus, both the licensing process and the environmental approval have indirect roles in protecting biodiversity. In addition, there are provisions in this act to designate areas as Environmental Protection Areas where the biodiversity value of a particular area merits conservation. An important feature of this act is that there can be regulations to prohibit, restrict, regulate and approve certain types of activities within such areas and these are effected through regulations.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Coast Conservation Act No. 57 of 1981	Act No 64 of 1988.	The Director of the CC&CRMD	Protects biodiversity in coastal areas.

#### Provisions

The Coastal Zone is defined under this act. This enactment details regulations related to activities permitted within this zone, as well as those prohibited. The Director of the CC&CRMD can request an EIA for development activities in the coastal zone. This act has provisions to prevent pollution as well as to declare special management areas.



Table 14. Contd.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Fisheries and Aquatic Resources Act, No 02 of 1996	Act No 64 of 1988.	DFAR	Supports biodiversity conservation by declaring areas protected for regulation of fisheries, which supports other species and habitats in the area. It also protects some marine species.
<p><b>Provisions</b></p> <p>The objectives of this enactment are to provide for the management, regulation, development and the conservation of the fisheries and aquatic resources of Sri Lanka. This enactment has defined the term 'fish' in a very broad manner and covers not only fish but also every species of aquatic fauna from invertebrates to marine and aquatic mammals. The definition of aquatic resources covers every type of aquatic plants including seaweeds and thus, has a broad range of applications. This enactment has provisions to declare protected areas and to prohibit the import of any species that can have an adverse impact on aquatic organisms.</p> <p>There are two types of special areas that can be declared under this enactment, namely the Fisheries Management Areas and Fisheries Reserves. The former are declared for the sustainable management of a particular area and are established through regulations that ensure the sustainable use of fisheries resources and through a process of public participation in decision-making in relation to the area. The type known as Fisheries Reserves is intended to protect a particular resource or the resources that are found in a particular area by restricting and controlling the activities that are allowed in such an area. This provision can be used to protect the spawning areas of aquatic animals and to ensure the sustainable use of fisheries resources.</p> <p>This enactment provides for the declaration of any species from being overexploited and to protect species by restricting or preventing the catching and landing of such species and also through the regulation of exports. Marine mammals and marine turtles and thresher sharks are protected by prohibition of the catching of these species, while the export trade has been regulated by prohibition of the export of certain species of freshwater and marine species, the mandatory need for permits for the export of yet other species. Another important aspect in this enactment is the powers to prevent the import of any species of aquatic organisms by formulation of regulations. This will help protect biodiversity by preventing the introduction of predators and invasive alien species. The regulations made during the past have prohibited the import of 24 species of fish, which can become either predators or invasive species if released to the water bodies.</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Marine Pollution Prevention Act No. 59 of 1981	Act No. 35 of 2008	The Marine Environment Protection Authority is responsible for the enforcement of this enactment.	Supports biodiversity conservation by preventing one of the drivers of its loss, in the marine sector.
<p><b>Provisions</b></p> <p>This enactment authorises the Marine Environment Protection Authority (MEPA) to implement and</p>			

take necessary steps to prevent marine pollution in the territorial waters of Sri Lanka. This act has provisions for contingencies such as oil spills and to prevent the discharge of ships' waste into Sri Lankan waters.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Antiquities Ordinance No 9 of 1940	Act No 24 of 1998	The Director-General of Archaeology is responsible for the enforcement of this enactment.	Indirectly supports biodiversity conservation through the declaration of archaeological reserves which serve as habitats for species.

#### Provisions

This ordinance and its amendments provides for the Director General of Archaeology to declare certain areas as Archaeological Reserves, where encroachment of any kind is prohibited. It also empowers the Director General of Archaeology to conduct an Archaeological Impact Assessment of areas that may be affected by development, industrial or other projects proposed by anyone and implement any mitigatory measures that may be required.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Plant Protection Act No. 35 of 1999	No amendment	The Director of Agriculture is responsible for the enforcement of this enactment	This has direct bearing on the spread of invasive alien species.

#### Provisions

This act provides for the protection of wild plants, seeds and prevention of plant diseases and controls the introduction of new plant species. The intention is to protect native and agricultural species from disease as well as from attack from introduced herbivorous invertebrates. To a certain extent, this Act can control the entry of invasive alien species.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Soil Conservation Act No. 25 of 195	Act No. 24 of 1996	Director of Agriculture, Ministry of Agricultural Development is responsible for enforcement of this enactment	Soil erosion damages water ways that become sedimented, thus degrading aquatic habitats. This act therefore, indirectly supports biodiversity by preventing habitat degradation.

Table 14. Contd.

<p><b>Provisions</b></p> <p>This act and its amendments provide for the conservation of soil resources, mitigation of soil erosion, and protection against floods and drought. The quality of the soil (physical, chemical and biophysical) is maintained through the provisions of this act.</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Felling of Trees (Control) Act No. 9 of 1951	Act No 1 of 2000	The Conservator-General of Forests is the competent authority	This can be used to protect threatened tree species.
<p><b>Provisions</b></p> <p>This act provides for the prohibition and control of the felling of selected tree species. So far only three species are thus protected: Jak (<i>Artocarpus heterophyllus</i>); breadfruit (<i>Artocarpus altilis</i>) and palmyrah (<i>Borassus flabellifer</i>).</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Mahaweli Authority of Sri Lanka Act No. 23 of 1979	Act No. 59 of 1993	MASL	This has a bearing on biodiversity conservation in the Mahaweli Basin which covers 16% of the land area of Sri Lanka.
<p><b>Provisions</b></p> <p>This act established the Mahaweli Authority of Sri Lanka and provides for the protection of watershed areas and protection of the physical environment of the Mahaweli area. It has provisions for the acquisition of land for irrigation development.</p>			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Urban Development Authority Law 1978	Act No. 41 of 1988	Urban Development Authority	This act has a direct bearing on habitat loss and degradation, and can have either a positive or negative impact.
<p><b>Provisions</b></p> <p>This law and its amendments promote integrated planning and implementation of economic, social and physical development in areas declared as urban development areas, all development activity within the said areas fall within the purview of the Urban Development Authority.</p>			

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Water Hyacinth Ordinance No 9 of 1909	No amendment	Department of Agriculture	This act has a direct bearing on the spread of IAS.
<b>Provisions</b> This controls the introduction and proliferation of water hyacinth and other weeds and invasive plants in the country.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
The National Zoological Gardens Act no.41 of 1982	No amendment	Department of National Zoological Gardens	This act has a direct bearing on biodiversity conservation as it sets up an <i>ex-situ</i> conservation site.
<b>Provisions</b> This Acts governs the management and administration of the National Zoological Gardens.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
The Botanic Gardens Ordinance No. 31 of 1928.	Law No. 32 of 1973	Department of National Botanic Gardens	This act has a direct bearing on biodiversity conservation as it sets up an <i>ex-situ</i> conservation site.
<b>Provisions</b> This deals with <i>ex-situ</i> conservation of plants, and concerns the management and administration of the National Botanic Gardens.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Mines and Minerals Act No. 33 of 1992.	Act No. 66 of 2009	Board of Management of the Geological Surveys and Mines Bureau	This act has a direct bearing on habitat loss and degradation.
<b>Provisions</b> Regulates mining, exploitation, processing, trading and export of minerals.			

Table 14. Contd.

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Irrigation Ordinance No. 32 of 1946 (as amended) – Part VI.	Act No. 13 of 1994	Department of Irrigation	This has a bearing on e-flows.
<b>Provisions</b> Deals with environmental aspects of water, irrigation and land use in irrigated agricultural activities.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Control of Pesticides Act No. 33 of 1980 (as amended).	Act No. 31 of 2011	Registrar of Pesticides	This has a direct bearing on pollution of soil and water.
<b>Provisions</b> Provides for the licensing and regulation of the import, packing, labelling, storage, formulation, transportation, sale and use of pesticides. Thus only permitted pesticides can be used in the country.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Municipal Councils Ordinance No. 29 of 1947 (as amended).	Act No 34 of 2014	Municipal Councils	This has a direct bearing on solid waste and water pollution.
<b>Provisions</b> Provides for the establishment of Municipal Councils and outlines their powers, duties and responsibilities in relation to the built environment and matters such as waste disposal and sanitation.			
Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Water Resources Board Act No. 29 of 1964 (as amended).	Act no. 42 of 1999	Water Resources Board	This has a direct bearing on the prevention of water pollution and attempting to reverse habitat loss.
<b>Provisions</b> Establishes the Water Resources Board and sets out its duties, which include promotion of afforestation, preventing the pollution of rivers, streams and other water courses, and formulation of national policies relating to the control and use of water resources of the country.			

Act	Last amendment	Implementing Agency	Relevance to biodiversity conservation
Sri Lanka Land Reclamation and Development Corporation Act No. 15 of 1968 (as amended).	Act No 49 of 2011	Sri Lanka Land Reclamation and Development Corporation	This has direct bearing on the loss of habitats particularly wetlands. Earlier, the Act was a driver of ecosystem loss but now is not.
<b>Provisions</b> Empowers the Sri Lanka Land Reclamation and Development Corporation (SLLR&DC) to reclaim low-lying lands and wetlands			

## Organizations

The Ministry of Mahaweli Development and Environment is the key government agency which is authorized by parliament of Sri Lanka to manage the environment and biological wealth of Sri Lanka. However, there other key organizations listed in the table below, which have mandates that relate to biodiversity conservation.

A large number of non-governmental organizations are also working in biodiversity conservation. Some of these organizations are directly involved in protection, research, conducting surveys, assessments, preparation of policies, implementation of laws, education and awareness related to biodiversity, while other organizations contribute in cross cutting areas. These are also listed in the table below.

**Table 15. A Selection of Organizations that have a Bearing on Biodiversity**  
(Sources: Extracted directly from each organization's website)

Organizations	Functions	Remarks
<b>Government Agencies</b>		
Ministry of Mahaweli Development and Environment (MoMD&E)	The key government agency that is authorized by the parliament of Sri Lanka to manage the environment and biological wealth of Sri Lanka.  It is the focal point for overseeing all environmental, biodiversity and climate change related initiatives at the government level.	It is the focal point for many multilateral conventions. (See Table 16.)
Biodiversity Secretariat (BDS) of the Ministry of Mahaweli Development and Environment	Is responsible at the national level for coordinating, implementing and monitoring conservation programmes; protecting traditional knowledge and cultural activities; updating the National Red List; preparing and administering policies and action plans related to biodiversity conservation; coordinating work on the Convention on Biological Diversity and other related agreements; coordinating activities related to the Nagoya Protocol on Access to Genetic Resources and implementing national legislation and multilateral agreements.	Key agency for the preparation and implementation of the NBSAP.

Table 15. Contd.

Organizations	Functions	Remarks
Ministry of Sustainable Development and Wildlife	Oversees the DWC. It is planned that a national secretariat for sustainable development will be established.	
Department of Wildlife Conservation	This department is entrusted with managing two million hectares of land which cover approximately 15% of the total land area of Sri Lanka. The areas managed by DWC are categorized under several management units as National Parks (26), Nature Reserves (7), Strict Natural Reserves (3), Jungle corridors (1) and Sanctuaries (61). Within these there are several marine sanctuaries and marine national parks declared and managed by the DWC. The vision of the DWC is to conserve the wildlife heritage of Sri Lanka for present and future generations.	Implements the FFPO. Comes under the MSD&W.
Forest Department	This department is responsible for managing 2.1 million hectares of forests and other ecosystem types, which represent 55% of the forest land area of Sri Lanka. The vision of the Forest Department is to sustainably manage forest and tree resources of Sri Lanka in order to meet the requirements of timber and forest produce, while preserving their ability to provide environmental services for the well-being of people and the national economy.	Implements the Forest Conservation Ordinance. Comes under the MoMD&E.
The Coast Conservation and Coastal Resource Management Department	This department is the prime agency responsible for coastal issues (CCD, 2004). The mandate of the CC&CRMD is the coastal zone defined in the Coast Conservation Act of 1981. The mission of the CC&CRMD is the sustainable development of coastal resources and the management of coastal processes to optimize social, economic and environmental status of Sri Lanka.	Implements the Coast Conservation Act. Comes under the MoMD&E.
Central Environmental Authority	The Central Environmental Authority was established and empowered under the National Environment Act and is responsible for enforcing the National Environment Act, as well as formulating and implementing other environmental policies.  Its mission is to be the flagship of the nation steering towards protecting and managing the quality of the environment by promoting public participation, enforcement, advanced technological interventions and environmental education.	Implements the National Environmental Act. Comes under the MoMD&E.
The Marine Environment Protection Authority (MEPA)	MEPA is the apex body with the sole responsibility of preventing, controlling and managing the pollution of Sri Lanka's marine environment.	Implements the Marine Pollution Prevention Act No.35 of 2008. Comes under the MoMD&E.

Organizations	Functions	Remarks
Ministry of Fisheries and Aquatic Resources Development (MoFARD)	MoFARD is mandated to be responsible for the development and, sustainable use and conservation of fisheries sector in Sri Lanka.	Implements the Fisheries Act.
Ministry of Agriculture	This Ministry directly influences the conservation of agricultural biodiversity and plays an important role in ensuring sustainable use of natural resources and the prevention of pollution in order to avoid significant damage to biodiversity.	Implements the Soil Conservation Act, Plant Quarantine Act; Control of Pesticides (Amendment) Act No. 6 of 1994 and Plant Protection Act No 35 of 1999.
Department of National Zoological Gardens (DNZG)	The DNZG is the main <i>ex-situ</i> conservation organization for fauna	Implements the National Zoological Gardens Act No.14 of 1982. Comes under the Ministry of Sustainable Development and Wildlife.
Department of National Botanic Gardens (DNBG)	The DNBG is the main <i>ex-situ</i> conservation organization for flora	Implements the Botanic Gardens Ordinance No. 31 of 1928. Comes under the Ministry of Sustainable Development and Wildlife.
<b>Non-Governmental Sector</b>		
The Wildlife and Nature Protection Society (WNPS)	The WNPS is the oldest biodiversity conservation agency in Sri Lanka. Initially founded as a game protection society in 1894, WNPS has evolved into a wildlife and nature conservation society that advocates policy and provides environmental education.	
The Ceylon Bird Club	The Ceylon Bird Club was founded in 1943 with seven members, including G. M. Henry and W.W.A. Phillips, two of Sri Lanka's foremost ornithologists. The CBC has been engaging in activities such as collecting, recording and providing information on the birds of Sri Lanka.	
The Field Ornithology Group of Sri Lanka (FOGSL)	Established in 1976, the Field Ornithology Group of Sri Lanka is a non-profit organization affiliated to the Department of Zoology, University of Colombo. Its main aim is the conservation of birds and the environment. It is the national affiliate of Birdlife International, which is the global umbrella organization for the conservation of birds.	
The Young Zoologists Association (YZA)	The YZA is also one of the oldest nature conservation organizations in Sri Lanka, founded in 1972. Its membership is made up mainly of undergraduates, students and young professionals.	



Table 15. Contd.

Organizations	Functions	Remarks
The Environmental Foundation Limited (EFL)	EFL is another leading non-governmental organization founded in 1981, to promote environmental advocacy and providing free legal aid to marginalized communities to protect their environmental rights.	
<b>Private Sector</b>		
Dilmah Conservation,	This is the dedicated CSR wing of MJF Group of Companies and is responsible for promoting sustainable environmental and social development. It is a prime example of the commitment shown by Sri Lanka's private sector to biodiversity conservation.	
Sri Lanka Business and Biodiversity Platform (now called Biodiversity Sri Lanka)	This was established jointly by the Ceylon Chamber of Commerce, IUCN and Dilmah Conservation in order to provide a mechanism to cultivate dialogue between the private sector and conservation agencies. It aims to provide services to businesses interested in investing in natural resource conservation and sustainable development.	
<b>International Organizations which Work with Governments to Conserve Biodiversity</b>		
The United Nations Development Programme (UNDP)	THE UNDP was founded in 1965 under the UN, through the merger between the UN Special Fund and the Expanded Programme of Technical Assistance (Stoke, 2009). Its headquarters are in New York. UNDP provides training, grants and advice to developing countries to achieve sustainable human development (UNDP, 2012). After being engaged in Sri Lanka for many years, the UNDP, amongst many other achievements, has helped support and establish livelihoods in the post-conflict era, aided the government in monitoring aid distribution and strengthened government agencies. Significantly, it has also aided in building capacity to manage biodiversity, in particular, at present, with the project on <i>Strengthening capacity to control the introduction and spread of alien invasive species in Sri Lanka</i> (UNDP, 2012).	
IUCN, International Union for the Conservation of Nature	Founded in 1948, IUCN is the world's largest and oldest global environmental organization with over 1,300 government and NGO members and more than 15,000 volunteer experts in 185 countries. Operations in Sri Lanka commenced in 1988. At present, the Sri Lanka Country Office has 12 members, four of which are Government entities, and eight of which are NGOs. The Sri Lanka Country Programme involves supporting members in biodiversity conservation, environmental policy, institutional support, conservation and management of critical habitats and environmental education and awareness. IUCN is most recognized for the creation and continual revision of the National Red List, which catalogues biodiversity in Sri Lanka and the conservation status of each species. The Red List™ has been a primary tool for conservation biologists around the country and the globe.	
The Food and Agriculture Organization (FAO)	The FAO of the United Nations was founded in 1945. It aims to eradicate hunger, malnutrition and food insecurity; eliminate poverty; and facilitate the sustainable management and use of natural resources including water, land, air, genetic resources and climate. The international organization acts as a vessel for knowledge transfer between parties providing information about food, agriculture and natural resources, and those who need it. The FAO Sri Lanka Country Programme aims to 'achieve a sustainable food and nutrition security while developing livelihoods in the rural agricultural sector' and to preserve and rehabilitate forestry and biodiversity of forests.	

Organizations	Functions	Remarks
IWMI	<p>The International Water Management Institute (IWMI) is a scientific, non-profit research organization focusing on sustainable utilization of land and water resources in developing countries. With offices across Asia and Africa, its headquarters are in Sri Lanka. IWMI develops scalable agriculture water management solutions which directly impact on poverty reduction, ecosystem health and food security with the collaboration of government, civil society and the private sector. IWMI's achievements in Sri Lanka include tsunami relief and research, investigations into irrigation and wetland systems, malaria mapping and research, overall water accounting and groundwater research.</p>	



Naalin Perera © IUCN, Sri Lanka

Kokmote Wildlife Bungalow, Wilpattu National Park, Managed by the Department of Wildlife Conservation

In addition to the above listed in the previous table, the Ministry of Science, Technology and Research; Ministry of Education; Ministry of Higher Education and Highways; Ministry of Power and Renewable Energy; Ministry of Disaster Management; Ministry of Irrigation and Water Resources Management; Ministry of Megapolis and Western Province Development; Ministry of City Planning and Water Management; and the Ministry of Finance also play roles that have a direct or indirect influence on biodiversity.

The Green Movement, Turtle Conservation Project, Wildlife Trust, Sri Lanka Environmental Journalists Forum, Young Biologists Association, Ocean Resources Conservation Association, Wildreach Trust and Eco-v are some of the other non-government organizations which have contributed to biodiversity conservation in Sri Lanka.

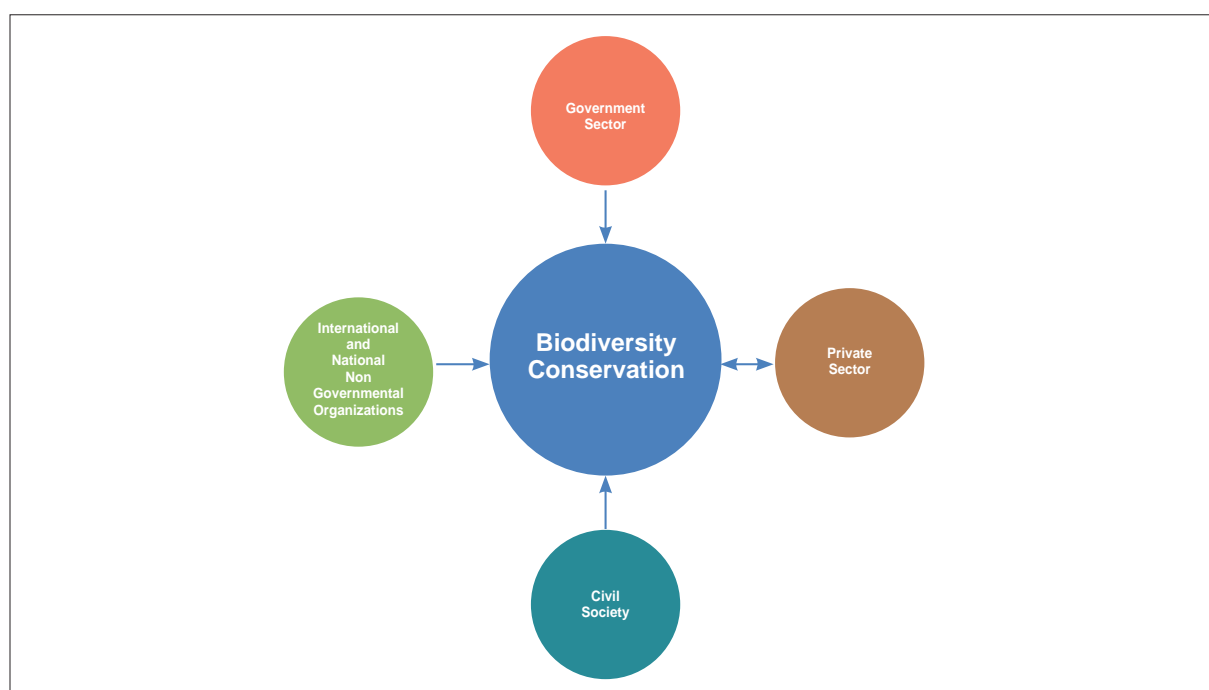
Sevalanka Foundation, the Small Fishers Federation and Sarvodaya are some of the national-level organizations which have contributed to biodiversity conservation, as a cross-cutting theme of their organizations.

In addition, there is also a large number of community-based organizations (CBOs) and indigenous people and local community organizations (IPLCs) that are playing active roles in the biodiversity conservation of Sri Lanka.

In the private sector, HSBC Plc, Nation Trust Bank, Sampath Bank, Kelani Valley Plantations Ltd, Tokyo Cement, Holcim (Lanka) Ltd, and Sri Lanka Telecom are some of the leading companies that annually contribute funds for biodiversity conservation through their CSR programmes.

### ***The Role of Civil Society in Biodiversity Conservation***

Since ancient times, members of the civil society have contributed to biodiversity conservation in many ways. Voluntary work for conservation, creating and providing shelters for faunal species, donation of land and money for biodiversity conservation activities and avoiding harmful activities, which are detrimental to biodiversity, are some of the contributions by civil society towards biodiversity conservation in Sri Lanka. At present, members of civil society play a critical role in monitoring illegal activities that cause damage to biodiversity and continuously reporting them to the relevant authorities (Figure 28).



**Figure 28. Sectoral Contributors to Biodiversity Conservation in Sri Lanka**



Community Participation in the Ecological Restoration of a Tank



Young Volunteers Create a Habitat for a threatened Fish

## ***Biodiversity-related International Treaties and Conventions Signed and Ratified by the Sri Lankan Government***

Sri Lanka is a signatory to a number of international conventions related to biodiversity conservation or which have an impact species or habitats. These are listed chronologically in the table below.

**Table 16. International Conventions Related to Biodiversity Conservation to which Sri Lanka is a Signatory**

(Source: MoENR, 2008)

<b>Convention</b>	<b>When ratified</b>	<b>Implementing Agency</b>	<b>Relevance to biodiversity conservation</b>
Convention of the High Seas (1948)	1958	Ministry of Fisheries and Aquatic Resources Development	May affect biodiversity in the high seas due to freedom of fishing.
<b>Provisions</b> <ul style="list-style-type: none"> <li>• Codified the traditional principle of freedom of the high seas, including the freedom of fishing.</li> </ul>			
<b>Convention</b>	<b>When ratified</b>	<b>Implementing Agency</b>	<b>Relevance to biodiversity conservation</b>
International Plant Protection Convention (1951)	1952	Seed Certification and Plant Protection Centre, Department of Agriculture	Convention provides for the protection of local floral biodiversity from pests and invasive species.
<b>Provisions</b> Aims to protect the world's cultivated and natural plant resources from the spread and introduction of plant pests. <ul style="list-style-type: none"> <li>• Provides an international framework for plant protection.</li> <li>• Provides for the development of International standards for phytosanitary measures, which include procedures, pest monitoring, import regulations, compliance procedures, pest management, post-entry quarantine, exotic pest emergency response and export certification</li> <li>• Provides for information exchange</li> <li>• Encourages support to developing countries to improve effectiveness of their National Plant Protection Organizations.</li> </ul>			
<b>Convention</b>	<b>When ratified</b>	<b>Implementing Agency</b>	<b>Relevance to biodiversity conservation</b>
Plant Protection Agreement for Asia and Pacific Region (1956)	1956	Seed Certification and Plant Protection Centre, Department of Agriculture	Convention provides for the protection of local floral biodiversity from pests and invasive species.
<b>Provisions</b> Aims to prevent the introduction and spread within the Asia and Pacific Region of destructive plant diseases and pests. <ul style="list-style-type: none"> <li>• Asia and Pacific Plant Protection Commission is established to review reports from Parties, make recommendations and consider problems requiring regional cooperation.</li> <li>• Parties undertake to use their best endeavours to apply measures to regulate movement of plants within the region.</li> </ul>			

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Convention on Fishing and Conservation of the Living Resources of the High Seas (1958)	1958	Ministry of Fisheries and Aquatic Resources	Conserves aquatic biodiversity by reducing the threat of such species being over harvested due the development of modern techniques.
<p><b>Provisions</b></p> <p>To solve the problems involved in the conservation of the living resources of the high seas through international co-operation considering that through the development of modern techniques some of these resources are in danger of being overexploited.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Convention on the Continental Shelf (1958)	1964	Ministry of Foreign Affairs	May affect marine biodiversity associated with continental shelves, should the state take any action regarding continental shelves.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Codifies the rules of international law relating to continental shelves.</li> <li>• Established the rights of a sovereign state over the continental shelf surrounding it, present.</li> </ul>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969)	1983	Marine Environmental Protection Agency (MEPA)	Threats to biodiversity from maritime casualties and oil spills may be reduced as states have the right to take necessary action.
<p><b>Provisions</b></p> <p>Affirms the right of a coastal State to take measures on the high seas that may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Convention on Wetlands (Ramsar Convention) (1971)	1990	Department of Wildlife Conservation	Conserves wetland and wetland associated species by encouraging the conservation of wetland habitats.
<p><b>Provisions</b></p> <p>The Ramsar Convention is the oldest inter-governmental environmental convention in modern times. The Convention also has five 'International Organization Partners': IWMI, Birdlife International, WWF International, Wetlands International and IUCN. The Convention's mission is 'the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world'. It makes provisions to delegate certain wetlands as 'Wetlands of International Importance'.</p>			

Table 16. Contd.

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
United Nations Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)	1980	Sri Lanka UNESCO National Commission, Ministry of Education	Promotes the conservation of biodiversity in natural heritage sites by promoting the conservation of such sites.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Aims to promote cooperation among nations in protecting heritage around the world that is important for current and future generations because of their outstanding universal value. This includes natural heritage sites.</li> <li>• To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis and in accordance with modern scientific methods.</li> <li>• Provides for declaration of UNESCO World Heritage Sites.</li> </ul>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
International Convention for the Prevention of Pollution from Ships (MARPOL) (1973)	1997	Marine Environmental Protection Authority (MEPA)	Reduces the threat to biodiversity from pollution from ships, especially from oil and noxious liquid substances.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and from that of routine operations.</li> <li>• Includes six technical annexes: Regulations for the prevention of pollution by oil; Regulations for the control of pollution by Noxious liquid substances in bulk; Prevention of pollution by harmful substances carried by sea in packaged form; Prevention of pollution by sewage from ships; Prevention of Pollution by Garbage from Ships; and Prevention of Air Pollution from Ships.</li> </ul>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)	1979	Department for Wildlife Conservation	Protects species from being over harvested and traded on international markets.
<p><b>Provisions</b></p> <p>CITES is an international agreement between governments that aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Under this convention, more than 35,000 different species are accorded varying degrees of protection.</p>			

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Convention on the Conservation of Migratory Species (also known as CMS or Bonn Convention) (1979)	1990	Department of Wildlife Conservation	Protects migratory species.

#### Provisions

- Provides a global platform for the conservation of migratory animals. CMS is the only international convention focusing on the conservation of migratory species, their habitats and migration routes.
- Agreements associated with this convention are tailored to each party based on the conservation needs throughout the migratory range, and can vary from legally binding treaties to Memoranda of Understanding.

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
United Nations Convention on the Law of the Sea (UNCLOS) (1982)	1995	Ministry of Fisheries and Aquatic Resources Development	Promotes the conservation of marine biodiversity by aiming to preserve the marine environment, controlling pollution and obliging states to maintain international standards.

#### Provisions

- Formulation of a set of criteria that determine the extent of sea area a maritime country can claim under its jurisdiction.
- Aims to protect and preserve the marine environment.
- Obliges states to preserve international standards of practice
- Obligations related to formulating regulations related to controlling land-based, sea bed-based and open sea-based pollution.

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Agreement on the Network of Aquaculture Centers in Asia and the Pacific (1988)	1989	Ministry of Fisheries and Aquatic Resources Development	Biodiversity may be directly or indirectly affected by aquaculture development through factors such as habitat displacement, inadvertent spread of IAS spread and disease transfer.



Table 16. Contd.

<p><b>Provisions</b> Aims to assist the members in their efforts to expand aquaculture development mainly for The purpose of: increasing production, improving rural income and employment, diversifying farm production; and increasing foreign exchange earnings and savings.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)	1992	Central Environment Authority	Indirectly protects biodiversity from unregulated release of hazardous waste into the environment.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Aims to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries, excluding radioactive waste.</li> <li>• Applies conditions to imports and export of above wastes.</li> <li>• Applies stringent requirements for notice, consent and tracking for movement of wastes across national boundaries.</li> </ul>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
United Nations Convention on Biological Diversity (CBD) (1992)	1994	Ministry of Mahaweli Development and Environment	Promotes conservation and sustainable use of biodiversity.
<p><b>Provisions</b> The CBD came into effect in 1993, after the Rio Summit. The Convention has three goals: 'the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources'. The agreement covers all species, ecosystems and genetic resources. The convention is legally binding.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
United Nations Framework Convention on Climate Change (UNFCCC) (1992)	1993	Ministry of Mahaweli Development and Environment	There is a sector action plan on biodiversity and ecosystems as well as the coastal and marine sector in the NCCAS (2015).
<p><b>Provisions</b> The UNFCCC came into effect in 1993, after the Rio Summit. The aim of this convention is to stabilize greenhouse gases to prevent 'dangerous' climate change, allowing <i>inter alia</i>, ecosystems to adapt naturally to climate change.</p>			

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Agreement for the establishment of the Indian Ocean Tuna Commission (1993)	Date of Entry in Force: 1996	Ministry of Fisheries and Aquatic Resources Development	Conserves fish species by promoting conservation of such species and sustainable development of fisheries, reducing the threat of over-harvesting.
<p><b>Provisions</b></p> <p>Aims to promote cooperation among its members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks and encouraging sustainable development of fisheries based on such stocks.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of Seas Relating to the Conservation and Management of Straddling Fish Stocks and Migratory Fish Stocks (1995)	1996	Ministry of Fisheries and Aquatic Resources Development	Promotes conservation of fish species, especially those who are part of 'straddling fish stocks' through encouraging sustainable methods.
<p><b>Provisions</b></p> <p>Aims to ensure long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the United Nations Convention on the Law of the Sea.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Rotterdam Convention (1998)	2006	Ministry of Agriculture	Reduces the threat to biodiversity of imported harmful chemicals that may eventually be released into the environment.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Monitors and controls trade in certain hazardous chemicals.</li> <li>• Instrument to provide importing parties with the power to make informed decisions on which chemicals they want to receive and to exclude those that cannot be safely managed.</li> <li>• Regulates the prior informed consent (PIC) process, involving mutual information exchange.</li> </ul>			

Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Cartagena Protocol on Bio Safety (2000)	2004	Ministry of Mahaweli Development and Environment	Safeguards biodiversity from living modified organisms resulting from modern biotechnology.
<p><b>Provisions</b></p> <p>Aims to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specially focusing on transboundary movements.</p>			
Convention	When ratified	Implementing Agency	Relevance to biodiversity conservation
Stockholm Convention on Persistent Organic Pollutants (2001)	2005	Ministry of Mahaweli Development and Environment	Protects biodiversity in the environment from the harmful effects of POPs and PCBs.
<p><b>Provisions</b></p> <ul style="list-style-type: none"> <li>• Aims to protect human health and the environment from persistent organic pollutants (POPs).</li> <li>• Established a list of 12 key POPs for which signatories are required to reduce risks to the environment and human health due to their release.</li> <li>• Parties are required to legal and/or administrative measures to heavily restrict or eliminate the production and use of POP pesticides and PCBs.</li> <li>• Parties are required to minimise unintentional production of the POPs.</li> </ul>			



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Spinner Dolphins (*Stenella longirostris*) Listed in both CITES and CMS

### Box 14. The UN REDD Programme

*The UN REDD Programme* was launched in 2008 to facilitate the combined force of UNDP, FAO and UNEP in supporting developing countries to conserve their globally important forests, in order to mitigate climate change. It currently has 67 partner countries. Sri Lanka became a partner of UN REDD in 2009, and the UN REDD National Programme was launched in 2013. The Forest Department is the focal point for implementing the UN REDD programme in Sri Lanka. Within this convention, industrialized countries provide incentives for developing countries to improve their land use management and forest cover. Sri Lanka is one of the 23 countries with a UN REDD National Programme. The National Programme objectives are as follows:

- National consensus reached on National REDD+ Programme;
- Management arrangements contributing to the National REDD+ process;
- Improved stakeholder awareness and effective engagement; and
- Forest monitoring system for REDD+ activities provided.

(Source: The REDD Desk, 2016)



Naalin Perera © IUCN, Sri Lanka

Moist-mixed Evergreen Forest, Maragala EPA

## Box 15. Globally Important Biological Sites

In the interest of protecting vital ecosystem services, protected areas have been demarcated around the world for biodiversity conservation. Many species migrate across national borders. Thus, the destruction of biodiversity in one country can have consequences for biodiversity in another. Therefore, some protected areas have been given international recognition because of their global importance. Sri Lanka has 10 globally important, internationally recognised biological sites. These are classed into three categories: World Heritage Sites, Biosphere Reserves and Ramsar Sites.

### **World Heritage Sites**

Founded by the UN Convention Concerning the Protection of the World Cultural and Natural Heritage of 1972, the International World Heritage Programme administered by the UNESCO lists World Heritage Sites as being places of special cultural or physical significance (UNESCO, 2016a&b). Sri Lanka has two sites of natural heritage.

*Sinharaja Forest Reserve:* Sri Lanka's largest patch of lowland tropical rainforest (approximately 11,187ha) is located in the island's southwest lowland wet zone, extending across the Sabaragamuwa and Southern Provinces. It was a World Biosphere reserve, declared in 1978, before it was declared a World Heritage Site by UNESCO in 1988. Approximately 60% of tree species are endemic and 50% bird, butterfly and mammal species endemic to Sri Lanka are found within the Sinharaja forest (UNESCO, 2015). The forest is famous for its bird diversity and unique bird interactions, known as mixed species feeding flocks.

*Central Highlands Serial Property:* This site comprises three distinct conservation areas, namely, the Peak Wilderness Sanctuary (now a Nature Reserve), Horton Plains National Park and Knuckles Conservation Forest. The Peak Wilderness Nature Reserve is known for Adam's Peak, a site of religious pilgrimage; Horton Plains National Park, for its unique landscape; and Knuckles, for its five peaks and extremely biodiverse montane rainforests (IUCN, 1990; Werner, 1985; Forest Department, 2012). The Central Highlands Serial Property was declared a World Heritage Site by UNESCO in 2010 due to the importance of its unique montane and cloud forests which contain a high level of endemism (UNESCO, 2015).

### **Biosphere Reserves**

Biosphere Reserves are 'areas of terrestrial and coastal ecosystems which are internationally recognised within the framework of UNESCO's programme on Man and Biosphere' (Watson, 1998). Sri Lanka has four International Biosphere Reserves, three of which are described below. (The fourth is Sinharaja, which has already been described as a World Heritage Site.)

*Hurulu Forest Reserve:* Declared a forest reserve in 1942 and a Biosphere Reserve in 1977, the Hurulu Forest Reserve is located in the North Central Province of Sri Lanka. The dry evergreen forest of this dry zone landscape is an ideal habitat for elephants, as there are large areas of grassland and minimal human intervention.

*Bundala National Park:* This park was declared a Ramsar Site in 1990, and was given the status of National Park in 1993. In 2005, Bundala was designated as a biosphere reserve by UNESCO. It is located in the Hambantota District and extends across 6,216 ha. Bundala is also categorized as an internationally important wetland due to the presence of its five shallow lagoons.

*Kanneliya-Dediyagala-Nakiyadeniya (KDN) Biosphere Reserve:* This was declared an International Biosphere Reserve by UNESCO in 2004. The KDN forest complex is located in the Southern Province, in the Galle District, near Sinharaja Forest. It has an area of approximately 10,867 ha, and is the second largest block of lowland rainforest in Sri Lanka (after Sinharaja), despite having previously endured heavy logging (FD, 2015). It is a major catchment area for the Gin and Nilwala Rivers, both of which are vital for industrial and agricultural activity in the Galle and Matara Districts (UNESCO, 2006).

### **Ramsar Sites**

The Ramsar Convention, the oldest intergovernmental environmental convention, aims to conserve important wetlands (Ramsar Convention Secretariat, 2014). There are six Ramsar Sites in Sri Lanka, all of which are described below with the exception of Bundala (already described in the previous page).

*Kumana Wetland Cluster:* This site falls within both Kumana National Park and the Panama-Kudumbigala Sanctuary, located in the Amapara District. It was designated a Ramsar Site in 2010 and covers an area of 19,011 ha. Kumana comprises coastal wetland habitats, lagoons, mangroves, salt marshes, estuaries and reservoirs. It supports many threatened wetland species, including turtles and wetland birds (Ramsar, 2010a).

*Wilpattu Ramsar Wetland Cluster:* Located in the North Central and Northwestern Provinces, this site covers all 165,800 ha of the Wilpattu National Park. It was declared a Ramsar Site in 2013. It is unique in that it holds several *villus*, which are sand-rimmed basins filled with rainwater of varying salt contents. These provide unique ecosystems suited to a diverse range of migrant and resident species. Altogether there are approximately 205 water bodies within the site (Ramsar, 2013).

*Maduganga:* This site is a mangrove lagoon containing 15 islands. It was declared a Ramsar site in 2003 and covers 915 ha, and is located in the Southern Province, in the District of Galle. Mangroves that are relatively undisturbed can be found on the islands, thus supporting a unique and biodiverse community (Ramsar, 2003).

*Annaiwilundawa Tank Sanctuary:* Located in the Northwestern Province, in the District of Puttalam, Annaiwilundawa is a cascade tank system established by ancient civilizations back in the 12<sup>th</sup> century. It was declared a Ramsar Site in 2001. In addition to being important for irrigation, the sanctuary is a highly productive wetland, which supports 50% of Sri Lanka's freshwater fish, as well 40% of the country's vertebrate species (Ramsar, 2001).

*Vankalai Sanctuary:* Vankalai is located in the Mannar District, in the Northern Province. The sanctuary was designated as a Ramsar Site in 2010. It supports a large variety of wetland bird species, including migrants who use the area as they exit Sri Lanka, including the Greater Flamingo (*Phoenicopterus roseus*). The 4,839 ha site contains arid scrubland, maritime grasslands, mangroves, salt marshes, tidal-flats, lagoons, seagrass beds and other ecosystems. It is also home to Dugongs (*Dugong dugon*) (Ramsar, 2010b).



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Sinharaja World Heritage Site



Isuru Alawatte © Forest Department

Hurulu Biosphere Reserve



© Sriyani Withnabala

Wilpattu Ramsar Site



Naalin Perera © IUCN, Sri Lanka

Bundala Ramsar Site



Naalin Perera © IUCN, Sri Lanka

Kumana Ramsar Site



© Nirosan Miranda

Vankalai Ramsar Site

## **1.5.8 Barriers and Challenges for Effective Conservation and Sustainable use of Biodiversity**

### ***Policy and legal***

Sri Lanka has a number of policies and legislative enactments that protect the environment and natural resources. However, these do not allow for integrated planning at the landscape level to mitigate adverse impacts of large-scale land use changes. This may have arisen because of many reasons. Firstly, development programmes in the country are being implemented by a multitude of agencies linked to different ministries with less than optimal coordination. Also sometimes, large-scale investment projects appear to take precedence over existing conservation policies and safeguards expected through legislations outlined in Table 14. Secondly, inter-agency communication and information sharing needs improvement. Thirdly, the environment for sector agencies and their stakeholders (communities) — enabling them to work together and engage in joint planning more easily — must be strengthened. Fourthly, the lack of mainstreaming of key concepts such as the relationships among biodiversity and development, ecosystem services and human well-being into medium and long-term planning including the targeting resources in annual budgets is a serious issue. Finally, there is a lack of capacity in the planning and financial sectors to articulate and account for global environmental benefits or threats in a quantifiable/measurable manner.

Further there is a need to amend some provisions of certain laws. Important laws such as a law on biosafety and invasive alien species is currently being formulated. However, the main drawback in Sri Lanka's legal environment is poor implementation, discussed in the section below.

### ***Institutional***

There are key organizational barriers that prevent effective biodiversity conservation. For example, the environment to acquire knowledge about and apply new tools, approaches to and models of conservation is not sufficiently conducive. The capacity to effectively carry out the mandated duties needs much institutional strengthening. Clear roles and responsibilities among different government agencies for the management of biodiversity are urgently needed. There are overlapping mandates and often, mutually exclusive objectives that increase conflicts between development goals versus biodiversity concerns. Effective inter-sectoral coordination mechanisms are inadequate. The capacity to integrate biodiversity conservation principles into development plans and production sector practices to reduce pressures on biodiversity needs considerable strengthening in the capacity of related institutions, including those in private sector. An effective decision-making support system (such as access to strong, evidenced-based research data) is also urgently needed along with an effective data sharing among institutions. It is envisaged that the hierarchical process for coordination presented in Chapter 5 section 1 will address weaknesses in relation to organizational issues.

### ***Implementation***

Both of the above barriers impact heavily on implementation related challenges are probably the greatest barrier for effective biodiversity conservation. Key barriers encountered at the implementation level include: the inadequacy of a platform or a system for multiple agencies operating in the infrastructure, economic and social development sectors and the conservation sectors at various levels (national or regional administrative levels or river basin or other ecosystem levels) to learn and work together; few opportunities for joint project implementation with common monitoring, to conserve and manage the environment, while facilitating development; inadequacy of mechanisms to engage, as key partners, NGOs, the private sector and local communities whose livelihoods and at times, lives are at stake; and inadequacy of capacity (man power, as well as knowledge) to effectively manage the assigned portfolios by the relevant line agencies.



## ***Financial***

Since the preparation of the original BCAP and through subsequent iterations, many important recommendations have been made for the conservation and sustainable use of the biodiversity of Sri Lanka. However, it is clear from the National Reports to CBD (BDS, MoENR, 2009; BDS, MoERE, 2014) that many of those recommendations have not been met repeatedly. Amongst various other barriers (see above), inadequate financing allocated for biodiversity sector has been identified as one of the key barriers. Insufficient financial allocation for the biodiversity sector can be attributed to the inability of converting such biodiversity plans — NBSAPs — into the Government's budget proposals. This may be due to the lack of recognition, in economic terms, of returns to investment in the biodiversity sector. Thus, biodiversity plans are not converted to investment proposals.

There is also a lack of coordination amongst biodiversity planners and the Treasury. During the current NBSAP period, most of these barriers will be addressed through ecosystem service valuation, green accounting and resource mobilization for NBSAP — supported by Biofin initiative and enhanced coordination amongst conservation and planning agencies.

Another serious barrier to effective implementation is that biodiversity conservation is often low down on the list of priorities, not only for decision-makers, but also for much of the general public as well. Clearly linking ecosystem well-being and human well-being, valuing ecosystem services, in economic terms (that most people understand) and conveying all this through effective communication are addressed in this NBSAP.



This magnificent Sambur buck (*Rusa unicolor*) was photographed in Horton Plains National Park. This unique park is part of the Central Highlands Serial Property. This isolated Sambur is an integral part of montane wet *patana* ecosystems. Also within the Central Highlands Serial Property, are montane evergreen forests, which absorb the atmospheric water and sequester carbon; peat bogs, which attenuate floods; a network of streams, which distribute water to most parts of the island; several hundreds of plants, animals and microbes; and people, who depend on the ecosystem services provided by the Central Highlands Serial Property. All of above are integrated into parts of the NBSAP.

# Chapter 2

## Setting National Targets



## 2.1 Existing National Biodiversity Targets

Sri Lanka as a signatory to the CBD has developed action plans starting from 1998 to achieve various global biodiversity targets, such as 2010 biodiversity targets as defined by the CBD and Millennium Development Goals. Sri Lanka has achieved many of these targets partially or fully as reviewed in successive national reports to the CBD. Some of the key biodiversity-related national targets and strategies for Sri Lanka include

- Increasing Sri Lanka's forest cover from the present extent of 29.7% to 32% of the land area to ensure climate resilience and protection from natural hazards (FAO, 2016);
- Contributing towards achieving the global target of keeping the global temperature rise below 2°C during this century by controlling greenhouse gas emissions (Sri Lanka NEXT, 2016);
- Establishing the necessary policy, legal and institutional framework for biodiversity conservation, sustainable use, and benefit sharing including information sharing and networking (Strategy in Mission 2, Haritha Lanka Programme, National Council for Sustainable Development, 2009);
- Establishing an optimum protected area network to ensure representation of critical aspects of Sri Lanka's biodiversity, connectivity of habitats and recovery of priority threatened species and ecosystems (*Ibid.*);
- Conserving and sustainably using biodiversity outside protected areas (*Ibid.*);
- Establishing financing mechanisms for biodiversity conservation, by valuation of biodiversity (*Ibid.*);
- Sustainably using agrobiodiversity (*Ibid.*);
- Limiting access to genetic resources (*Ibid.*);
- Preserving and promoting traditional knowledge and practices relevant to biodiversity conservation (*Ibid.*);
- Promoting research and development on conservation and sustainable use of bio-diversity (*Ibid.*);
- Enabling sustainable use through benefit sharing mechanisms (*Ibid.*);
- Mainstreaming biodiversity conservation into education and related sectors (*Ibid.*);
- Promoting carbon sequestration (Strategy in Mission 3, Haritha Lanka Programme, National Council for Sustainable Development 2009);
- Developing fisheries (marine and inland) in an ecologically sustainable manner. (Strategy in Mission 4, Haritha Lanka Programme, National Council for Sustainable Development 2009);
- Restoring the coastal zone, by conserving its natural resources and thereby minimizing vulnerability to natural hazards (*Ibid.*);
- Using soft engineering solutions such as habitat restoration to stabilize eroding coastal stretches (*Ibid.*);
- Promoting environmentally-friendly fishing practices (*Ibid.*);
- Preventing coastal and marine pollution (*Ibid.*);
- Reducing land degradation in agricultural areas sequestration (Strategy in Mission 5, Haritha Lanka Programme, National Council for Sustainable Development 2009); and
- Assessing the forest cover of Sri Lanka, including different categories of forests (*Ibid.*).

Currently being proposed are a 'Punarudaya' three-year national environmental action plan and 'Towards a Blue-green Era' National Sustainable Development Programme. It is envisaged that these goals will also be reflected in the NBSAP.

## **2.2 National Targets for 2022**

During the development of this NBSAP, active steps were taken to ensure that the national targets are aligned with the Aichi Biodiversity Targets and the relevant Sustainable Development Goals. Once again, it should be noted that none of these targets have specific quantitative milestones, because it was deemed difficult to define specific quantitative targets, given the current ground realities and proposed period of implementation of seven years.

Some of the above national targets listed in section 2.1 above are included in the 2022 targets with modification. The National Targets for 2022 are shown below.

### **The 12 National Targets are:**

1. By 2022, a system established and ongoing for inventorising species (taxonomy and conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision-making.
2. By 2022, habitat loss, degradation and fragmentation are significantly reduced.
3. By 2022, the PA network is made representative of all critical ecosystems and species and managed effectively.
4. By 2022, the loss of species is significantly reduced.
5. By 2022, the valuation of biodiversity is mainstreamed.
6. By 2022, mechanisms are established to ensure sustainable use of biodiversity.
7. By 2022, traditional sustainable uses of biodiversity is promoted and established
8. By 2022, sustainable agriculture practices are promoted and established.
9. By 2022, genetic diversity of crop wild relatives, cultivated species and livestock are conserved.
10. By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established and implemented.
11. By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced.
12. By 2022, biosafety is ensured.

### Box 16. Justification for the Formulation of National Targets

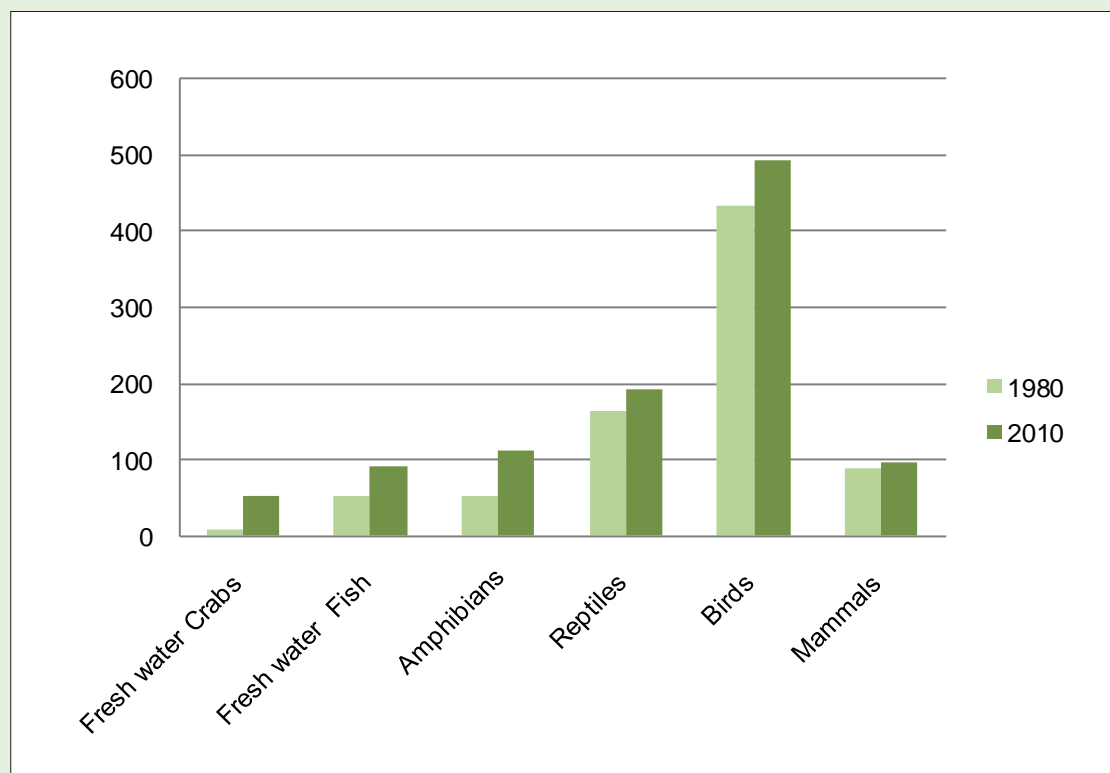
The National Targets for 2022 were formulated around five strategic objectives listed in section 3.3.

**Target 1: By 2022, a system is established and ongoing for inventorising species (taxonomy and conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision-making.**

Sri Lanka is a small island with high diversity and high endemism (MoE, 2012a). It is home to large charismatic species (mentioned in Section 1.5.2). The combination of Sri Lanka's climate and topography (that increased isolation and resulted in more speciation); its paleobiological history (the ancient affinities with Gondwana, the repeated land bridges that allowed for repeated colonization of species from India) (Karanth, 2006; Katupotha, 2013; Swan, 1983) have given rise to a great wealth of biodiversity, as well as a high degree of endemism (Table 2).

Sri Lanka is listed as one of 35 global hotspots in the world (CI, 2016) based on its species richness and extent of loss of habitats. Yet, this categorization has been made on limited data, as many of the invertebrates of Sri Lanka have not yet been studied and identified. In fact, even among the vertebrates, new species are still being discovered (*inter alia* Fernando et al., 2007; Groves and Meijaard, 2005; Groves et al., 2009; Manamendra-Arachchi and Pethiyagoda, 2005; Meegaskumbura et al., 2014; Meegaskumbura, and Manamendra-Arachchi, 2011; Meegaskumbura et al., 2002; Pethiyagoda et al., 2012; Ukuwela et al., 2013; Warakagoda and Rasmussen, 2004; and Wickramasinghe and Munindradasa, 2007) (Table 5; Figure 29).

Given the need for continued taxonomic studies, *National Target 1* was formulated to ensure that species are inventorized.



**Figure 29. Change in the Number of Species in Three Decades**  
(Source IUCN database, 2016)

Considering the ecosystem diversity of the island, much of the focus has related to classifying vegetation types. A broader classification with grouping by major ecosystem type and their variants (edaphic and anthropogenic) was presented, through consultation of a technical group, in Table 1. Target 1, therefore, also deals with inventorizing habitats.

Through Target 1 and its actions, a standard classification system for species and ecosystems will be developed, documented and gaps identified. A national programme will be established to obtain information to fill these gaps, through systematic biodiversity surveys, capacity development to do so, with mobilization of resources and dissemination of information.

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***Target 2: By 2022, habitat loss, degradation and fragmentation are significantly reduced.***

Sri Lanka has been colonized for more than 100,000 years by humans (Deraniyagala, 1986). With the advent of humans, the natural landscape of Sri Lanka was changed significantly. Sri Lanka's history chronicles a hydraulic civilization from 200 BC till 1200 AD, for about a thousand years (Jayasena and Selker, 2004). During this period, much of the forests of the dry zone were cleared for agriculture (Wijesinghe, 2000). During colonial rule, the forests of the wet zone were cleared in swathes for the establishment of plantations (MoFE, 1999). The dry zone, which had been largely ignored during colonial rule, again came into focus in the late 1960s, with the commencement of the Mahaweli Development Programme. An accelerated loss of forests between 1983 and 1992 is attributed to large-scale clearing of forests for the schemes established by this programme (BDS, MoENR, 2009).

Currently Sri Lanka is at another historic turning point, post-conflict, since 2009. Many challenges — such as resettlement, resource extraction, increased irrigation for agriculture, generation of energy, provision of drinking water, and infrastructure development — are placing the remaining forests in the North and East under a great deal of pressure. As a consequence of these stressors, there is increased habitat fragmentation, pollution and spread of invasive alien species.

Therefore, Target 2 was formulated to conserve habitats. Its actions will help reduce habitat loss through better planning; conduct national level ecosystem restoration plans to enhance carrying capacity and connectivity; conduct national level programmes to reduce impacts due to agrochemicals and other pollutants; reduce the impacts due to invasive alien species; reduce impacts due to over-visitation of natural habitats; manage climate change-driven impacts; manage wetlands and conduct assessment of ecosystem status.

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***Target 3: By 2022, the protected area (PA) network is made representative of all critical ecosystems and species and managed effectively.***

Currently, 35% of land and 0.3% of marine areas of Sri Lanka are protected by law (DWC, FD, 2016). (See Section 1.3 and Figure 18). Aichi Target 11 states that globally, 17% of land and 10% of marine areas must be protected by 2010 (CBD, 2010a). Although Sri Lanka has already surpassed the goal of having 17% of its land under protection, it falls short for marine protected areas. Therefore, assessment of adequacy is essential. Also very necessary is evaluation of representation (i.e., are all ecosystems of Sri Lanka represented in the protected area system?); proper designation; ensuring connectivity (i.e., Does Sri Lanka have a true network of protected areas, that allows for movement of animals?); and finally, effective management.

Therefore, the actions of Target 3 include updating the PA gap analysis (to ensure representation and connectivity); reassessing the status of the PA network (designation and management); improving the PA representation in coastal and marine areas and strengthening their management; preparing adaptive management plans for all designated areas; protecting paleobiodiversity sites; and promoting other conservation models such as community-based, public-private partnerships.



**Target 4: By 2022, the loss of species is significantly reduced.**

Figure 17 and Table 6 show that many species are threatened with extinction. The loss of habitats (mainly through rapid urbanization and infrastructure development); their degradation; overexploitation; the spread of invasive alien species; and the over-arching impacts of climate change are the main threats facing species. (See section on Species-related and Climate Change-related Drivers for a more detailed description.)

Therefore, Target 4 was formulated to prevent further loss of species. The actions of Target 4 include updating the Red List (as a priority); identifying research needs for threatened species; formulating recovery plans for threatened species; establishing *ex-situ* facilities for threatened species; establishing *ex-situ* facilities in different bioclimatic zones; establishing research and breeding centres; regularizing turtle hatcheries; establishing animal care shelters; formulating management plans for species which create conflict with humans; and controlling illegal trafficking.

**Target 5: By 2022, the valuation of biodiversity is mainstreamed.**

Since the MEA explicitly linked biodiversity (specifically, ecosystem services) to human well-being in 2005, there has been a steady increase in studies of valuing Sri Lanka's ecosystems (*inter alia*, Bandara and Tisdell 2005; Piyadasa and Thiruchelvam, 2005; Rathnayake and Gunawardena, 2011; Rathnayake, 2015; and Wattage, 2011).

Yet, ecosystem valuation (the value of biodiversity and ecosystem services — BES) has yet to be mainstreamed into planning, implementation and decision-making. Target 5 was formulated to address just this: that the valuation of biodiversity will be mainstreamed.

The actions of Target 5 are designed to increase awareness about biodiversity and ecosystems (BES); undertake valuation of key ecosystems; integrate BES to national accounting; and integrate BES to regional and national financing mechanisms.

**Target 6: By 2022, mechanisms are established to ensure sustainable use of biodiversity.**

The FAO estimates that 40% of global economy is based on biological resources (CBD, undated a). The CBD Secretariat states that 'in many cases, if not most, sustainable use is one of the strongest assurances for the protection of biological resources. As the adage goes, "Nature pays, so it stays". Indeed, the lessons derived from experiences of sustainable usage can be applied to all economic activities, including agriculture and livestock management, forestry, fisheries, biofuels production or bioprospecting. Under the general guidelines of sustainable management, healthy ecosystems result in economic and other benefits to people, and only then does their long-term survival become secure' (CBD, undated a).

Target 6 was formulated to ensure sustainable use of biodiversity and its actions involve establishing new financing mechanisms for sustainable financing for biodiversity conservation; introducing economic instruments to encourage biodiversity conservation and sustainable use; removing perverse incentives; improving harvesting methods and preventing overexploitation through proper resource management, especially in the marine sector.

**Target 7: By 2022, traditional sustainable uses of biodiversity are promoted and established.**

Sri Lanka has a long-history of traditional use of natural resources (Mahindapala, 2005). For example, there has been rice cultivation in Sri Lanka since 800 BC (Jayawardena, 2003). However, with the advent of the Green Revolution in the mid-20<sup>th</sup> century, many of these traditional practices went into decline, and with this decline, the practice of sustainable use was sacrificed for high yields and use of technology.

Given the challenge of reducing the current threats facing biodiversity, while ensuring sustainable use (Target 6), an obvious pathway is the revival of traditional methods. To this end, Target 7 was formulated and its actions involve learning from traditional practices; bio-prospecting through traditional knowledge; reducing dependence on natural harvesting through establishment of outgrowing systems; and improving community-based resource management.

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**Target 8: By 2022, sustainable agriculture practices are promoted and established.**

From 1950 to 2000, humans changed ecosystems more rapidly and extensively than in any comparable period of time in human history (MEA, 2005). In year 2000, cultivated systems covered 25% of Earth's terrestrial surface (MEA, 2005).

With the over-use of synthetic fertilizers, soil fertility declined, with the loss of beneficial soil micro-organisms (MEA, 2005). The use of pesticides destroys beneficial insects. Beneficial insects such as pollinators are known now to be declining (Potts et al., 2010). In Sri Lanka, 81.5% of bee species are listed as threatened (MoE, 2012a).

Conversion of natural habitats for cultivation also has to be limited in order to protect ecosystems. Therefore, in cultivated areas, productivity per unit area both in terms of time and space needs to be increased. Cropping intensity increased; maximal use the three-dimensional space whenever possible; improving soil biodiversity and pollination; increasing the post-harvest shelf life of food products; and finding markets for the produce, all have become important.

There are 250,000 globally identified plants species, of which, only 150 plant species are used as crops. Of those 150, just 12 provide 75%, and more than 50% of the world's energy comes from rice, wheat, and maize (IDRC, 2016).

In addition, within the crops, genetic diversity is rapidly being depleted. Since the 1900s, 75% crop genetic diversity has been lost through the adoption of high-yielding, genetically similar varieties; six breeds of livestock are now lost each month (FAO, 1999).

In the past, Sri Lanka had many varieties of rice, but now, nearly 95% of paddy lands are sown with semi-dwarf, newly-improved rice varieties and many wild varieties have been lost (Jayawardena, 2003).

On the other hand some of the traditional land use practices such as *owita*, Kandyan home gardens and *mavee* lands were harmonious with the nature. Currently, some countries across the globe are practising such harmonious human-nature interactions to promote biodiversity conservation. The *Satoyama* landscape which is functionally similar to our *Wawe Gammanaya* (Village Tank System) is the best example for such an initiative.

Target 8 was therefore formulated to promote sustainable agriculture practices, and its actions include improving conversion efficiency; promoting underutilized or neglected crops; conserving useful biodiversity and ecosystem services such as soil biodiversity, pollination; and promoting useful elements of biodiversity-friendly traditional practices such as *chena*, *owita*, Kandyan home gardens, *mavee* lands.

***Target 9: By 2022, genetic diversity of crop wild relatives, cultivated species and livestock is conserved.***

In the previous description, the loss of agrobiodiversity was presented. However, as is noted by FAO (1999) 'Agrobiodiversity is a vital subset of biodiversity which is developed and actively managed by farmers, herders and fishers'. Hence, there is a need to conserve crop wild relatives.

To this end, Target 9 was formulated and includes actions that will establish genetic resource centres; conserve neglected, lesser known or under-utilized crops; clone useful genes that can be used to improve crops; conserve, on-farm traditional crops; and promote farmer-based crop varieties.

***Target 10: By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established and implemented.***

Genetic resources, like other biological resources, are not evenly distributed across the world. Many of the world's 35 biodiversity hotspots are found in developing countries (CI, 2016). Thus, there are providers of genetic resources and users (CBD, 2016d).

Article 15 of the CBD — relating to access and benefit-sharing — ensures that the access to genetic resources is enabled for users and that the benefits obtained from the use of these resources are shared equitably with the providers (CBD, 1992). '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 is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources. The Nagoya Protocol will create greater legal certainty and transparency for both providers and users of genetic resources by: establishing more predictable conditions for access to genetic resources; helping to ensure benefit-sharing when genetic resources leave the country providing the genetic resources; by helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being' (CBD, 2010d).

Target 10 was formulated to promote equitable sharing of benefits from biodiversity and includes actions that will enact or amend legislature for the implementation of the Nagoya Protocol; develop procedures, guidelines and mechanisms for equitable benefit sharing; develop and implement bioprospecting programmes; prepare guidelines on use of genetic resources; and establish a mechanism to trickle down benefits to the grass-root level.

***Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced.***

Worldwide, the climate has changed, and will continue to change (van Aaslt, 2006). The World recognized climate change as the dominant driver of biodiversity change by the end of this century (MEA, 2015). Increasing climate-related natural disasters such as flash floods, droughts, landslides, tornado-type winds, coastal storms and tropical cyclones have been observed in Sri Lanka (Punyawardena et. al., 2013).

One approach to reduce climate induced vulnerability is to better understand the risks and employ Ecosystem-based Adaptation (EbA). It involves maintaining, to be healthy and functioning, intact natural ecosystems — such as forests, wetlands, mangroves, and coral reefs — and thereby,

minimizing natural hazards. EbA promotes biodiversity, ecosystem services and community resilience (UNEP, 2016), as opposed to building infrastructure to meet climate risks. EbA also involves minimization of non-climatic anthropogenic risks on ecosystems.

Although there is a growing body of research on climate change and agriculture (*inter alia*, Athulathmudali et al., 2011; De Costa, 2000; Eriagama et al., 2010; Esham and Garforth, 2013), research linking climate change and biodiversity is lacking. Thus, promotion of EbA through ecosystem leadership and awareness, as a means of adapting to climate change, as well as allocating resources for EbA related investments in national budgets, becomes important.

Target 11 is designed to address this lacuna and its actions will initiate research on impact of climate change on natural hazards and biodiversity; develop home gardens, urban and rural green spaces to enrich carbon stocks; implement mangrove and river bank restoration and forest conservation projects for watersheds; identify and promote species that are resilient to extreme conditions and use them for agriculture and forestry; and mainstream EbA) and ecosystem-based adaptation to disaster risk reduction (Eco-DRR).

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**Target 12: By 2022 Biosafety is assured.**

Since the 1970s, advances in genetics that involved gene splicing gave birth to the field of biotechnology. The CBD defines 'biotechnology as any technology that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use' (CBD, 1992). 'The mission of the biotechnology industry is to heal, fuel and feed the world' (Greenwood, 2011).

However, these advances do not come without risks. There are concerns that genes from Living Modified Organisms (LMOs) *inter alia*, will transfer to wild relatives; that there may be development of superweeds; that there may be a negative impact of fauna and flora; that pest resistance will increase. In addition, there are concerns that there will be a negative impact on sustainable agriculture, as again, LMOs indicate a dominance by large-scale industrialized agriculture.

Target 12 was formulated to assure biosafety and its actions include strengthening policy on biosafety; implementing biosafety master plan and formulate biosafety legislature; strengthening risk assessment and risk management capacity; developing and implementing legal instruments to protect native biodiversity; ensuring that human health is not at risk from new technologies; and promoting traditional alternatives in place of modern biotechnological applications.

### Box 17. The Process of Preparing the NBSAP

The methodology for the preparation of the NBSAP was developed based on guidelines provided by the CBD, other NBSAP guidance materials provided by IUCN, previous local experience in similar processes and methodologies already used by other countries to develop their own NBSAP documents.

At the beginning of the preparation process, an outline of the NBSAP document was developed. This outline was then presented at the first consultative workshop, which was held on the 14<sup>th</sup> of July 2015. This initial workshop was chaired by the Secretary of the State Ministry of Environment. Several other additional secretaries, sectional directors of the Ministry and key staff, who were directly involved in this project, also participated in the workshop. The proposed NBSAP outline and methodology was presented at the workshop and approved by the committee of secretaries, sectional directors and key staff mentioned above. Furthermore, through the contributions of workshop participants, the NBSAP preparation team was able to collect valuable information and inputs to incorporate into the NBSAP document.

The proposed outline and methodology of the NBSAP was then presented to the National Biodiversity Expert Group. Their feedback was used to further fine-tune the document.

After this, the NBSAP preparation team had further discussions with the Biodiversity Secretariat and it was decided that a series of small-scale consultative workshops, rather than a few large-scale consultation workshops, would be conducted.

A number of national sectors, for which stakeholder consultation workshops were conducted, were identified (a list of stakeholders consulted is given in Annex 1). In the NBSAP document, under each broad strategic objective, targets — aligned with Aichi targets — were formulated. Under each target key national actions were identified. These actions, targets and strategic objectives were discussed at each workshop. Stakeholder consultative workshops were held for the following sectors: 1. *In-situ* and *ex-situ* conservation; 2. Food and nutrition; 3. Climate change and development; 4. Coastal and marine conservation; 5. NGOs, CBOs and IPLCs; and 6. The corporate sector.

After gathering information, inputs and viewpoints from the stakeholders of each sector, a draft action plan was developed. This draft action plan was then sent back to the stakeholders (all those who participated in the workshops) to obtain their feedback. An additional workshop was also conducted to compile an updated ecosystems list for Sri Lanka, with the participation of national-level experts on the ecosystems of Sri Lanka. This ecosystems list was included in the NBSAP.

As described above, the draft action plan was continually changed and improved through a broad consultative process involving key stakeholders and national-level experts. Once this process was complete, the final draft was presented to the National Biodiversity Expert Group, after which, their comments and feedback were duly addressed.

After all feedback, comments and suggestions from the National Biodiversity Expert Group were incorporated, a final draft of the NBSAP was developed. This penultimate NBSAP draft was then presented at the National Stakeholder Workshop. The National Stakeholder Workshop involved a larger stakeholder group, which included both participants from previous consultation workshops, as well as key stakeholders who did not participate in previous workshops.

Finally, after incorporating feedback from the National Stakeholder Workshop, the final NBSAP draft document was developed. This final draft document was reviewed firstly in-house and then by external, international experts, and finally presented to a wider stakeholder group at a validation workshop. Comments and suggestions received by reviewers as well as participants of the validation workshop were incorporated and the NBSAP was finalized.



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NBSAP Consultative Sessions

According to the IUCN Global Red List™, this endemic Toque Monkey (*Macaca sinica*) is an Endangered (EN) species. However, the 2012 National Red List of Sri Lanka categorized this species as one of Least Concern (LC). This species is widely distributed on the island, and is a problem species, causing conflict with humans. This picture exemplifies the complexities of conservation: here is an endemic species (subspecies *M. s. opisthomelas* shown here), listed globally as Endangered, in Sri Lanka considered a problem animal, sitting on an exotic *Pinus* tree, feeding on garbage.



# Chapter 3

## National Strategic Action Plan





### 3.1 Vision

Sri Lanka's biodiversity is valued, conserved, sustainably used and is more resilient and able to adapt to change, at the same time providing essential services and delivering benefits for all Sri Lankans, as well as contributing to sustaining a healthy planet. (An abbreviated version of this Vision was presented at the very beginning of this document.)

### 3.2 Consideration of Concepts in Developing the Strategy

The NBSAP is anchored on the following concepts:

- Conservation of biodiversity;
- Sustainable use of biological resources;
- Poverty alleviation through equitable sharing of benefits;
- Conservation and efficient use of agrobiodiversity;
- Promotion of human well-being through the ecosystem approach;
- Consistency and integration with national development and sectoral plans;
- Alignment with the Aichi targets and SDGs;
- Adaptation to climate change; and
- Multi-stakeholder consultation and engagement.

#### **Box 18. The NBSAP: Synergies among Global and other National Targets**

- This NBSAP ensures synergies with existing national plans/projects and programmes, as well as with global targets and protocols. As noted before, the national targets of the NBSAP are closely aligned with the Aichi Targets, the SDGs and Sri Lanka's other national targets from Haritha Lanka (Section 3.5).
- In addition, some targets relate to CBD protocols such the Nagoya and Cartagena Protocols — Targets 10 and 12 respectively. EBSAs, proposed at COP 9 of the CBD (CBD, 2008), are addressed in actions of Target 3.
- Nationally, actions 10 and 11 of Target 2 complement actions of the recently concluded project 'Strengthening Capacity in Managing Invasive Alien Species (IAS) in Sri Lanka' (Box 12). Actions 2 and 13 of Target 2 and action 1 of Target 3 will feed into the national climate change adaptation planning process.
- Actions of Target 5 are synergistic with the project 'The Pricing the Biodiversity of the Island' and the Green Accounting Mechanism commenced in 2012 and 2011 respectively (MoERE, 2013; MoE, 2011).

### 3.3 The Strategic Objectives

The NBSAP is based on the following five strategic objectives:

1. Ensure the long-term conservation of biodiversity;
2. Promote sustainable use of biological resources;
3. Conserve agrobiodiversity;
4. Promote equitable sharing of benefits from biodiversity; and
5. Improve human well-being through an ecosystem approach.

### 3.4 The Approach Taken in the Preparation of the NBSAP

#### 3.4.1 A Three-tiered Hierarchical Approach

The approach taken in preparing the current update of the NBSAP has deviated from the approach taken during the two previous occasions. This NBSAP is based on a three-tiered hierarchical approach. First, five broad strategic objectives have been identified for Sri Lanka. Under each strategic objective one or a few targets have been identified. Under each target, a number of national level actions have been identified (Figure 30). The fulfilment of a set of actions will allow achievement of a given national target; and the fulfilment of specific national target(s) will allow achievement of the relevant strategic objective. Fulfilment of all five strategic objectives will ensure achievement of the overall goal set forth by the NBSAP, which is ensuring the long-term conservation of Sri Lanka's biodiversity, while promoting its sustainable use and ensuring that benefits arising from such use is equitably shared.



Figure 30. The Three-tier Hierarchical Approach used in the Preparation of this NBSAP

### 3.5 National Actions to Achieve Strategic Objectives

Key: AT= Aichi Target; SDGs= Sustainable Development Goal; NT= National Target; HL=Haritha Lanka: Time frame: There are seven cells under the column for the Time Frame. Each cell represents an year.

The lead primary organization responsible for a given action has been presented in bold text

Strategic Objective 1: Ensure the long-term conservation of biodiversity						
Target 1: By 2022, a system is established and ongoing for inventoring species (taxonomy conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision making.						
No.	Action	Indicator	Primary	Secondary	Time Frame	AT SDGs NT
1.	Establish a national list of species and ecosystem types with annual updating	Biodiversity Expert Group established to provide technical backstopping Species and Ecosystem Lists established and annually updated	<b>Biodiversity Expert Group, BDS</b>	DWC, FD, IEOs, NARA, DNBG, DNM, NGOs, CC&CRMD, Individual experts, Universities	19	HL2
2.	Establish a national biodiversity database to document biodiversity in all natural areas	Data base established Data entry, reporting, sharing and access protocols defined Mechanism for regular updating defined	<b>BDS, DWC, FD</b>	DNM, BEC, NARA, NGOs, Universities Individual experts	19	HL2
3.	Populate the database with existing data sets and update continuously	Database populated with all existing data sets	<b>BDS, DNM, FD, DNBG, DWC, Individual experts</b>	IEOs, NARA, CC&CRMD, NGOs, Universities	19	HL2

Target 1: Contd.								
No.	Action	Indicator	Primary	Secondary	Time Frame	AT	SDGs	NT
4.	Develop a research agenda to address identified information gaps on sites, taxa and valuation of ecosystem services and share this information with relevant stakeholders	Research agenda developed and presented to broad stakeholder group and research priorities identified	<b>NSF, BDS</b> NRC	UGC, DWC, FD, Universities, NGO's, Individual experts, NPD		19		HL2
5.	Establish a national botanical and zoological survey programme to conduct baseline surveys for subsequent monitoring of sites identified in action 4	National Botanical and Zoological Survey programme established with funds	<b>NSF, BDS,</b> NRC	DNBG, DNM, DNZG, Universities, Individual experts		19		HL2
6.	Provide seed grants for contract research on identified sites, taxa and ecosystem services, where information is not presently available	Number of seed grants provided Number of sites inventoried	<b>BDS</b>	NSF, NRC, UGC, NARA, DNBG, DNM, CC&CRMD, Universities, Private sector		19		HL2
7.	Provide training for local experts on lesser known taxa	Number of experts trained Number of para taxonomists trained per district National database of taxonomic experts established	<b>Universities,</b> BDS, NSF, DNBG, DNM, DNZG	NARA, DWC, FD, NGOs, IPLCs		19		HL2
8.	Provide financial support for local experts to communicate their findings related to biodiversity of Sri Lanka both nationally and globally	Criteria to provide travel grants developed Travel support given	<b>NSF, NRC,</b> UGC, Universities	BDS, DNM, DNBG, DNZG, NARA,		19		

Target 1: Contd.								
No.	Action	Indicator	Primary	Secondary	Time Frame	AT	SDGs	NT
9.	Develop and implement a communication strategy to disseminate the information collected to relevant stakeholders	Communication strategy developed and implemented	BDS, DNBG, DNZG. FD, DWC, DNM	Universities. Education Department. Individual experts		19		

Target 2: By 2022, habitat loss, degradation and fragmentation are significantly reduced.								
No.	Action	Indicators	Primary	Secondary	Time frame	AT	SDGs	NT
1.	Conduct Strategic Environment Assessments for all nine provinces and identify the best possible pathway to achieve national development goals with the least amount of habitat loss and fragmentation	Nine SEAs completed SEAs are used in provincial and National Level physical planning	CEA, NPPD, UDA	CEB, ID, MASL, RDA, GSMB, DoA, SLTDA, NG&JA, CC&CRMD, NWS&DB, NAQDA, NARA, SLLR&DC, DFAR		5	15	
2.	Develop a national ecosystem (terrestrial, coastal and marine) conservation plan to identify the best possible strategies for afforestation, enhancement, restoration and establishing connectivity, with reference also to ecosystem-based climate change adaptation	National committee of experts established to provide technical support National ecosystem conservation plan established	FD, DWC,BDS, NSCAG, BEC SLLR&DC, NARA, MEPA, CC&CRMD, CEA	DNBG, DNZG, NGOs, IPLCs, MASL, Universities, Private Sector CG, Provincial councils		15	15	HL2
3.	Implement the national ecosystem conservation plan by integrating it with provincial and local development plans as well as ensuring private sector participation	Conservation plan mainstreamed into Provincial level development plans	DWC, FD, BDS, Provincial councils, UDA, Local chambers of commerce, Private Sector, BDSL	CEA, NWPEA, NARA, CBOs, NGOs, IPLCs, DNBG, DNZG, MEPA, IDB, CC&CRMD, SLTDA, MASL, SLLR&DC,		15	15	HL2

Target 2: Contd.									
No.	Action	Indicators	Primary	Secondary	Time frame	AT	SDGs	NT	
4.	Develop and implement a national programme that reduces reliance on agrochemical usage	National programme developed	DoA, MASL, ID, DAD, SLPD, Municipalities, Farmer organizations, Agrochemical companies	IPLCs, CBOs, NGOs, MoH, All research institutes related to agriculture & farming		8	3	HL1	
		Number of programmes conducted							
5.	Develop and implement a national strategy that reduces the release of pollutants and solid waste into wetlands (as defined by Ramsar)	National Strategy developed and implemented	CEA, BOI, Local authorities, SLLR&DC, NWPEA	NWS&DB, MEPA, DWC, CC&CRMD, ID, MASL		8	3	HL1	
		Polluting sources reduced by 25%							
6.	Develop and implement a set of guidelines to reduce the impact of tourism on natural habitats	Guidelines developed and implemented	SLTDA, FD, DWC, CEA, CC&CRMD, Provincial authorities, Hotels	Tour operators, Tour guides, MEPA, NGOs, CBOs, Pradeshiya sabha		5			
7.	Conduct a national level awareness campaign on invasive alien species and their impacts on natural habitats	Number of programmes conducted	BDS, DWC, FD, DAD, DoA, Shipping companies, DNBG, DNZG, Importers, Media	MEPA, NARA, NAQDA, NPQS, DAPH, SLC, CC&CRMD, Universities, Research institutes		9		HL2	
8.	Strengthen regulatory mechanisms to prevent entry of invasive alien species	Risk Assessment Protocols established and utilised	BDS, NPQS, DAPH, DFAR, SLC	MoFARD, DWC, NAQDA		9	15	HL2	

Target 2: Contd.								
No.	Action	Indicators	Primary	Secondary	Time frame	AT	SDGs	NT
9	Establish early warning system for invasive alien species	Early warning system established and implemented	<b>BDS, DWC, FD, MEPA, DNBG, NARA, DNZG, Local government</b>	Individual experts, Fish collectors, Fisherman, CG, Media		9	15	HL2
10.	Establish a mechanism for updating National IAS lists every four years	Mechanism established and implemented	<b>BDS</b>	DWC, FD, DNBG, DNZG, NARA, MEPA, NAQDA Universities, NGOs, CBOs, DoA, DFAR		9	15	HL2
11.	Develop and implement species-specific management plans for identified invasive alien species	Management plans for priority IAS developed Management plans implemented	<b>BDS, DOA, NAQDA, CEA, DFAR, MASL, MEPA, SLPA</b>	DWC, FD, MEPA, CC&CRMD, DNBG, NGOs, CBOs, Farmer & fisher organizations		9	15	HL2
12.	Strengthen the implementation of special management areas, conservation areas and affected areas as defined by the CC&CRM Act	Management plans prepared and implemented for SMA, CA and AA	<b>CC&amp;CRMD</b> CEA, UDA, SLTDA	DFAR, MEPA, DWC, FD, Universities, CBOs, NGOs, NARA, Research institutes, Local authorities, Fish exporters		5	14	
13.	Carry out an assessment of species that are undergoing range expansion due to climate change and examine their impacts on ecosystems and develop and implement mitigation measures	Impact of range expansion of species due to climate change and their effects assessed Mitigation implemented	<b>BDS, CCS</b>	Universities, DNBG, FD, DWC, NARA, MEPA, CC&CRMD		10	13	HL3

**Target 2: Contd.**

No.	Action	Indicators	Primary	Secondary	Time frame	AT	SDGs	NT
14.	Carry out a national assessment of the impact of climate change on identified vulnerable species and ecosystems and develop potential mitigation and adaptation strategies and ensure that this assessment feeds into the climate change national adaptation planning for Sri Lanka	National Assessment completed Mitigation and adaptation strategies developed and mainstreamed to national adaptation planning	CCS, BDS, DoM, FD, DWC, NARA, CC&CRMD, DFAR, DMC	CBOs, NGOs, Individual experts, Universities		10	13	HL3
15.	Prepare and implement wetland conservation management plans for wetlands that are identified as critical systems lying outside the PA network	Wetland conservation and management plans prepared and implemented	CEA, BDS, SLLR&DC, UDA, CC&CRMD, MEPA, FD, DWC	FD, DWC, NARA, CC&CRMD, MEPA, CBOs, NGOs, Local authorities, RDA		5	15	HL2
16.	Preparation of the Red List of Ecosystems for Sri Lanka and updated every five years	Ecosystem Red List Prepared and updated regularly	BDS, NSCAG, BEC, IUCN	DWC, FD, DNBG, DNZG, NARA, Universities, NGOs, Individual experts, DNM		5	15	HL2



Target 3: By 2022, the PA network is made representative of all critical ecosystems and species and managed effectively.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
1.	Update the protected area gap analysis based on the recommendations of the provincial SEAs and develop and implement a strategy to protect the critical habitats outside the PA network with reference also to ecosystem-based climate change adaptation	Gap analysis completed	DWC, FD, CEA, NARA CC&CRMD	BDS, MASL, ID, Universities, Individual experts		11	15	HL2	
		Number of PAs established based on the gap analysis							
2.	Conduct a status assessment of the PA network and identify sites that need to be upgraded or downgraded based on their current status	PA network assessed and designations updated	DWC, FD, CEA, NARA CC&CRMD	BDS, Universities, Individual experts		11	15	HL2	
3.	Carry out an assessment of the coastal and marine sector and identify and designate areas that need to be protected and further up scaling of existing and new marine PAs to internationally recognized marine PAs such as Ecologically or Biologically Significant Marine Areas (EBSAs)	At least 10% of coastal and marine areas protected	DWC, FD, CEA, NARA CC&CRMD	BDS, Universities, Individual experts		11	14	HL2	
		At least 4 EBSAs are declared							
4.	Establish a marine division in the Department of Wildlife Conservation and implement effective management of MPAs and marine species	Marine unit established and functioning in DWC	DWC, CG	BDS, NARA, CC&CRMD		11	14	HL2	

Target 3: Contd.							
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs
5.	Prepare adaptive management plans for all areas declared as protected under action 2 and 3 and ensure that these plans are implemented effectively	Management plans prepared and implemented for all designated areas	<b>FD, DWC, CEA, CC&amp;CRMD</b>	BDS, Universities, Individual experts, Private sector		11	15 HL2
6.	Protect sites that harbour key evolutionary links such as fossils or sub-fossils	Number of paleobiodiversity sites designated	<b>BDS, DoArch, CCF</b>	DWC, FD, CC&CRMD, CEA		11	HL2
7.	Promote community-based conservation using <i>sui-generis</i> tools for community owned land	Biocultural community protocol developed for Kithul	<b>BDS</b>	IEOs, CBOs, NGOs, IPLCs		11	

**Target 4: By 2022, the loss of species is significantly reduced.**

No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs
1.	Update the national red list every five years and ensure that the data is shared in an appropriate format with the IUCN Global Red List	National Red List revised at least twice during the period Sri Lanka data incorporated into the IUCN Global Red List	<b>BDS, NSCAG, BEC, IUCN</b>	DWC, FD, DNBG, DNZG, NARA, Universities, NGOs, Individual experts, DNM		12	15 HL2
2.	Establish an interactive web portal on threatened species to create awareness on threatened species of Sri Lanka and ensure that this portal is continually updated.	Web portal established Number of visitors to the portal	<b>BDS</b>	FD, DWC, CEA, DNBG, DNZG, NARA, DNM		19	HL2

Target 4: Contd.										
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT		
3.	Identify research needs with respect to prioritized threatened species and develop a funding mechanism to facilitate such research	Prioritized threatened species list formulated	BDS, NSF, NRC, NSCAG, BEC	Private Sector, Universities, UGC, NGOs		19		HL2		
		Research agenda developed								
		Funding mechanism established								
4.	Develop and implement recovery plans for prioritized threatened species	Number of recovery plans developed and implemented	BDS, NSCAG, BEC, DNBG, DNZG	DWC, FD, NARA, CEA, Universities, NGOs, Private sector		12	15	HL2		
		Number of species that are downlisted based on recovery								
5.	Establish an <i>ex-situ</i> breeding and research facility for breeding/ propagation of threatened species under the Department of National Zoological Gardens and National Botanic Gardens	<i>Ex-situ</i> breeding facility established	DNZG, DNBG, NARA, NAQDA	BDS, Universities, Private sector, DWC, FD, DoAyur, Aquaria, NGOs, Individual experts		12	15	HL2		
		Number of threatened species successfully bred or propagated								
6.	Regularize turtle hatcheries with appropriate guidelines for scientific management and a monitoring system established	Guidelines developed	DWC, CC&CRMD, NARA	BDS, NAQDA, Universities, Individual experts, NGOs, Private sector		12	15			
		Number of permits issued and renewed								
		Monitoring reports								
		No of turtle hatcheries regulated								

Target 4: Contd.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
7.	Establish animal care shelters under the Department of Wildlife Conservation for rehabilitation of confiscated, injured and displaced animals in each wildlife region and develop guidelines for reintroduction of rehabilitated species back to the wild	A shelter per wildlife region established	<b>DWC</b>	BDS, NGOs, CC&CRMD, DFAR, SLC, CG, FD, NARA, DNZG		12	15		
		Protocols and standards for animal care developed and implemented							
		Protocols for the re-release into the wild of rehabilitated animals established							
8.	Develop and implement species level management plans for mitigation of conflicts caused by threatened species	Training for all relevant officials on animal care provided	<b>DWC, FD</b>	BDS, Universities, Individual experts, NGOs		12	15	HL2	
		Species creating conflict identified							
		Management plans developed for identified species							
9.	Establish <i>ex-situ</i> conservation facilities such as botanic gardens, zoos, aquaria, wetland parks, arboreta, medicinal gardens, urban parks, natural history museums, plant herbaria etc., or upgrade and improve existing facilities in each bioclimatic zones for recreation, conservation, education and research	Implementation initiated	<b>DNBG, DNZG, SLLR&amp;DC, DNM, PGRC, UDA, MASL, DoAyur</b>	BDS, FD, DWC, NARA, CEA, NIFS, Private sector, NGOs, Municipal councils, Hospitals, Universities		12	15	HL1	
		Number of <i>ex-situ</i> facilities established							
		Number of existing <i>ex situ</i> facilities improved and upgraded							

Target 4: Contd.							
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDG
10.	Identify gaps in enforcement of tracking, monitoring and prosecuting illegal trade of scheduled species and update current legislation and regulations to address identified gaps as well as alignment with international conventions such as CITES	Database on trade and trafficking in flora and fauna established	DWC, BDS, SLC, FD, CG CCD, DFAR	CC&CRMD, NARA, IEO, NGOs, Individual experts, DOA			
		Gap analysis on effective regulation of illegal trade of scheduled species conducted					
		Legislation to regulate illegal trade of scheduled species updated				12	15

Strategic objective 2: Promote sustainable use of biological resources							
Target 5: By 2022, the valuation of biodiversity is mainstreamed.							
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs
1.	Conduct programmes to capture and create awareness on value of Biodiversity and Ecosystem Services (BES)	Types and number of BES values captured	BDS, IEOs, IPS, Media	Universities, DWC, FD, NGOs, NIE			
		Number of programmes conducted and types of stakeholders covered					
		Level of awareness creation					
		Number of information materials produced					
2	Undertake TEEB type valuation studies to determine the value of key ecosystems and their services in Sri Lanka	Number of valuation studies conducted	PGIA, Universities	BDS, IEOs, IPS			
		Number of ecosystem services covered				1	

Target 5: Contd.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
3	Integrate biodiversity and ecosystem service values into educational curricula for meaningful engagement	Teacher guidelines for schools and other educational institutes updated	NIE, BDS, UGC	Universities		1		HL2	
		Subjects and grades integrated							
		Types and number of engagements							
4.	Capture and share biodiversity and ecosystem service values embedded in religion and culture	Number and types of values captured	BDS, Religious institutions	Ministry of Buddha Sasana and Religious Affairs and other religious ministries		1			
		Number of programs or stakeholders engaged							
5.	Link existing databases and develop and maintain a searchable database/web portal for ecosystems, ecosystem services and their values	Searchable database established	BDS	Universities, IPS, IEOs, DWC, FD		1		HL2	
6.	Integrate biodiversity and ecosystems service values to national accounts	Operational framework of green accounting developed	DCS, SDD, NPD	IPS, UoSJP, PGIA, IEOs, BDS		2	15	HL2	
		Number of ES incorporated in to green accounting							
		Sectoral contribution to GDP captured							
7.	Develop guidelines to incorporate Biodiversity and Ecosystem Service values into regional/ national/ local level planning and plan implementation	Number of guidelines developed	DoNP, NPPD, LUPPD, BDS, UNDP, IEOs	DWC, FD, BDSL		2	15		
		Number of guidelines incorporated							

Target 6: By 2022, mechanisms are established to ensure sustainable use of biodiversity.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
1.	Develop innovative financing mechanisms to generate sustainable self-financing for biodiversity and ecosystem service conservation	Types and number of mechanisms developed	BDS, FD, DWC, CC&CRMD	Private sector, NGOs, CBOs, IPLCs Universities		3		HL2	
2.	Introduce appropriate economic instruments for biodiversity and ecosystem service conservation	Types and number of economic instruments introduced Number of sectors covered	BDS, FD, DWC, MoF, CC&CRMD	Universities, IPS,		3		HL2	
3.	Identify and remove perverse incentives that damage biodiversity and ecosystem services	A review conducted to identify perverse incentives Actions taken to remove perverse incentives	BDS, DWC, FD,, MoF, CC&CRMD	IPS, Universities		3		HL2	
4.	Promote best practices to minimize the destructive harvesting methods used for biological resources from terrestrial, aquatic and marine systems	Number of guidelines on best practices produced Number of programs conducted to promote best practices and types and number of stakeholders covered	DFAR, DWC, FD, MoH CC&CRMD	CG, SLPD, SLC, BDS		4	12	HL2	
5.	Assess the present levels of harvesting of freshwater and marine finfish/ shell fish and develop and implement recovery plans for finfish/ shell fish species stocks that are depleted due to overexploitation	Prioritization of species that are overexploited Develop and implement recovery plans for the prioritized species	DFAR, NARA, NAQDA, MoFARD	CC&CRMD, Universities, BDS		6	14		

Target 7: By 2022, traditional sustainable uses of biodiversity are promoted and established.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
1.	Promote and mobilize cultural practices and traditional wisdom related to biodiversity	Number of cultural practices identified	NSF, BDS, IPLCs	Universities, CBOs, IPLCs, DoA, NARA,		18	12	HL2	
		Number of identified practices mobilized							
2.	Establish a searchable database on traditional knowledge, beliefs and practices related to biodiversity	Database established	BDS, NARA, IEOs, IPLCs,	DFAR, CBOs, IPLCs Universities, MoH, Ministry of Indigenous Medicine, NARA		19		HL2	
3.	Promote bio-prospecting of both animal and plant genetic resources through the application of traditional knowledge	Develop policy and legal mechanisms for bio-prospecting	BDS	Universities, PGRC, IEOs, NGOs, IPLCs		18		HL2	
		Develop a pilot project for sustainable bio-prospecting							
4.	Develop policy tools for repatriation of traditional knowledge and artefacts which are related to biodiversity and mainstreaming suasive behaviour related to biodiversity conservation	Policies developed and implemented	BDS			18			
5.	Introduce an outgrowing system for medicinal plants with the involvement of private sector	Identify species that are suitable for outgrowing	MoH, DoAyur	Private sector, IEOs, CBOs, NGOs, IPLCs		18	12		
		Number of pilot projects conducted							
6.	Identify gaps in Fishery Management Areas (FMA) and implement programs to address the identified gaps	Gaps identified	DFAR, MoFARD	BDS, Universities, NARA, NGOs,		6	14		
		Number of new FMAs established							



Strategic Objective 3: Conserve agrobiodiversity									
Target 8: By 2022, sustainable agriculture practices are promoted and established.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
1.	Improve conversion efficiency of raw material to final products	Number of programmes conducted to enhance conversion efficiency Number of research outputs	IPHT, DFAR, TC, FD, DoAyur	IPHT of NARA, RRD, NERD, Universities, NGOs, BMARI		4	12	HL2	
2.	Promote and mainstream underutilized, lesser known or neglected food crops, livestock and food fishes which provide nutrition	At least three underutilised varieties (species) of seed, fruits & plants promoted at national level Food <i>Mandala</i> developed at national/provincial level Food composition tables of underutilised plants and animals produced	DoA, BDS	CBOs, NGOs, IPLCs, Media, PGRC, DFAR		7	2	HL2	
3.	Establish and maintain a searchable database linked with global databases on nutritional quality of food	Data base established	DoA, BDS	Universities NGOs		19	2		
4.	Promote useful elements of traditional knowledge/ practices of unique agroecosystems (such as Kandyan home gardens, cascade tank systems, <i>chena</i> , <i>owita</i> and <i>Mavee</i> lands) to address current issues	Number of lessons learnt from traditional or unique agro ecosystem practices promoted	BDS, DoA,	Universities, IEOs, NGOs, CBOs, IPLCs		18	2	HL2	

Target 8: Contd.								
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT
5.	Identify and conserve useful BES such as natural enemies, pollinators and soil microorganisms for sustainable agricultural productivity	Number of programmes conducted to raise awareness on sustainable agriculture Growth of the percentage of land under sustainable agriculture Identify and remove perverse incentives that prevents the use of sustainable practices Number of research findings	BDS, DoA, FD	NGOs, CBOs, IPLCs, Universities		7	2	HL2
6	Establish a database on traditional knowledge	Database established	DoAyur, DoA,			19		HL2

Target 9: By 2022, genetic diversity of crop wild relatives, cultivated species and livestock is conserved.								
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT
1.	Establish and strengthen genetic resource centres such as field gene banks, seed banks etc., for both short and long-term conservation of genetic diversity of crops, poultry and livestock	Number of new genetic resource centres established Number of functioning genetic resource centres improved Number of community based seed banks established	PGRC, BDS, DAPH	CRI, RRDI, DoEA, DoAyur, DoA, NGOs, CBOs		13	2	HL2

Target 9: Contd.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
2.	Promote conservation of neglected, lesser known and under-used food crops, livestock and their wild relatives such as vegetables, seeds, fruits, poultry, livestock and food fish	Number of lesser known, underutilized crops and their wild relatives conserved	<b>PGRC, BDS, B4FN, BACC,</b>	<b>DoA, NGOs, FD, DWC</b>		13	2	HL2	
3.	Carry out molecular genetics research to identify and use beneficial genes of wild relatives and traditional varieties with the aim of improving cultivated crop varieties and animal varieties	Number of new genes identified, characterized and utilized	<b>DoA, RRD, Universities, Research institutes, PGRC</b>	<b>BDS</b>		13		HL2	
4.	Implement on-farm conservation for traditional crop varieties and land races and encourage promotion of farmer-based crop varieties and livestock	Number of programmes conducted	<b>DoA, BDS</b>	<b>NGOs, CBOs, IPLCs</b>		13	2	HL2	
		Number of crop varieties conserved							
		Number of farmer based crop varieties identified and promoted							
5.	Create new protected areas or special management zones within existing protected areas for <i>in-situ</i> conservation of crop wild relatives	Number of crop wild relatives protected through <i>in-situ</i> conservation initiatives	<b>DWC, FD, CEA BDS, PGRC</b>	<b>Universities, DoA NGOs, CBOs, IPLCs</b>				HL2	

Strategic objective 4: Promote equitable sharing of benefits from biodiversity								
Target 10: By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established and implemented.								
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT
1.	Enact necessary legislation or amend existing legislation for the smooth implementation of the Nagoya protocol	Legislation amended	<b>BDS,</b> MoMD&E, DWC, FD	IEOs, NGOs IPLC		16		HL2
2.	Develop regulations, procedures, guidelines and benefit sharing mechanisms for biological resources	Number of regulations, procedures, guidelines and benefit sharing mechanisms for biological resources developed	<b>BDS,</b> MoMD&E,	IEOs, NGOs , IPLCs		16	1	HL2
3.	Develop and implement bio-prospecting programmes and establish relevant mechanisms	Mechanism for bio-prospecting established	<b>BDS,</b> MoMD&E	MoF, IPLCs PSC		16		HL2
4.	Prepare guidelines, handbook for all stakeholder groups for use of genetic resources that includes economic, social, cultural, legal and ethical considerations	Guidelines and handbook prepared	<b>BDS,</b> MoMD&E	IEOs, NGOs		16		HL2
5.	Establish a mechanism to ensure benefit sharing at the grass roots level and piloting the bio-cultural protocols via collective action for stewardship development	Mechanisms established to ensure benefit sharing at grass root level  At least two biocultural protocols are prepared collectively with IPLCs	<b>BDS,</b> MoMD&E	CBOs, IPLCs		16	1	HL2

Strategic objective 5: Improve human well-being through the restoration and enhancement of key ecosystems									
Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced.									
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs	NT	
1.	Initiate research and monitoring programmes on the impacts of climate change, infrastructure development, and natural hazards on biodiversity	Number of studies initiated	CCS, BDS, NSF, DoM, NBRO	Universities, IEOs, NGOs, FD, DWC, CCD NWS&DB CEA, ID, DMC		15	13	HL3	
		Number of permanent plots established for monitoring impacts of climate change							
2.	Development or enrichment of home garden carbon stocks and both urban and rural green spaces to improve ecosystem services provided by them	Number of programs conducted	DoDD, BDS, CCS, DoA, UDA, MoM&WD	IEOs, NGOs CBOs FD,		15	13	HL3	
		Number of home gardens where the concept is applied							
		Number of building approval programs							
3.	Implement mangrove and river bank restoration and forest conservation projects for watersheds	Extent of river banks, mangroves and catchment forests restored	FD, MASL, CC&CRMD, BDS, DWC	CBOs, NGOs, IEOs, SLTDA, Private sector		14	15	HL2	
4.	Identify and promote species with enhanced resilience to extreme conditions in agriculture and reforestation	Number of species identified and promoted	DoA, FD	Universities, CBOs, NGOs, CRI, TRI, RRI, RRD		14	13		
		Number of agencies applying the concept							

Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced.							
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs NT
5.	Mainstream EbA and Eco-DRR in all development planning and the education system	<p>Number of provincial councils adopting EbA and Eco-DRR</p> <p>Number of universities and technical institutes that have included EbA and EcoDRR in their curriculums</p> <p>Number of public awareness programs conducted on this topic</p>	DMC, CCS, CG	MEPA, NARA, CC&CRMD		14	HL3


Target 12: By 2022 Biosafety is assured							
No.	Action	Indicator	Primary	Secondary	Time frame	AT	SDGs NT
1.	Strengthen the policy on biosafety	Biosafety policy adopted and mainstreamed	BDS, NSF, MoMD&E	Universities			3 HL2
2.	Develop and implement a National Biosafety Master Plan and formulate biosafety legislation	<p>Biosafety master plan developed</p> <p>Biosafety legislation developed</p>	BDS, MoMD&E	Universities, CEA, Individual experts, NGOs			3 HL2
3.	Establish risk assessment procedures for new technologies	<p>Risk assessment procedures to assess the impact of new technologies on human health developed and implemented</p> <p>Number of GMOs evaluated</p>	BDS, MoH	NSF, SLINTEC, CEA, Universities, Individual experts			3 HL2

**Target 12: Contd.**

No.	Action	Indicator	Primary	Secondary	Time frame				AT	SDGs	NT
4.	Strengthen capacity for risk assessment and risk management	Capacity developed for conducting risk assessments and risk management	<b>BDS</b> , CEA, MoMD&E	Universities, Individual experts						3	HL2
5.	Develop and implement legal instruments to protect native biodiversity and indigenous crops from contamination of GMOs	Laws to protect indigenous crops from GMO's drafted	<b>BDS, DoA</b> , MoMD&E	Universities, Individual experts, NGOs, IPLCs, CBOs							HL2
6	Enhance Sri Lanka's scientific capacity on biosafety	No of staff trained	<b>BDS</b> , DoA	Universities, Research Institutes							HL2







School children from the Anuradhpura district participated in restoring a degraded tank catchment area. This picture represents the importance of engaging a wide range of stakeholders to achieve the targets listed in this NBSAP.

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# Chapter 4

## Needs for Implementation



## 4.1 Capacity Building

This NBSAP proposes to engage a wide range of stakeholders, from those mandated to conserve biodiversity — such as the Biodiversity Secretariat, the Central Environmental Authority, Department of Wildlife Conservation and the Forest Department — to others — such as the Department of Agriculture, Department of Agrarian Development, Department of Indigenous Medicines and the Department of Fisheries and Aquatic Resources, whose actions profoundly affect biodiversity, as well as the Sri Lanka Tourism Development Authority and the private sector, whose actions also seriously affect biodiversity.

The NBSAP is based on the principles of biodiversity conservation and sustainable use. It is also based on the ecosystem approach and introduces concepts of valuation of biodiversity and ecosystem services, equitable benefit sharing and issues of biosafety.

These concepts are often not known and/or are misunderstood. The phrase ‘ecosystem approach’ is a misnomer, as it implies that the focus is on ecosystems; in reality, it is a holistic approach that balances conservation of biodiversity, its sustainable use, and equitable sharing of benefits arising from the use of natural resources (Box 3). The value of biodiversity among many non-biologists is still understood mainly as the market value of goods (the marketable values of natural resources), but the immense value of ecosystems services aside from provisioning, remains largely unknown. (See Chapter 1, section 1.3 for more details.) The critical link between ecosystems and human well-being that underpins sustainability of livelihoods and development is also rarely articulated and nor even understood.

This is particularly true for those stakeholders whose actions impact biodiversity, but are not mandated with any responsibilities related to conserving biodiversity.

As noted by Chachibaia, 2004, ‘Awareness and knowledge of complex issues arising from the integrated ecosystem approach to biodiversity conservation is still insufficient. The ecosystem approach requires highly integrated policies among and between the agriculture, forestry, energy, trade, transport, financial and other sectors’.

### 4.1.1 Plan for Capacity Development for the Implementation of the NBSAP

This section presents a plan for capacity building needed for the NBSAP. It builds on the National Capacity Needs Self-Assessment for Global Environmental Management funded by the UNDP/GEF and carried out, in 2007, by the Ministry of Environment and Natural Resources (MoENR, 2007b). The reader is referred to the NCSA for a comprehensive capacity needs assessment, but this section deals specifically with the needs for the current NBSAP and its specific targets and actions.



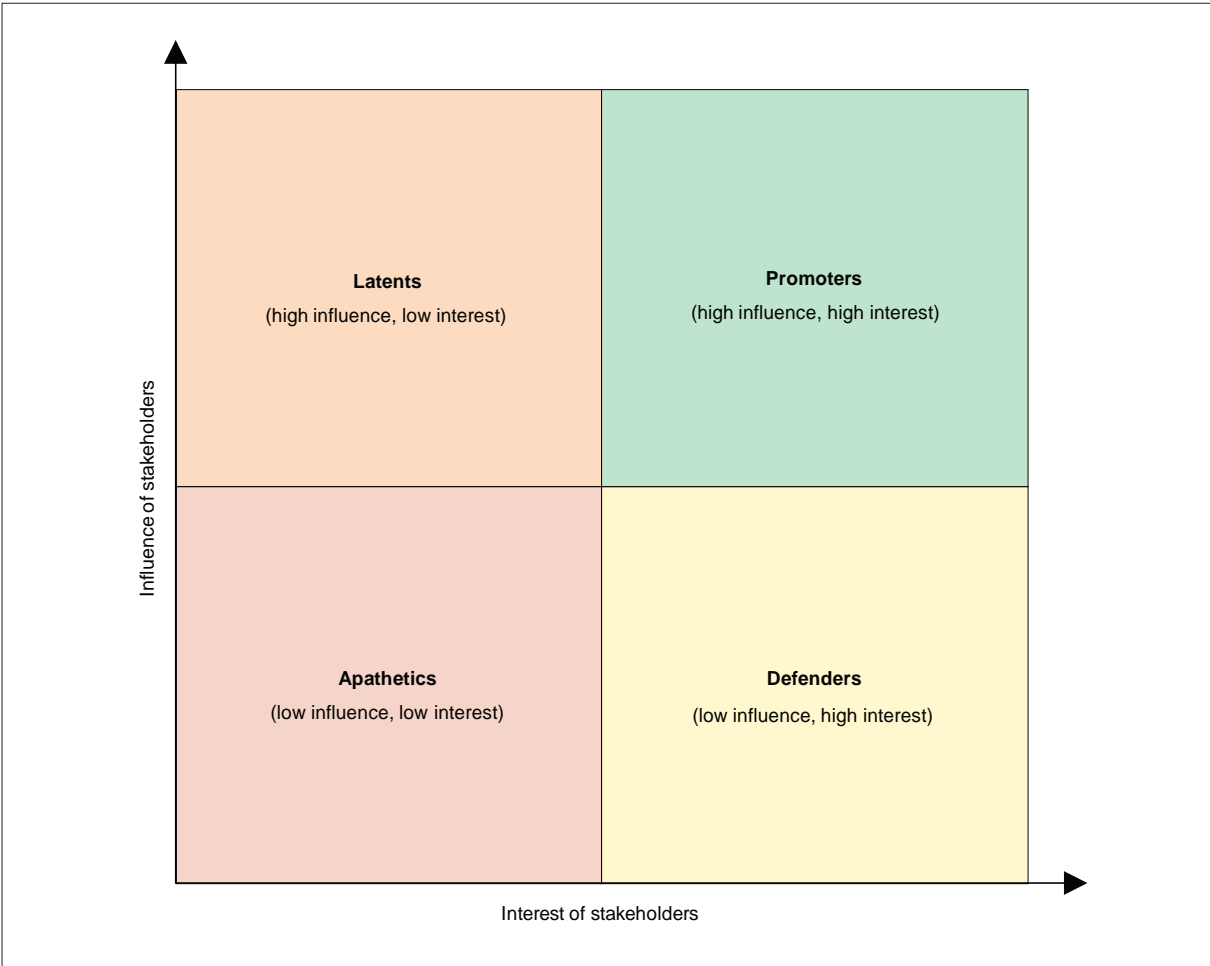
Nadine Perera © IUCN, Sri Lanka

Community Awareness Programme,  
Thirukkivil

Initially, a stakeholder analysis<sup>1</sup> was carried out for all the stakeholders listed in the NBSAP actions, in relation to their capacity to implement the NBSAP. This analysis is presented in Annex 2.

Based on influence and interest gradients, stakeholders can then be graded into four categories and mapped into a matrix (Figure 31):

- **promoters:** target groups who have high influence to effect the changes of the NBSAP, and who have a significant interest in the actions listed in the NBSAP;
- **defenders:** target groups who have little influence to effect the changes of the NBSAP, but who are significantly interested in the actions listed in the NBSAP;
- **latents:** target groups who have high influence to effect the changes of the NBSAP, but who have significantly little interest in the actions listed in the NBSAP;
- **apathetics:** target groups who have little influence on NBSAP, and who have little interest as well in the actions listed in the NBSAP<sup>2</sup>.

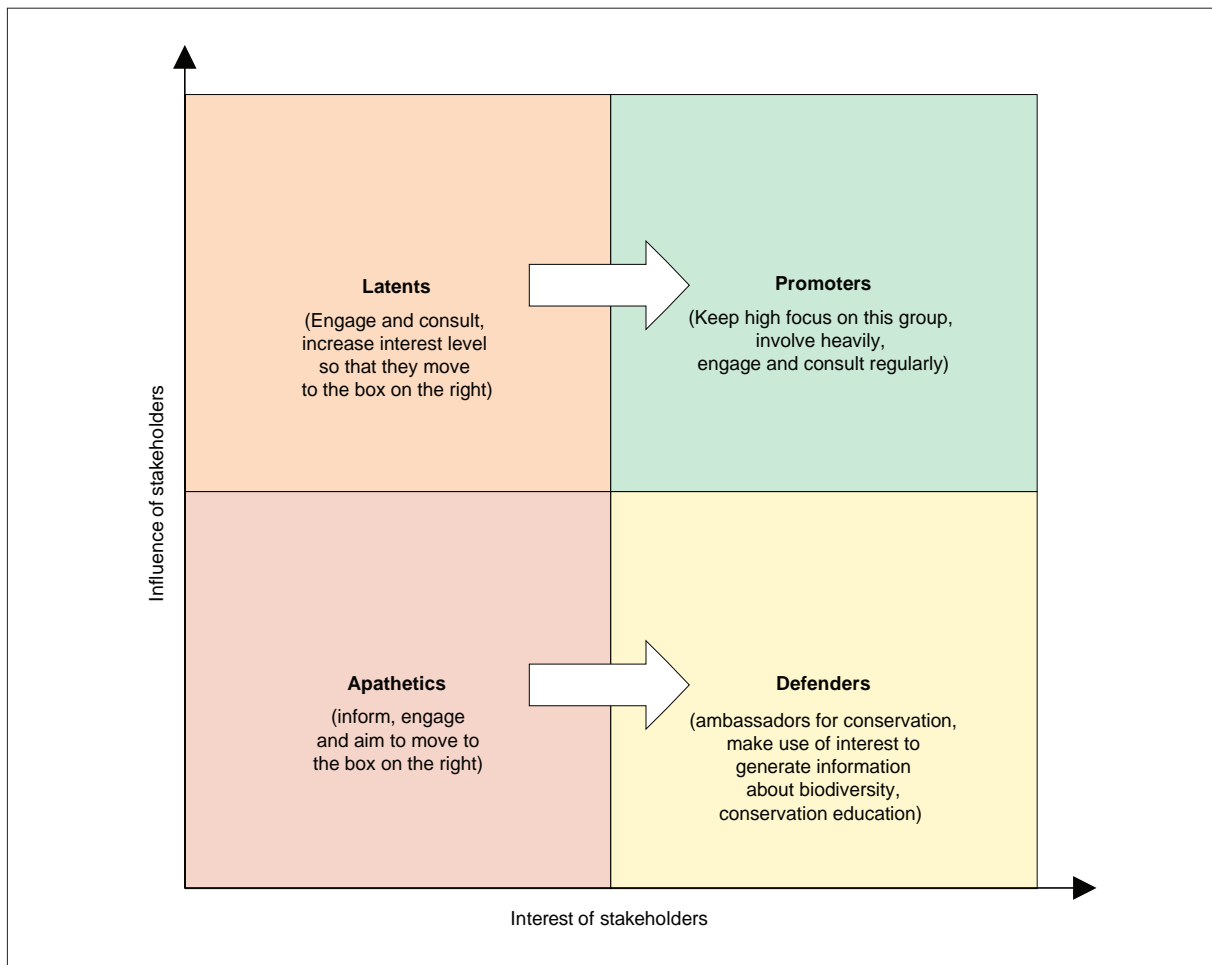


**Figure 31. Matrix of Stakeholders**  
(Source: World Bank, undated)

<sup>1</sup> 'Stakeholder Analysis (SA) is a methodology used to facilitate institutional and policy reform processes by accounting for and often incorporating the needs of those who have a stake or an interest in the reforms under consideration' (World Bank, undated).

<sup>2</sup> In some cases, when either influence or interest was moderate, new categories such as weak promoter or promoter/latent were described.

This categorization allows for the formulation of appropriate strategies for both capacity building and communication in relation to the NBSAP. The idea in both capacity building and communication will be to effectively move all stakeholders to the boxes on the right hand side (Figure 32).



**Figure 32. Matrix of Stakeholder Engagement**  
(Source: World Bank, undated)

Once stakeholders were classified into groups, key areas for capacity building were identified from the NBSAP actions and listed by group. These key areas are presented in Table 17.

Proposed capacity building needs for 12, 13, 14 and 15 are areas listed in the NCSA that are reiterated in this document as being critically important as general cross-cutting themes for the implementation of the NBSAP.

Detailed communication and capacity actions per NBSAP action are presented in Annex 3.

**Table 17. Key Capacity Needs by Type of Group**

Light grey highlights refers directly to a capacity need identified in the NCSA  
Other colours refer to the type of target group as shown in Figure 31.

Group	Key capacity need/s	Time frame	Remarks
All (promoters, defenders, latents, apathetics)	1. Introduction to the NBSAP and its actions.		Without complete knowledge and acceptance of the NBSAP, cooperation and collaboration essential for the implementation of the NBSAP will be poor. The introduction will have to be tailored to suit the level of knowledge and interest.
Promoters (including weak promoters, and promoter/latents)			
All promoters	2. Content management of databases, uploading and sharing protocols.		This is essential for safe sharing of data.
All promoters	3. Understanding biodiversity and ecosystem services (BES), valuation of BES (TEEB type), and perverse incentives.		A better understanding of the value of biodiversity, methodology for valuation, as well as about perverse incentives is essential.
All promoters	4. Understanding and application of gap analysis (for research needs, PA sites, species, valuation etc.).		This is an essential prerequisite for a range of activities.
Mandated custodians of biodiversity	5. Understanding and implementation of ecological ecosystem restoration.		Ecological restoration rests on applying principles of ecology to assist ecosystems to recover their health and resilience. It is not mere replanting of vegetation.
Mandated custodians of biodiversity	6. Management of PAs, SMA, CA sites strengthened		This is critical as one of the barriers identified for successful implementation of the NBSAP was the lack of implementation.
All promoters	7. Increasing knowledge and usage of Ecosystem Red Listing		Knowledge of this tool is currently poor.
Climate Change Secretariat, MEPA, CC&CRMD, NARA, includes latents DMC and coastguard	8. Strengthen knowledge of EbA and EcoDRR		Here too the knowledge of EbA and EcoDRR needs to be mainstreamed.

Table 17. Contd.

Group	Key capacity needs	Time frame	Remarks
Departments mandated with <i>ex-situ</i> conservation and related research	9. Improving <i>ex-situ</i> conservation: improving technical knowledge on captive breeding, molecular genetic techniques for improving crops		It is imperative that the capacity in departments mandated with <i>ex-situ</i> conservation is improved thus.
All Promoters	10. Strengthening knowledge about access and benefit sharing of genetic resources, introducing the policy		This is overdue.
BDS, CEA, MoMD&E, universities, individual experts	11. Strengthen knowledge about biosafety, risk assessment and management		In the current climate of global trade, this is critical.
All promoters	12. Improving outreach, training, communication, education and creation of awareness on biodiversity conservation		Improving the capacity to tailor training to suit the audience, including how biodiversity conservation benefits that specific audience, is critically important.  Including outreach and communication as integral to any project is also important. (Conservation education and communication are often not considered at the planning or initial implementation stage. Often, it is carried out as <i>ad hoc</i> activities at the end of a project.)
All promoters	13. Increase capacity to engage and conduct multi-stakeholder platforms		This is critical for cross-sectoral dialogue, cooperation and collaboration.
All promoters	14. Increase professional networking and their capacity in relation to research, funding availability, implementation of laws and other cross-cutting areas		Such professional networks, by themselves, will provide increased technical capacity.

Table 17. Contd.

Group	Key capacity need/s	Time frame	Remarks
<b>Defenders</b>			
Universities and research organisations	15. Increasing research related to the needs of the NBSAP (for example, filling the gaps found in research)		There is an urgent need to increase research on, <i>inter alia</i> , lesser known ecosystems, PAs, ecosystem valuation, threatened species so that this knowledge can feed into decision making, planning and implementation.
Universities and research organisations	16. Improving knowledge on lesser known taxa		Without proper taxonomic assessment it is not possible to develop species inventories.
Universities and research organisations	17. Increasing research on ecosystem valuation		This is critical for ensuring the engagement of the private sector and other sectors that are not directly engaged in biodiversity conservation.
Universities and research organisations	18. Strengthening understanding of the impacts of climate change on species		As above, research is needed for science-based decision-making, planning and implementation.
Universities and research organisations	19. Strengthening research on ethnobiology, traditional practices of biodiversity conservation,		As above, research is needed for science-based decision-making, planning and implementation.
<b>Latents</b>			
All	20. Introduction to why biodiversity is important — including ecosystem services and their values (monetary and otherwise), focusing on the importance to each target group		This is critical for a buy-in, initially to agree that biodiversity conservation is important and then to engage this group in a call to action.
All	21. Understanding biodiversity and ecosystem services (BES), perverse incentives		A better understanding of the value of biodiversity, as well as about perverse incentives is essential.
NIE/UGC	22. Strengthening capacity to include the above in secondary and tertiary curricula		This will ensure that the upcoming cohort of the working population also understand the above.
Local government	23. Understanding and application of Strategic Environmental Assessments		Local government authorities do not always understand the need for SEAs and therefore, this is essential.



**Table 17. Contd.**

<b>Group</b>	<b>Key capacity need/s</b>	<b>Time frame</b>	<b>Remarks</b>
Particularly those involved directly or indirectly with agriculture	24. Strengthening knowledge about agrobiodiversity, on-farm conservation, sustainable agriculture and eco-agriculture so that these can be put into practice		Increasing sustainable practices in agriculture and reducing dependency on chemical intensification is critical.
Particularly those involved directly or indirectly with agriculture	25. Strengthening knowledge of lesser known crop varieties		This will increase crop diversity.
Those involved in the tourism industry	26. Strengthening knowledge about why biodiversity is important for the industry and introduce guidelines to reduce the impact of tourism on natural habitats		
Private sector	27. Strengthen knowledge about biodiversity, its services and its loss, specifically in the private sector for engagement in the implementation of the NBSAP		This is a largely untapped resource.
<b>Apathetics</b>			
All	28. Create awareness about biodiversity, its services and its loss specifically in relation to impacts to each specific target group		This is a group that must not be forgotten.

## 4.2 Communication and Outreach

'The importance of communication, education and public awareness cannot be underestimated. Communication is the key for gaining support for implementing activities towards the conservation and sustainable use of biodiversity. **After all, no one wants to conserve something they do not know about or care about.** Biodiversity will need to become an urgent priority nationally and locally in order for the actions of NBSAPs to be implemented . . . It is unfortunate that even the best national strategies and reports may remain just pieces of paper on a shelf unless the priority issues they address are widely communicated to decision-makers, managers, civil society and the general public. **Only through effective communication will the issues in NBSAPs and national reports truly become national priorities.**' (CBD, 2007, emphasis added).

In post-conflict Sri Lanka, there has been a strong and urgent thrust for infrastructure development, with less focus on the conservation of natural capital. In this current climate, the paradigm of biodiversity conservation, as we know it, has to change. Conservation can no longer be relegated to the mandated custodians of biodiversity — the Department of Wildlife Conservation, the Forest Department and the Central Environmental Authority — *but must be the responsibility of every single citizen of Sri Lanka. It is, therefore, imperative that all stakeholders be made aware of the actions proposed in the NBSAP, so that a larger group of stakeholders may assist in/support these conservation actions.*

### Box 19. Failure of Communicating Conservation

In 2002, the CBD declared 2010 as 'The International Year of Biodiversity' with the main target of achieving 'by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth'. This was also reflected in the Millennium Development Goals (UN, 2015). This target had measurable indicators (CBD 2010e).

Buchart et al.'s study (2010) showed that most indicators of the state of biodiversity showed no change in the rate decline while indicators of drivers of loss had increased. The communication for the International Year of Biodiversity had not been successful. Somehow, the urgency of the problem and the need for integration of conservation concerns into development had not been conveyed effectively to decision-makers with the consequence that there was no engagement in conservation actions (CANARI, 2012).

### 4.2.1 Preliminary Strategy for the Communication and Outreach of the NBSAP

To this end, there needs to be a strategy to disseminate the actions of the strategic action plan to create awareness about the vital importance of biodiversity conservation among the gamut of stakeholders, to sustain this knowledge and to 'mobilize positive action' (CANARI, 2012). It is critical that there is a complete 'buy-in' to conservation across the gamut of stakeholders (CANARI, 2012).

The overarching objective of the communication strategy is to create a national consciousness with regard to biodiversity conservation and facilitate the implementation of the NBSAP.

The communication strategy aims to:

- Use advertising and marketing methods to brand and promote the NBSAP targets among the general public, as well as the gamut of stakeholders, to create awareness about the NBSAP and engage a wide audience;

- Create a clear understanding about the need for biodiversity conservation and the links between ecosystem well-being and human well-being among all stakeholders;
- Engage all sectors, not only those mandated with biodiversity conservation, of government and non-governmental organizations, as well as, inter alia, the private sector, school children and media to recognize the national significance and value of undertaking actions recommended in NBSAP;
- Mainstream biodiversity conservation as a multi-sector, value-added, and benefit-sharing effort to on-going conservation and development efforts; and
- In addition to traditional communication tools, use innovative modern tools — such as social media — to disseminate information related to the NBSAP and biodiversity conservation.

### *Target Audience*

The NBSAP lists primary and secondary stakeholders in each of its actions. These and other stakeholders such as the general public and media are presented in Annex 2, categorised after a stakeholder analysis according to their interest and influence in relation to the NBSAP. These stakeholders will comprise the target audience.

The communication strategy, therefore, aims to target individual stakeholders based on their understanding of and interest in biodiversity conservation, and their potential ability to influence the successful implementation of the NBSAP.

### *The Targeted Approach to the Strategy*

The targeted approach to the communication strategy is divided into two sections: The first is the preparatory steps section, which needs priority actions within the first year after acceptance of NBSAP. These steps are vital to make the general public aware of the NBSAP, as well and to ensure their buy-in. They will also serve as a springboard for specific actions of the NBSAP. The second section details communication actions for specific actions of the NBSAP.

1. The approach will initially use marketing methods and social media to create awareness about the NBSAP: its strategic objectives and targets along the lines of the brochure created by the CBD secretariat for the Aichi targets (CBD undated, b: <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>).
2. It will create biodiversity champions among the school children and the private sector in order to ensure wide dissemination of communication actions and buy-in from a wider audience.
3. It will use mass and social media to enlist the widest possible audience in a 'call to action' to elicit positive actions in relation to drivers of biodiversity loss. For example, it is proposed that 'the European Union 52 tips for biodiversity' (Royal Institute of Natural Sciences of Belgium, 2009) is adapted to suit Sri Lanka and its problems of biodiversity loss and turn it into '12 tips for biodiversity' so that one tip is released per month for the duration of the NBSAP.
4. *In Annex 3 a specific, time-bound communication action, in tandem with a capacity building action, is presented for each action of the NBSAP and its identified target group. These communication actions have their own indicators that will allow for monitoring. These are only preliminary suggestions. Each action will have to be reviewed and fleshed out by running it against checklists detailed in Hesselink et al. (2007), to ensure that the message has all the elements necessary and reaches the target audience in the most effective way.*

### *Key Expected Results of the Strategy*

#### 1. Awareness and Capacity of Stakeholders are improved

In concert with the proposed capacity building, the main aim of the communication strategy is to improve the understanding and capacity through consistent and accurate messaging and information, as well as developing a national consciousness and responsive positive action in relation to biodiversity. The creation of awareness has been differentiated based on the specific NBSAP actions and will need to be tailor-made to suite each target group for the proposed action.

#### 2. The mainstreaming of the NBSAP is supported

As noted above, the communication strategy is aimed raising the national consciousness on the topic of biodiversity conservation. By doing so it engages all stakeholders and sensitises them to mainstream biodiversity conservation sensitivities into their organizations approaches, work plans, and budgets. It is hoped that this communication strategy will not only facilitate mainstreaming NBSAP into organizational work plans but also make biodiversity conservation a cultural way of governance.

#### 3. Knowledge management and dissemination are facilitated

The NBSAP activities will generate considerable knowledge, best practices and lessons. This information and knowledge on biodiversity conservation needs to be generated and shared widely using the range of tools and activities currently available in order to maximize the reach of the communication strategy. This will become a positive cycle of reinforcement, further enabling and stimulating interest in biodiversity conservation and further enabling effective mainstreaming of management efforts.

## **4.3 Resource Mobilization**

Investment in biodiversity and ecosystems is being increasingly recognized by Sri Lanka as an efficient and effective way of meeting sustainable development goals. The Haritha Lanka programme, Sri Lanka NEXT and REDD readiness initiatives provide necessary guidance. The NBSAP 2016-2022 will be the overarching strategy and action plan for Sri Lanka to achieve national biodiversity targets, based on the ambitious Aichi targets agreed by parties to the CBD in 2010. Realization of the targets depends on the allocation of resources. Therefore, the detailed costing of activities to achieve the NBSAP targets, availability of resources and the resource gaps need to be assessed as an immediate step for implementation of the NBSAP for Sri Lanka.

### **4.3.1 Road Map for Resource Mobilization for NBSAP Implementation**

Currently, a project by the GoSL with support from UNDP, has been commenced for this purpose — BIOFIN, the biodiversity finance initiative. A detailed resource mobilization plan for the NBSAP will be developed separately under that initiative.

#### **Principle behind Resource Mobilization**

Investment in biodiversity and ecosystem conservation is recognized as investment into sustainable development, as healthy ecosystems generate economic returns through ecosystem services. Therefore, as with investment in development projects, investment in NBSAP towards meeting its targets in timely manner, is essential for sustainable development in Sri Lanka. The resource mobilization plan will set the mechanism for financing the NBSAP in a coordinated manner.

### ***Strategy for Resource Mobilization***

The responsibility for mobilizing the resources required for the NBSAP implementation lies jointly with the Ministry of Finance and the Ministry of Environment. To realize the NBSAP targets as planned, integration of biodiversity into development planning is essential. As in the past, core national funding will come from the Ministry of Mahaweli Development and Environment and the Ministry of Sustainable Development and Wildlife. Other national non-core funding will come from the other ministries and government agencies mandated for other areas with a bearing on biodiversity. Additional local funding will come from various foundations and NGOs. The main external funds will come from multilateral agencies and bilateral agencies, of which, GEF funding will be a significant component. In order to ensure that the NBSAP is adequately financed, all internal and external funders should be satisfied that they are addressing the priorities identified in the NBSAP and contributing to achieving the set of NBSAP targets. By way of mainstreaming biodiversity into development sectors, the BDS and the Finance Ministry will have to ensure that all new development projects include substantial allocations for investments in biodiversity.

### ***Approach to Resource Mobilization***

All actions proposed by the NBSAP will need to be costed with the engagement of BDS and other key stakeholders such as the Ministry of Sustainable Development and Wildlife, FD and DWC. There is a baseline of funding that will be received as budget allocation for the core biodiversity agencies (such as BDS, MoSDW, FD and DWC). The NBSAP will require that non-line agencies (such as MASL, Mol, DoA and ID) also receive allocations for biodiversity-related work.

Similarly, the available external funding for biodiversity — including GEF allocations, other bilateral funding and multilateral funding for biodiversity — will need to be assessed.

The contribution to biodiversity of local foundations, local and international NGOs, and the private sector will also have to be ascertained.

Finally, the total financial gap between meeting the NBSAP's requirements and the combined 'business as usual' scenario can be calculated.

### ***Budget estimate for implementing the NBSAP 2016-22***

The table below provides summary budget estimates for implementing NBSAP for each target. Estimates at action level is presented in Annex 4. These budget estimates must be considered as indicative figures in current Sri Lankan rupees based on several assumptions stated below. They were arrived at as incremental costs for implementing the current NBSAP, mainly by government agencies, without including their recurrent expenditure into the calculations. These figures were finalized through consensus reached by the NBSAP preparatory team, with the use of best available information at the time of NBSAP finalization.

Because the UNDP led Biofin project has already commenced — specifically to develop resource mobilization plan for the NBSAP — and will be completed in next 18 months, it is expected that this initiative will generate more precise estimates for each activity of the NBSAP.

Therefore, it is recommended the budget estimates presented in this document to be used as indicative figures merely for planning purposes. Once more accurate figures are generated by the Biofin project, those estimates will supersede the estimates given in Table 18.

**Table 18. Summary Budget Estimates for Implementing the NBASP 2016-22**

No	NBSAP 2016-22 Target	Estimated budget (in Mn LKA)
1	Target 1: By 2022, a system established and ongoing for inventorising species (taxonomy conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision making	444.50
2	Target 2: By 2022, habitat loss, degradation and fragmentation are significantly reduced	1,804.00
3	Target 3: By 2022, the PA network is made representative of all critical ecosystems and species and managed effectively	123.00
4	Target 4: By 2022, the loss of species is significantly reduced	1,207.35
5	Target 5: By 2022, the valuation of biodiversity is mainstreamed	51.00
6	Target 6: By 2022, mechanisms are established to ensure sustainable use of biodiversity	126.50
7	Target 7: By 2022, traditional sustainable uses of biodiversity are promoted and established	29.00
8	Target 8: By 2022, sustainable agriculture practices are promoted and established.	50.00
9	Target 9: By 2022, genetic diversity of crop wild relatives, cultivated species and livestock is conserved.	176.00
10	Target 10: By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established and implemented	7.00
11	Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced	300.00
12	Target 12: By 2022 Biosafety is assured	12.00
	<b>Total budget</b>	<b>4,330.35</b>



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## **Possible Financing Mechanisms**

Once the financing gap is identified for different strategies in the NBSAP, financing mechanisms to bridge the gap will need to be identified. One way of meeting the financial gap is to design innovative financing mechanisms.

Implementation of non-traditional and innovative financial mechanisms will be the key to successful achievement of the NBSAP targets. The following are some of the potential mechanisms that could be implemented in Sri Lanka.

### *Bio-prospecting*

Bio-prospecting is 'the exploration of biodiversity for commercially valuable genetic and biochemical resources' (CBD, 2000b). However, its definition varies in scope among countries, with some defining bio-prospecting narrowly to include only the search for valuable genetic materials, whereas others encompass the development and application of such materials. For Sri Lanka to benefit, a legal framework for access and benefit sharing has to be in place, and enhanced negotiation skills developed. A National Policy on Access to Biological Resources, sustainable Use and Benefit Sharing has been formulated with 'the goal of ensuring conservation and sustainable use of biological resources and the fair and equitable sharing of benefits arising from them' (MoERE, 2013). A law/framework law has yet to be enacted, as opinions on whether such a law is needed are sharply divided.

Article 15, section 7 of the CBD reads 'Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 and 19 and, where necessary, through the financial mechanism established by Articles 20 and 21 with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms' (CBD, 1992).

Sri Lanka has completed a policy on access and benefit sharing (MoERE, 2013). Currently, a Material Transfer Agreement for Research and Development has been finalized. It is currently proposed that provisions of the FFPO and FCO be strengthened to address the weaknesses in legislation in relation to access and benefit sharing.

It is imperative that Sri Lanka has some regulations or legislation to prevent *a priori* bio-piracy or bio-theft described in Box 20, where regulations were applied *a posteriori*, after the damage had been done.

Sri Lanka will also have to ratify the Nagoya Protocol, of the Convention on Biological Diversity, which deals with access to genetic resources and the fair and equitable sharing of benefits arising from their use.

In addition capacity building related to the Nagoya Protocol, a clear understanding of the policy and regulations/provisions, once enacted is needed.

Without such controls in place, Sri Lanka will continue to fall prey to bio-theft and bio-piracy. (See box below.)

## Box 20. Bio-piracy and Bio-theft

The negative side of bio-prospecting is that, without controls, it can lead to bio-theft and bio-piracy. Bio-theft is the theft of biological materials from one country by another country. Bio-piracy also includes the theft of intellectual property rights and the traditional cultural knowledge that accompanies it (Gunawardena person. comm.). Bio-piracy has negative effects on biodiversity, such as the extinction of endemic species, depletion of biodiversity and privatization of the biological wealth of a country. Bio-piracy seeks complete control (patents or intellectual property) over these resources and knowledge (Etc Group, undated). Developing countries which are rich in biological resources are susceptible to bio-piracy and related problems.

In Sri Lanka, the case of *Salacia reticulata*, long used in Sri Lanka by the Ayurveda system of medicine to control diabetes, is good example of bio-piracy. Before a total ban of exports in 2006, plants had been exported heavily, mainly to Japan. It is reported that 136 applications and patents are pending for this species (Gunawardena person. comm.).

Two proteins from the venom of the saw-scaled viper (*Echis carinatus*) have also been patented as coagulants (Gunawardena person. comm.).

The above examples clearly indicate why the enactment of a law for the fair and equitable sharing of benefits is urgently needed.



Sampath de Alwis Goonatilake © IUCN, Sri Lanka

Comorants and Pelicans, Padaviya Tank



*Payments for Ecosystem Services (PES)*

Every ecosystem is not assessed nor valued. Therefore, there is no mechanism to identify the value of services that they provide to the society. Payments for Ecosystem Services (PES) aim to fill this gap by creating new marketplaces for ecosystem services, such as carbon sequestration, biodiversity conservation, watershed protection and landscape values. In the most commonly-accepted definition of PES, as given by Wunder (2005), 'PES is a voluntary transaction whereby a well-defined ecosystem service (ES) is 'bought' by a minimum of one ES buyer from a minimum of one ES provider if and only if, the ES provider continually secures the ES provision' (i.e. with an element of conditionality).

Water and biodiversity-related services have greater demand and by PES, people try to maintain the most significant ecological systems without degrading them.

*Ongoing projects*

Selected ongoing biodiversity-related projects are presented in Table 19.

**Table 19. Selected Ongoing Biodiversity-related Projects**

#	Project name	Duration	Implementing agency	Reach	Amount US\$
1	Mainstreaming agrobiodiversity conservation and Use in Sri-Lankan agro-ecosystems for livelihoods and adaptation to climate change	December 2012 -December 2017	Plant Genetic Resource Centre of Department of Agriculture	National agriculture policy, government agencies and local farmers	4,683,820
2	Mainstreaming biodiversity conservation and sustainable use for improved human nutrition and well-being	November 2011 – October 2016	Plant Genetic Resource Centre of Department of Agriculture	National food and nutrition policy, government agencies including the Department of Education, school children and general public	3,506,993
3	Implementation of the National Biosafety Framework in accordance with the Cartagena Protocol on Biosafety	Project is in PPG stage	To be decided	Expected to reach national policy as well as local farmers	5,000,000
4	National Biodiversity Planning to Support the Implementation of the CBD 2011-2020 Strategic Plan in Sri Lanka	2013 – 2016,	Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment	Conservation policy	200,000
5	The pricing the biodiversity of the Island	2012 – 2016	Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment	National policy and practitioners of environmental valuation and planners	140,285

**Table 21. Contd.**

6	Enhancing biodiversity conservation and sustenance of ecosystem services in environmentally sensitive areas	2015-2019	UNDP	National policy and Local level planners of the Land Use Policy Planning Department	2,626,690
7	Ecosystem Conservation and Management Project (ESCAMP)	2016-2021	Department of Wildlife Conservation and the Forest Department	Conservation oriented departments, local communities	40,000,000



Naalin Perera ©/UCN, Sri Lanka

Separating Chaff from Paddy — the Traditional Way

Most grass-root communities — such as these two community members, representing the Massalawa Tank Village in Anuradhapura — directly depend on ecosystems services. They are most vulnerable to the impacts of climate change, degradation of ecosystems and loss of species, as these affect the ecosystem services upon which they depend. During monitoring and evaluation on the implementation of the NBSAP, it is critical that their needs are not ignored.



# Chapter 5

## Coordination, Monitoring, Evaluating and Reporting



## 5.1 National Coordination and Reporting Format

The national coordination of the implementation of the NBSAP will be carried out by the BDS of the Ministry of Mahaweli Development and Environment. The Biodiversity Experts Committee will serve as in a supervisory and advisory capacity to provide overall guidance and will meet every three months to review progress and offer guidance. (See section 5.3). In addition, it is proposed that a steering committee be set up comprising the identified line agencies, as well as representatives from the Ministry of Finance. The steering committee will be expected to meet twice a year to review work plans and find solutions to barriers that may arise during the implementation phase. It is proposed that the steering committee will also facilitate coordination among line agencies, where such coordinated actions are required to achieve a specific output.

The implementation of the NBSAP will be subject to reporting requirements on the progress achieved, depending on the decision by the COP. During the period of implementation, regular national reports will be submitted. It is expected that the national report preparation will be carried out in connection with monitoring and evaluation conducted by the M&E sub-committee (See Section 5.3) as well as with independent data collection against the indicators identified in the NBSAP.

Through this hierarchical mechanism (Figure 33), it is envisaged that many of concerns related to organizational inadequacies under section 1.5.8 of Chapter 1 will be addressed.

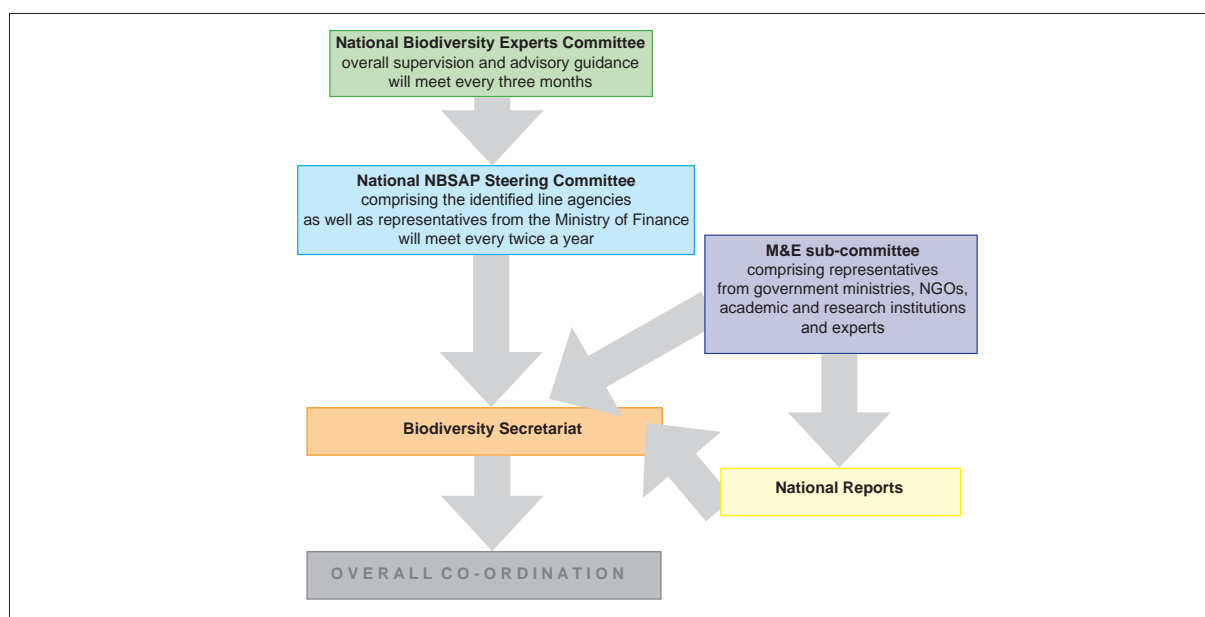


Figure 33. Proposed Hierarchical Co-ordination

## 5.2 Biodiversity Clearing-House Mechanism

When the Convention on Biological Diversity was established in 1992, it was understood that scientific knowledge and technological information would have a vital role to play in the implementation of the Convention. As the expertise in managing information and technology varies enormously from country to country, the Convention established a Clearing-House Mechanism to ensure that all parties have access to the information and technologies they need for their work on biodiversity.

CBD COP4, in its decision IV/2 (CBD, 1998), requested all Parties to develop their national CHMs and to link these to the central CHM at the CBD Secretariat. At COP 10, the CHM strategy was aligned to the overall Strategic Plan for Biodiversity 2011-2020 (decision X/15) (CBD, 2010g). The aim was to contribute significantly to the implementation of the Convention on Biological Diversity and its Strategic

Plan for Biodiversity 2011-2020, through effective information services and other appropriate means, in order to promote and facilitate scientific and technical cooperation, knowledge sharing and information exchange, and to establish a fully operational network of parties and partners.

Sri Lanka has initiated a process to develop its own National Clearing House Mechanism with technical assistance from the South Asia Co-operative Environmental Programme (SACEP). Relevant data and information on Sri Lanka's biological diversity have been collected from various sources. A suitable domain for the CHM website has been obtained and an interface for the CHM website created. Development of the national CHM website is in its final stage.

In order to ensure the sustainability and updating of the CHM website, the Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment (the national focal point for the CBD), has been equipped with the necessary IT equipment. A separate CHM cell will be established in the Biodiversity Secretariat and the staff will be trained for smooth functioning of the CHM cell, which will maintain an up-to-date national biodiversity CHM.

### ***5.3 Supervision of and Advice for the Implementation of the NBSAP***

The Biodiversity Expert Group Committee will function in the role of overall supervision for the implementation of the NBSAP and provide technical and other advice. They will be expected to meet every three months, assess progress and proposals and provide overall guidance to implementation.

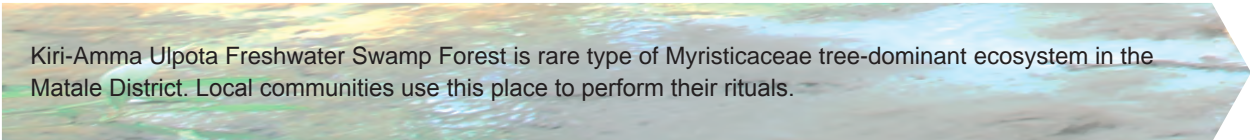
### ***5.4 Monitoring and Evaluation***

For the NBSAP to make a real difference, progress needs to be tracked through robust, integrated and regular monitoring, and changes need to be implemented when evidence suggests current approaches are ineffective. For this purpose it is proposed that a monitoring and evaluation sub-committee (M&E) be established within the Biodiversity Secretariat (BDS) of the Ministry of Mahaweli Development and Environment. The sub-committee should comprise representatives from government ministries, NGOs, academic and research institutions and experts, as identified by the BDS.

It is expected that the M&E sub-committee will ensure effective monitoring and evaluation by devising mechanisms for regular monitoring and periodic assessment of biodiversity related interventions at various levels. It is also expected that this sub-committee will co-ordinate with government and non-government agencies to obtain progress status, outcomes and learning from their biodiversity related projects and programmes, annually. The sub-committee should meet at least twice a year to assess overall progress and draw lessons, and annually submit a report to the BDS.

The specific tasks assigned to the M&E sub-committee include:

- i. developing a robust monitoring and evaluation system by 2017;
- ii. carrying out regular monitoring meetings twice a year;
- iii. carrying out a full evaluation at least two times during the implementation phase (preferably in 2019 and 2022) ; and
- iv. conducting regular monitoring, sharing and capacity building, activities.



Kiri-Amma Ulpota Freshwater Swamp Forest is rare type of Myristicaceae tree-dominant ecosystem in the Matale District. Local communities use this place to perform their rituals.

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# Citations





Ashton, P.S., and Gunatilleke, C.V.S. (1987). New light on the plant geography of Ceylon. I. Historical plant geography. *Journal of Biogeography* 14: 249-285.

Athulathmudali, S., Balasuriya, A. and Fernando, K. (2011). An Exploratory Study on Adapting to Climate Change in Coastal Areas of Sri Lanka. *Working Paper no 02/2011 NTNU Globalization Research Programme*. Trondheim: NTNU Globalization Research Programme. 46 pp.

Bandara, R. and Tisdell, C. (2005). The History and Value of the Elephant in Sri Lankan Society. Working Paper No. 133, *Economics, Ecology and the Environment*. 25: 1-21.

Basanyake, B .R. S. B. (2007). Climate change. Pp 54-55 in *The National Atlas of Sri Lanka*. Colombo: Government Press. 170 pp.

Basnayake, B. R. S. B., Fernando, T.K., and Vithanage, J.C. (2002). Variation of air temperature and rainfall during Yala and Maha agricultural seasons. *Proceedings of the 58<sup>th</sup> Annual Session of Sri Lanka Association for the Advancement of Science (SLASS)*. Section E, 1:212.

BDS, MoENR (2009). *Sri Lanka's Fourth National Report to the Convention on Biological Diversity*. Colombo: Biodiversity Secretariat, Ministry of Environment & Renewable Energy. xxi+150 pp.

BDS, MoERE (2014). *Sri Lanka's Fifth National Report to the Convention on Biological Diversity 2014*. Colombo: Biodiversity Secretariat, Ministry of Environment & Renewable Energy. xxi+128 pp.

BDS, MoMD&E (2016). *Food Mandala*. Unpublished case study.

Biodiversity for Food and Nutrition (B4FN)(undated). *Harnessing agricultural biodiversity to reduce hunger and malnutrition*. [http://www.b4fn.org/fileadmin/templates/b4fn.org/upload/documents/Flyers/BFN\\_flyer\\_new.pdf](http://www.b4fn.org/fileadmin/templates/b4fn.org/upload/documents/Flyers/BFN_flyer_new.pdf). Accessed 12<sup>th</sup> May 2016.

BOBLME (2011). Status of Marine Protected Areas and Fish Refugia in the Bay of Bengal Large Marine Ecosystem Country report on pollution — Sri Lanka. *BOBLME-2011-Ecology-10*. <http://www.boblme.org/documentRepository/BOBLME-2011-Ecology-10.pdf>. Accessed 2<sup>nd</sup> May 2016.

BOBLME (2013). Country report on pollution — Sri Lanka. *BOBLME-2011-Ecology-14*. <http://www.boblme.org/documentRepository/BOBLME-2011-Ecology-14.pdf>. Accessed 2<sup>nd</sup> May 2016.

Bournazel, J., Kumara, M. P., Jayatissa, L. P., Viergever, K., Morel, V., and Huxham, M. (2015). The impacts of shrimp farming on land-use and carbon storage around Puttalam lagoon, Sri Lanka. *Ocean & Coastal Management* 113: 18-28.

Briggs, J. C. (2003). The biogeographic and tectonic history of India. *Journal of Biogeography* 30: 381–388.

Burgiel, S. W. and Muir, A. A. (2010). Invasive Species, Climate Change and Ecosystem-Based Adaptation: Addressing Multiple Drivers of Global Change. Washington, DC, US, and Nairobi, Kenya: *Global Invasive Species Programme (GISP)*. 56 pp.

Burney, J. A., Davis, S. J., and Lobell, D B. (2010). Greenhouse gas mitigation by agricultural intensification. *PNAS* 106 (26): 12052–12057.

Butchart, S. H. M., Walpole, M., Collen, B., van Strien, A., Scharlemann, J. W. P., Almond, R. E. A., Baillie, J. E. A., Bomhard, B., Brown, C., Bruno, J., Carpenter, K. E., Carr, G. M., Chanson, J., Chenery, A. M., Csirke, J., Davidson, N. C., Dentener, F., Foster, M., Galli, A., Galloway, J. M., Genovesi, P., Gregory, R.D., Hockings, M., Kapos, V., Lamarque, J. F., Leverington, F., Loh, J., McGeoch, M. A.

McRae, L., Minasyan, A., Hernández Morcillo, M., Oldfield, T. E. E., Pauly, D., Quader, S., Revenga, C., Sauer, J. R., Skolnik, B., Spear, D., Stanwell-Smith, D., Stuart, S. N., Symes, A., Tierney, M., Tyrrell, T. D., Vié, J. C. and R. Watson (2010). Global Biodiversity: Indicators of Recent Declines. *Science* 328: 1164-1168.

Calder, J. (2009). *Worldislandinfo.com*. <http://www.worldislandinfo.com/LARGESTV1.html>. Accessed 28<sup>th</sup> Mar 2016.

CANARI (2012). *Communicating for Conservation: A communication toolkit for Caribbean civil society organisations working in biodiversity conservation*. <http://www.cepf.net/SiteCollectionDocuments/caribbean/CANARICommunicatingforConservation-toolkit2012.pdf>. Accessed 13<sup>th</sup> Nov 2015.

Cardinale, B. J., Duffy, E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., Narwani, A., Mace, G.M., Tilman, D., Wardle, D.A., Kinzig, A.P., Daily, G.C., Loreau, M., Grace, J.B., Larigauderie, A., Srivastava, D., and Naeem, S. (2012). Biodiversity loss and its impact on humanity. *Nature* 486 (7401): 59-67.

CBD (1992). *The Convention on Biological Diversity*. <https://www.cbd.int/doc/legal/cbd-en.pdf>. Accessed 28<sup>th</sup> Mar 2016.

CBD (1998). *COP decision IV/2: Review of the operations of the clearing-house mechanism*. <https://www.cbd.int/doc/decisions/cop-04/cop-04-dec-02-en.pdf>. Accessed 8<sup>th</sup> May 2016.

CBD (2000). *COP 5 Decision V/6. Ecosystem approach*. <https://www.cbd.int/decision/cop/default.shtml?id=7148>. Accessed June 8<sup>th</sup> 2016.

CBD (2000b). *COP 5 decision IV/4, IV/5, IV/7 Information on marine and coastal genetic resources, including bioprospecting*. <https://www.cbd.int/doc/meetings/cop/cop-05/information/cop-05-inf-07-en.pdf> Accessed 12<sup>th</sup> May 2016.

CBD (2007). *Communication Strategy for Issues in NBSAPs. Module B-7. Version 1 – July 2007*. <https://www.cbd.int/doc/training/nbsap/b7-train-communication-strategy-nbsap-en.pdf>. Accessed 13<sup>th</sup> Nov 2015.

CBD (2008). *COP12 decision IX/20. Marine and coastal biodiversity*. <https://www.cbd.int/doc/decisions/cop-09/cop-09-dec-20-en.pdf>. Accessed 8<sup>th</sup> May 2016.

CBD (2010a). *Aichi Biodiversity Targets*. <https://www.cbd.int/sp/targets/>. Accessed 30<sup>th</sup> April 2016.

CBD (2010b). *About the Nagoya Protocol*. <https://www.cbd.int/abs/about/default.shtml/>. Accessed 11<sup>th</sup> May 2016.

CBD. (2010c). *Value of Biodiversity and Ecosystem Services*. <https://www.cbd.int/2010/biodiversity/>. Accessed 28<sup>th</sup> Mar 2016.

CBD (2010d). *Introduction to access and benefit-sharing*. <https://www.cbd.int/abs/infokit/brochure-en.pdf>. Accessed 30<sup>th</sup> April 2016.

CBD (2010e). *United Nations International Year for Biodiversity*. <https://www.cbd.int/2010/welcome/>. Accessed 13<sup>th</sup> Nov 2015.

CBD (2010g). *COP 10 decision X/15: Scientific and technical cooperation and the clearing-house mechanism*. <https://www.cbd.int/doc/decisions/cop-10/cop-10-dec-15-en.pdf>. Accessed 12<sup>th</sup> May 2016.

CBD (2014). *COP 12 decision XII/22: Marine and coastal biodiversity: ecologically or biologically significant marine areas (EBSAs)* <https://www.cbd.int/doc/decisions/cop-12/cop-12-dec-22-en.pdf>. Accessed 8<sup>th</sup> May 2016.

CBD (2015a). *Report of the Expert Group on the Repatriation of Traditional Knowledge Relevant to the Conservation and Sustainable Use of Biological Diversity* UNEP/CBD/WG8J/9/INF/4, 2015. <https://www.cbd.int/doc/meetings/tk/wg8j-09/information/wg8j-09-inf-04-en.pdf>. Accessed 9<sup>th</sup> May 2016.

CBD (2015b). *BD Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (EBSAs) in the North-East Indian Ocean region, and Training Session on EBSAs*. Accessed <https://www.cbd.int/doc/?meeting=EBSAWS-2015-01>. Accessed 12<sup>th</sup> May 2016.

CBD (2016a). *Compilation of Experiences and Lessons Learned from Scientific Methodologies and Approaches for the Description of Areas Meeting the EBSA Criteria*. UNEP/CBD/SBSTTA/20/INF/2. <https://www.cbd.int/doc/meetings/sbstta/sbstta-20/information/sbstta-20-inf-20-en.pdf>. Accessed 9<sup>th</sup> May 2016.

CBD (undated a). *Sustainable Use of Biodiversity*. <https://www.cbd.int/sustainable/>. Accessed 12<sup>th</sup> May 2016.

CBD (undated b). *Brochure on Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets “Living in Harmony with Nature”* <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>. Accessed 12<sup>th</sup> May 2016.

CBD (undated c). *The Champions and their Pledges*. <https://www.cbd.int/champions/list/>. Accessed 12<sup>th</sup> May 2016.

CCS, MoE (2010). *National Climate Change Adaptation Strategy for Sri Lanka 2011-2016*. Battaramulla, Sri Lanka: CCS, MoE. 75 pp.

CCS, MoERE (2011). *Technology Needs Assessments and Technology Action Plans for Climate Change Adaptation: technological needs assessment*. Battaramulla, Sri Lanka: MoERE. 343 pp.

CCS, MoERE (2011). *Technology Needs Assessments and Technology Action Plans for Climate Change Adaptation: barrier analysis and enabling framework*. Battaramulla, Sri Lanka: MoERE. 265 pp.

CCS, MoMD&E (2015). *National Adaptation Plan for Climate Change Impacts in Sri Lanka*. Battaramulla, Sri Lanka: CCS, MoMD&E. 159 pp.

CEA (2013). *Environmental Protection Areas of Sri Lanka*. <http://www.cea.lk/web/index.php/en/environmental-protection-areas-of-sri-lanka>. Accessed 12<sup>th</sup> May 2016.

CEA (undated). *National Solid Waste Management Program in Sri Lanka*. [http://www.unescap.org/sites/default/files/6\\_CEA.pdf](http://www.unescap.org/sites/default/files/6_CEA.pdf). Accessed 10<sup>th</sup> May 2016.

CENARA (2010). *Fisheries Management Plan for the Shrimp fishery in the North West Coast (Puttalam and Mannar Districts) Fisheries Management Area (NWC/FMA)*. CENERA project, NARA. 25 pp.

Chachibaia, K. (2004). Capacity Development for Global Environmental Management: UNDP: Lessons, Tools and Approaches. pp 7-11 (eds.) Korn, H., Schliep, R. and Epple, C. *Report of the International Workshop Capacity-Building for Biodiversity in Central and Eastern Europe*. 104 pp. <https://www.bfn.de/fileadmin/MDB/documents/skript121.pdf>. Accessed 1<sup>st</sup> Mar 2016.

Chandrapala, L. (1996). Long term trends of rainfall and temperature in Sri Lanka. In: *Climate variability and agriculture*. Pp 153-162 in (eds.) Abrol, Y. P., Gadgil, S., and Pant, G. B. New Delhi, India: Narosa Publishing House.

Chapman, V. J. (1947). The application of aerial photography to ecology as exemplified by the natural vegetation of Ceylon. *The Indian Forester* 73: 287-314.

CI (Conservation International) (2016). *The Biodiversity Hotspots*. <http://www.cepf.net/resources/hotspots/Pages/default.aspx>. Accessed 30<sup>th</sup> April 2016.

Colls A., Ash, N. and Ikkala, N. (2009). *Ecosystem-based Adaptation: a natural response to climate change*. Gland, Switzerland: IUCN. 16pp. [http://cmsdata.iucn.org/downloads/iucn\\_eba\\_brochure.pdf](http://cmsdata.iucn.org/downloads/iucn_eba_brochure.pdf). Accessed May 3<sup>rd</sup> 2016.

Community Protocols (2011). *Community Protocols*. [www.community-protocols.org](http://www.community-protocols.org). Accessed 12<sup>th</sup> May 2016.

Cooray, P. G. (1984). *An Introduction to the Geology of Sri Lanka (Ceylon)*. 2<sup>nd</sup> revised edition. Colombo: National Museums of Sri Lanka. xix + 340 pp.

CZMP (Coast Zone Management Plan)(2006). Revised Coastal Zone Management Plan. Sri Lanka. Part 1 (Sec 1) *Gazette extraordinary of the Democratic Socialist Republic of Sri Lanka*. <http://www.coastal.gov.lk/downloads/pdf/CZMP%20English.pdf>. Accessed 2<sup>nd</sup> May 2016.

Dayaratne, P., Linden, O., and De Silva, M. W. R. (Eds.). (1997). *The Puttalam/Mundel Estuarine Systems and Associated Coastal Waters. A report on environmental degradation, resource management issues and options for their solution*. Colombo: NARA and NARESA. 98 pp.

de Costa, W. A. J. M. (2008). Climate change in Sri Lanka: myth or reality? Evidence from long-term meteorological data. *Journal of the National Science Foundation of Sri Lanka* 36 *Special Issue*: 63-88.

DeGeer, M. E. (2003). Biopiracy: The Appropriation of Indigenous Peoples' Cultural Knowledge. *New England Journal of International and Comparative Law*. 9:179.

de Rosayro, R. A. (1950). Ecological conceptions and vegetational types with special reference to Ceylon. *Tropical Agriculturist* 101: 108-121.

Department of Census and Statistics (2015). Population. *Statistical abstract 2015*. <http://www.statistics.gov.lk/Abstract2015/CHAP2/2.1.pdf>. Accessed 12<sup>th</sup> May 2016.

DAD (Department of Agrarian Development) (2011). *Watersheds of Sri Lanka*. First edition. Colombo; Department of Agrarian Development. i+97pp.

Deraniyagala, S. (1986). Pleistocene Coastal Sediments in the Dry Zone of Sri Lanka. Chronology, Paleoenvironment and Technology. *Ancient Ceylon* (6): 49-62.

Dhanasri, G., Reddy, M. S., Naresh, B. and Cherku, P. D. (2013). Micropropagation of *Salacia reticulata* — an Endangered Medicinal Plant. *Plant Tissue Culture and Biotechnology* 23(2): 221-229.

Dharmasena, P. and Bhat, M.S. (2011). Assessment of Replacement Cost of Soil Erosion in Uva High Lands Tea Plantations of Sri Lanka. *Current World Environment* 6 (2): 241-246.

DMC (Disaster Management Centre) (2012). Sea Level Rise. *Hazard Profiles of Sri Lanka*. <http://www.dmc.gov.lk/hazard/hazard/Sea%20Level%20Rise.html>. Accessed 12<sup>th</sup> May 2016.

DWC (2015). *Map of protected areas*. Unpublished.

DWC (2016). *Data on the extents of protected areas*. Unpublished.

Earth Day Network (2013). A Billion Acts of Green®. <http://www.earthday.org/2013/09/03/billion-acts-green-reduce-ecological-footprint/>. Accessed 12<sup>th</sup> May 2016.

Edirisinghe, E. A. P. N., Ariyadasa K. P. and Chandani R. P. D. S. (2012). Forest cover assessment in Sri Lanka. *The Sri Lanka Forester* 34:1-12.

Eisenberg, J. F. and McKay, G. M. (1970). An annotated checklist of recent mammals of Ceylon with keys to the species. *Ceylon Journal of Science. (Biol. Sci.)* 8: 69-99.

Erdelen, W. (1989). Aspects of the Biogeography of Sri Lanka. *Forschungen auf Ceylon*. 3:73-100.

Eriyagama, N., Smakhtin, V., Chandrapala, L. and Fernando, K. (2010). Impacts of climate change on water resources and agriculture in Sri Lanka: a review and preliminary vulnerability mapping. Colombo, Sri Lanka: International Water Management Institute. 51p. (*IWMI Research Report 135*). doi:10.5337/2010.211.

Esham, M. and Garforth, C. (2013). Climate change and agricultural adaptation in Sri Lanka: a review. *Climate and Development* 5 (1). pp. 66-76. doi:10.1080/17565529.2012.762333. Retrieved 11<sup>th</sup> May 2016.

Etc Group (undated). *Patents and Biopiracy*. <http://www.etcgroup.org/issues/patents-biopiracy>. Accessed 12<sup>th</sup> May 2016

FAO (1999). *What is Happening to Agrobiodiversity?* <http://www.fao.org/docrep/007/y5609e/y5609e02.htm>. Accessed 30<sup>th</sup> April 2016.

FAO (2016). *Preparing Sri Lanka's forest based-strategy of national development*. <http://www.fao.org/srilanka/news/detail-events/en/c/384824/>. Accessed 12<sup>th</sup> May 2016.

Fauna and Flora Protection Ordinance (FFPO) (2009). *Fauna and Flora Protection (Amendment) Act, No. 22 of 2009*. <http://www.dwc.gov.lk/documents/ordinanceeng.pdf>. Accessed 12<sup>th</sup> May 2016.

FCO (Forest Conservation Ordinance) (2009). *Forest (Amendment) Act No. 65 of 2009*. <http://faolex.fao.org/docs/pdf/srl102123.pdf>. Accessed 12<sup>th</sup> May 2016.

FD (Forest Department) (Forest Department) (2012). *Biosphere Reserves and Conservation Forests*. [http://www.forestdept.gov.lk/web/index.php?option=com\\_content&view=article&id=115&Itemid=117&lang=en#Hurulu%20International%20Biosphere%20Reserve](http://www.forestdept.gov.lk/web/index.php?option=com_content&view=article&id=115&Itemid=117&lang=en#Hurulu%20International%20Biosphere%20Reserve). Accessed 4<sup>th</sup> October 2015.

FD (Forest Department) (2012). *World Heritage Sites*. [http://www.forestdept.gov.lk/web/index.php?option=com\\_content&view=article&id=114&Itemid=116&lang=en#Knuckles Range of Forests](http://www.forestdept.gov.lk/web/index.php?option=com_content&view=article&id=114&Itemid=116&lang=en#Knuckles Range of Forests). 4<sup>th</sup> June 2015.

FD (2016). *Data on the extents of protected areas*. Unpublished.

FD (Forest Department) (2016). *Forest Policy*. [http://www.forestdept.gov.lk/web/index.php?option=com\\_content&view=article&id=110&Itemid=105&lang=en](http://www.forestdept.gov.lk/web/index.php?option=com_content&view=article&id=110&Itemid=105&lang=en). Accessed 12<sup>th</sup> May 2016.

Fernando, J. (undated). *National 'Pilisar' Waste Management Programme*. <http://www.iiirr.ucalgary.ca/files/iiirr/256.pdf>. Accessed 10<sup>th</sup> May 2016.

Fernando, R. H. S. S. (2012). Present Status of Family Orchidaceae in Sri Lanka. Pp 200-204 in *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D.K. & S. Wijesundara Eds., Colombo, Sri Lanka: Ministry of Environment. v+451 pp.

Fernando, S. S., Wickramasingha, L. J. M. and Rodrigo, R. K. (2007). A new species of endemic frog belonging to genus *Nannophrys* Gunther, 1869 (Anura: Dicroglossinae) from Sri Lanka. *Zootaxa*, 1403: 55-68.

Foden, W.B., Butchart, S.H.M., Stuart, S.N., Vié, J-C., Akçakaya, H.R., Angulo, A., DeVantier, L.M., Gutsche, A., Turak E., Cao, L. and Donner, S.D. (2013). Identifying the World's Most Climate Change Vulnerable Species: A Systematic Trait-Based Assessment of all Birds, Amphibians and Corals. *PLoS ONE* 8(6): e65427.

Gaussen, H., P. Legris, M. Viart, and Labroue, L. (1964). *International map of the vegetation: Ceylon (1: 1,000,000)*. India: French Institute of Pondicherry.

Greller, A. M., and Balasubramaniam, S. (1980). A preliminary floristic-climatic classification of the forests of Sri Lanka. *The Sri Lanka Forester* 14 (3,4): 163-171.

Greenwood, J.C. (2011). *Biotechnology – Healing, Fueling and Feeding the World*. <http://www.tradeandindustrydev.com/industry/bio-pharmaceuticals/update-bio-biotechnology-%E2%80%93-healing-fueling-and-feeding-world-4744>. Accessed 12<sup>th</sup> May 2016.

Groves, C.P. and Meijaard, E. (2005). Interspecific variation in *Moschiola*, the Indian chevrotain. In: Yeo, D. C. J., Ng, P. K. L. and Pethiyagoda, R. (eds), *Contributions to Biodiversity Exploration and Research in Sri Lanka. Raffles Bulletin of Zoology, Supplement 12*: 413-421.

Groves, C. P., Rajapaksha, C. and Manemandra-Arachchi, K. (2009). The taxonomy of the endemic golden palm civet of Sri Lanka. *Zoological Journal of the Linnean Society* 155: 238–251.

Gunasekara, R. S. (2011). *Export Trade of Indigenous Freshwater Fish Species in Sri Lanka*. iv-126 pp. Singapore: Published by the author.

Gunawardena, Jagath. Environmental Law expert, personal communication.

Herman Miller (2016). *Environmental Advocacy*. <http://www.hermanmiller.com/about-us/our-values-in-action/environmental-advocacy.html>. Accessed 12<sup>th</sup> May 2016.

Hesselink, F.J., Goldstein, W., van Kempen, P. P., Garnett, T. and Dela, J. (2007). *Education and Public Awareness, a toolkit for the Convention on Biological Convention*. Montreal: IUCN, Commission on Education and Communication. 310 pp.

Holmes, C. H. (1956). The broad pattern of climate and vegetational distribution in Ceylon. *The Ceylon Forester* 2 (4): 207-225.

IDRC (2015). *Facts & Figures on Food and Biodiversity*. <http://www.idrc.ca/EN/Resources/Publications/Pages/ArticleDetails.aspx?PublicationID=565>. Accessed 30<sup>th</sup> April 2016.

IIED (2005). Protecting Community Rights over Traditional Knowledge: Implications of Customary Laws and Practices *Research Planning Workshop*, Cusco, Peru, 20-25 May 2005. Organised by IIED and Andes, with financial support from SwedBio Royal Inka Hotel, Písaq. [http://www.wipo.int/export/sites/www/tk/en/igc/ngo/iied\\_commrights.pdf](http://www.wipo.int/export/sites/www/tk/en/igc/ngo/iied_commrights.pdf). Accessed 8<sup>th</sup> May 2016.

Illangakoon, A.D. (2012). Exploring anthropogenic activities that threaten endangered blue whales (*Balaenoptera musculus*) off Sri Lanka. *Journal of Marine Animals and Their Ecology* 5(1):37.

- Imbulana, K.A.U.S., Wijesekara, N.T.S. and Neupane, B.R. (eds.) (2006). *Sri Lanka National Water Development Report*. 221 pp. Sri Lanka, Paris and New Delhi: MAI&MD, UN-WWAP, UNESCO and University of Moratuwa.
- IPCC (2007). *Climate Change 2007: Synthesis Report*. [https://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](https://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf). Accessed 12<sup>th</sup> May 2016.
- Iqbal, M. C. M., Wijesundara, D. S. A., and Ranwala, S. M. W. (2014). Climate Change, Invasive Alien Flora and Concerns for their Management in Sri Lanka. *Ceylon Journal of Science (Biological Sciences)* 43(2).
- IUCN (1990). *IUCN Directory of South Asian Protected Areas*. Gland, Switzerland and Cambridge, UK: IUCN. xxiv + 294 pp.
- IUCN (2011). An Environmental and Fisheries Profile of the Puttalam Lagoon System. Regional Fisheries Livelihoods Programme for South and Southeast Asia (GCP/RAS/237/SPA) Field Project Document 2011/LKA/CM/05. xvii+237 pp.
- IUCN Sri Lanka (2015). Influencing community thinking and behaviour: Conservation of Endangered Bandula barb (*Pethia bandula*) [http://cmsdata.iucn.org/downloads/conservation\\_project\\_for\\_bandula\\_barb\\_3.pdf](http://cmsdata.iucn.org/downloads/conservation_project_for_bandula_barb_3.pdf). Accessed 3rd May 2016.
- IUCN Sri Lanka Database (2016). *Species database on Sri Lankan Flora and Fauna*. Accessed 5<sup>th</sup> May 2016.
- Jayasena, H.A.H. and Selker, J.S. (2004). Thousand years of hydraulic civilization — some socio-technical aspects of water management. pp 225-236 in *Proceedings of the workshop on Water and Politics — Understanding the role of Politics in Water Management*, World Water Council, Marseilles, France.
- Jayasuriya, A. H. M., Kitchener, D. and Biradar, C. M. (2006). *Portfolio of strategic conservation sites/protected area Gap Analysis in Sri Lanka*. Colombo: Ministry of Environment and Natural Resources and EML Consultants. 340 pp.
- Jayawardena, S. S. B. D. G (2003). Past, present and future of the golden grain, rice in Sri Lanka, In *Rice Congress 2000*, (eds.) Abeysirwardena, D.S. de Z. Dissanayaka, D.M.N. Nugaliyadde, L. Sri Lanka: Department of agriculture. [http://www.agrilearning.goviya.lk/Paddy/Paddy\\_Research/Paddy\\_pdf/SE7.pdf](http://www.agrilearning.goviya.lk/Paddy/Paddy_Research/Paddy_pdf/SE7.pdf). Accessed 10<sup>th</sup> May 2016.
- Joseph, L. (2004). *National report of Sri Lanka on the formulation of a transboundary diagnostic analysis and strategic action plan for the Bay of Bengal Large Marine Ecosystem Programme*. (Unpublished Report). [http://www.boblme.org/documentRepository/Nat\\_Sri\\_Lanka.pdf](http://www.boblme.org/documentRepository/Nat_Sri_Lanka.pdf). Accessed 30<sup>th</sup> April 2016.
- Kathriarachchi, H. S. (2012). Present status of Lowland Wet Zone Flora of Sri Lanka. Pp 175-180 in *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D.K. & S. Wijesundara Eds., Colombo, Sri Lanka. Ministry of Environment. v+451 pp.
- Karanth, P. K. (2006). Out-of-India Gondwanan origin of some tropical Asian biota. *Current Science*, 90(6): 789-792.
- Katupotha, J. (2013). Palaeoclimate change during Glacial Periods: Evidence from Sri Lanka. *Journal of Tropical Forestry and Environment* 3 (1): 42-54.

- Koelmeyer, K. O. (1957). Climatic classification and the distribution of vegetation in Ceylon. *The Ceylon Forester* 3(2): 144-164.
- Koelmeyer, K. O. (1958). Climatic classification and the distribution of vegetation in Ceylon (contd). *The Ceylon Forester* 3(3-4): 265-288.
- Kotagama, S. W. (1993). Wildlife conservation and development of the south east dry zone. In *The South-east Dry Zone of Sri Lanka*. Colombo: Agrarian Research and Training Institute.
- Lassen, B. (2012). *Biocultural Community Protocols (BCPs)*. Bonn and Eschborn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. 2 pp. <https://www.giz.de/expertise/downloads/giz2013-en-biodiv-biocultural-community-protocols.pdf>. Accessed 8<sup>th</sup> May 2016.
- Laurie, W. A., E. M. Lang and Groves, C. P. (1983). *Rhinoceros unicornis*. *Mammalian Species*, 211: 1-6.
- Legg, C and Jewell, N. (1995). A 1:500,000-scale map of Sri Lanka: the basis for a National Forest Geographic Information System. *Sri Lanka Forester, Special issue (Remote Sensing)*: 3-21.
- Long, B.G., Amarasiri, C., Rajasurya, A., Dissanayaka, D.C.T., Liyanage, K.U.S.P., Jayasinghe, R.P.P.K., Athukoorala, A.A.S.H., Karunathilaka, K.M.B., Fernando, H.S.G., and Fernando, T. D. (2010). *Near shore Fisheries Status Atlas, North West, South and East Coast Aquarium Fish, Chank, Lobster, Shrimp and Sea Cucumber Fisheries of Sri Lanka, Volume 1*. Crow Island, Mattakkuliya, Colombo, Sri Lanka, National Aquatic Resource Research and Development Agency, 15. GCP/SRL/054/CAN. 213 pp.
- Loops Solutions (2013). *Social Media Statistics Sri Lanka 2013-14*. <https://www.youtube.com/watch?v=2mIG48Mw2wl>. Accessed 25<sup>th</sup> Nov 2015.
- Macnamara, J. (2009). *The 21st Century Media (R)evolution: Emergent Communication Practices*. 401 pp. New York, Bern, Berlin, Bruxelles, Frankfurt am Main, Oxford, Wien: Peter Lang International Academic Publishers.
- Mahindapala, R. (2005). Conservation of medicinal plants: Lessons from Sri Lanka. pp 117-128 in *Conserving Medicinal Species: Securing a Healthy Future*, (ed.) S. Miththapala. Colombo: Ecosystems and Livelihoods Group Asia, IUCN. 184 pp.
- MALF (1995). *Sri Lanka Forestry Sector Master Plan*. Sri Lanka, Ministry of Agriculture, Lands and Forestry.
- Manamendra-Arachchi, K. and Pethiyagoda, R. (2005). The Sri Lankan shrub-frogs of the genus *Philautus* Gistel, 1848 (Ranidae: Rhacophorinae), with description of 27 new species. *Raffles Bulletin of Zoology*, Supplement 12: 163-303.
- Manamendra-Arachchi, K., Pethiyagoda, R., Dissanayake, R., and Meegaskumbura, M. (2005). A second extinct big cat from the Late Quaternary of Sri Lanka. *Raffles Bulletin of Zoology* 12: 423-434.
- Marine Environment Protection Authority (MEPA) (2011). *National Oil Spill Contingency Plan*. [http://www.mepa.gov.lk/web/index.php?option=com\\_content&view=article&id=49&Itemid=50&lang=en](http://www.mepa.gov.lk/web/index.php?option=com_content&view=article&id=49&Itemid=50&lang=en). Accessed 12<sup>th</sup> May 2016.
- Mattsson, E., Persson, U. M., Ostwald, M. and Nissanka S. P. (2012). REDD+ readiness implications for Sri Lanka in terms of reducing deforestation. *Journal of Environmental Management*. 100: 29-40.
- McVittie A. and Hussain S. S. (2013). *The Economics of Ecosystems and Biodiversity - Valuation Database Manual*. Scotland's Rural College – SRUC. [http://doc.teebweb.org/wp-content/uploads/2014/03/TEEB-Database-and-Valuation-Manual\\_2013.pdf](http://doc.teebweb.org/wp-content/uploads/2014/03/TEEB-Database-and-Valuation-Manual_2013.pdf). Accessed 10<sup>th</sup> May 2016.



Meffe, G. K., Carroll, C. R and others (1997). *Principles of Conservation Biology*. Sunderland, MA: Sinauer Associates. 729 pp.

Meegaskumbura, M. and Manamendra-Arachchi, K. (2011). Two new species of shrub frogs (Rhacophoridae: *Pseudophilautus*) from Sri Lanka. *Zootaxa* 2747:1–18.

Meegaskumbura, S., Meegaskumbura, M., and Schneider, C.J. (2014). Phylogenetic Relationships of the Endemic Sri Lankan Shrew Genera: *Solisorex* and *Feroculus*. *Ceylon Journal of Science (Bio. Sci.)* 43 (2): 65-71.

Meegaskumbura, M., Bossuyt, F., Pethiyagoda, R., Manamendra-Arachchi, K., Bahir, M., Milinkovitch, M. C. and Schneider, C. J. (2002) Sri Lanka: An Amphibian Hot Spot. *Science* 298(11): 379.

Menikpura, S.N.M. and Basnayake, B.F.A. (2009). New applications of ‘Hess Law’ and comparisons with models for determining calorific values of municipal solid wastes in the Sri Lankan context. *Renewable Energy* 34: 1587–1594.

MEA (Millennium Ecosystem Assessment) (2005). *Ecosystems and Well-being Synthesis report*. Washington DC: Island Press. v+86 pp.

Miller, M. (1996). Your own private Internet. *PC Magazine* 15(5):31-3.

MoE (2006). National Implementation Plan under the Stockholm Convention on POPs for Sri Lanka. 160 pp. [http://www.pops.int/documents/implementation/nips/submissions/NIP\\_srilanka.pdf](http://www.pops.int/documents/implementation/nips/submissions/NIP_srilanka.pdf). Accessed 12<sup>th</sup> May 2016.

MoE (2011). Green Accounting Mechanism for Sri Lanka. [http://www.environmentmin.gov.lk/web/index.php?option=com\\_content&view=article&id=105&Itemid=276&lang=en](http://www.environmentmin.gov.lk/web/index.php?option=com_content&view=article&id=105&Itemid=276&lang=en). Accessed 12<sup>th</sup> May 2016.

MoE (Ministry of Environment) (2012a). *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D.K. & S. Wijesundara Eds. pp viii + 476. Colombo, Sri Lanka: Ministry of Environment. v+451 pp.

MoE (Ministry of Environment) (2012b). *The National Invasive Alien Species (IAS) Policy of Sri Lanka*. <http://www.environmentmin.gov.lk/web/images/pdf/ias%20policy%20-%20english.pdf>. Accessed 12<sup>th</sup> May 2016.

MoENR (Ministry of Environment and Natural Resources) (2007a). *Biodiversity Conservation In Sri Lanka A Framework for Action – Addendum*. Battaramulla: Biodiversity Secretariat Ministry of Environment and Natural Resources. 67 pp.

MoENR (2007b). National Capacity Needs Self-Assessment for Global Environmental Management: Capacity Assessment and Action Plan for Developing Capacity for Compliance with Global Conventions on Biodiversity, Climate Change, and Land Degradation *Report of the NCSA Sri Lanka*. 67 pp. <https://www.thegef.org/gef/sites/thegef.org/files/documents/document/nca-sri%20lanka-fr-ap.pdf>. Accessed Mar 12<sup>th</sup> 2016.

MoENR (2008). Handbook on MEAs (Multilateral Environmental Agreements). Battaramulla, Sri Lanka. 56 pp.

MoENR (Ministry of Environment and Natural Resources) (2010). *Policies*. <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan042380.pdf>. Accessed 12<sup>th</sup> May 2016.

MoEPA (Ministry of Environment and Parliamentary Affairs) (1991). *National Environmental Action Plan 1 for the period 1992-1996*. 101 pp. Colombo: Ministry of Environment.

MoEPA (Ministry of Environment and Parliamentary Affairs) (1994). *National Environmental Action Plan 2 for the period 1995-1998*. 99 pp. Colombo: Ministry of Environment.

MoERE (Ministry of Environment and Renewable Energy) (2013). *IAS project document to GEF*. [https://www.thegef.org/gef/project\\_detail?projID=2472](https://www.thegef.org/gef/project_detail?projID=2472). Accessed 4<sup>th</sup> May 2016.

MoERE (Ministry of Environment and Renewable Energy) and IUCN (2013). *Services for Linking Biodiversity with Livelihoods*, conference report. *First National Conference on Livelihoods, Biodiversity & Ecosystem Services*. 26 – 27, September 2013, Colombo 7, Sri Lanka Foundation Institute. Unpublished report.

MoERE (2013). *National Policy on Access to Biological Resources, Sustainable Use and Benefit Sharing*. [http://www.environmentmin.gov.lk/web/index.php?option=com\\_content&view=article&id=775&Itemid=152&lang=en](http://www.environmentmin.gov.lk/web/index.php?option=com_content&view=article&id=775&Itemid=152&lang=en). Accessed May 12<sup>th</sup> 2016.

MoFAR (2016). Fisheries in Sri Lanka. *Statistics*. <http://www.fisheries.gov.lk/content.php?cnid=ststc>. Accessed 12<sup>th</sup> May 2016.

MoFE (Ministry of Forestry and Environment) (1998). *National Environmental Action Plan 3 for the period 1998-2001*. Colombo: Ministry of Environment. 126 pp.

MoFE (Ministry of Forestry and Environment) (1999). *Biodiversity Conservation in Sri Lanka a Framework for Action*. Colombo: Ministry of Forestry and Environment. 135 pp.

Miththapala, S. (2008a). *Incorporating Environmental Safeguards Into Disaster Risk Management. Volume 1*. Reference Material. Colombo: Ecosystems and Livelihoods Group, Asia, IUCN. viii + 130 pp.

Miththapala, S. (2008b). Coral reefs. *Coastal Ecosystems Series: Volume 1*. Colombo, Sri Lanka: Ecosystems and Livelihoods Group Asia, IUCN. iii + 36 pp.

Miththapala, S. (2008c) Mangroves *Coastal Ecosystems: Volume 2*. Colombo: Ecosystems and Livelihoods Group Asia, IUCN. iii + 29 pp.

Miththapala, S. (2008d). Seagrasses and sand dunes. *Coastal Ecosystems Series : Volume 3*. Colombo, Sri Lanka: Ecosystems and Livelihoods Group Asia, IUCN. iii + 36 pp.

Miththapala, S. (2013a). Lagoons and Estuaries. *Coastal Ecosystems Series: Volume 4*. Colombo: IUCN Sri Lanka Country Office. vi + 73 pp.

Miththapala, S. (2013b). Tidal flats. *Coastal Ecosystems Series Volume 5*. Colombo, Sri Lanka: IUCN. iii+ 48pp.

Morphy, T. (2015). *Stakeholder Analysis, Project Management, templates and advice*. <http://stakeholdermap.com/stakeholder-analysis.html>. Accessed 14<sup>th</sup> Nov 2015.

Mueller-Dombois, D. (1968). Ecogeographic analysis of a climatic map of Ceylon with particular reference to vegetation. *The Ceylon Forester* 8: 39-58.

Muthunayake T. B. S., Wickramasinghe, R. L. H. R., Wickramasinghe, U. R., Goonatilake, Sampath De A., Padmaperuma, A., Ranatunge, R. A. A. R. and Weerakoon, D. K. (2012). Community based conservation as a tool to conserve freshwater fish in Sri Lanka: Evidence from *Puntius bandula* conservation programme, *Proceedings of the International Forestry and Environment Symposium 2012 of the Department of Forestry and Environmental Science*, University of Sri Jayewardenepura, Sri Lanka. Muthuwatta L. P and Liyanage P. K. N. C. (2013). Impact of Rainfall Change on Agro-Ecological

Regions of Sri Lanka. *Proceedings of the International Conference on Climate Change Impacts and Adaptations for Food and Environment Security (Colombo)*, Organized by Coconut Research Institute, Sri Lanka, July, 30-31, 2013.

National Council for Sustainable Development (2009). *National Action Plan for Haritha Lanka Programme*. [http://www.environmentmin.gov.lk/web/pdf/Harita\\_Lanka\\_Book\\_small.pdf](http://www.environmentmin.gov.lk/web/pdf/Harita_Lanka_Book_small.pdf). Accessed 12<sup>th</sup> May 2016.

Pascual, U., Muradian, R., Brander, L., Gómez-Baggethun, E., Martín-López, B., Verma, M., Armsworth, P., Christie, M., Cornelissen, H., Eppink, F., Farley, J., Loomis, J., Pearson, L., Perrings, C. and Polasky, S. (2010). The Economics of Valuing Ecosystem Services and Biodiversity, *TEEB document*. Chapter 5.

Pemadasa, A. (1995). *“Siri-laka Thuru-laka”* (Vegetation of Sri Lanka – Publication in Sinhala). Kottawa, Sri Lanka: Sara Publishers and Printers. 234 pp.

Perera, A. (2012). Present status of Dry-zone Flora of Sri Lanka. pp 165-174 in *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D.K. & S. Wijesundara Eds., Colombo, Sri Lanka: Ministry of Environment. v+451 pp.

Perera, D. D. J. N. (2014). Predictive modeling of the Potential Distribution of Endemic Birds in Sri Lanka. Master's thesis submitted to the University of Colombo. xv+96.

Perera, G. A. D. (2014). Ecology of Sri Lankan Dry Forests: Implications for the Conservation Management of northernmost Dry Forests. *Proceedings of Jaffna University International Research Conference (JUICE-2012)*: 263-269.

Perera, K. A. R. S., Amarasinghe, M. D., and Sumanadasa, W. A. (2012). Contribution of plant species to carbon sequestration function of mangrove ecosystems in Sri Lanka (Abstract only). Pp 137 in (eds.) Dahdouh-Guebas, F., Satyanarayana, B., 2012. *Proceedings of the International Conference ‘Meeting on Mangrove ecology, functioning and Management - MMM3’*. xxxix + 192 pp. Galle, Sri Lanka, 2-6 July 2012. VLIZ Special Publication 57.

Perera, N. P. (1975). A physiognomic vegetation map of Sri Lanka (Ceylon). *Journal of Biogeography* 2: 185-203.

Pethiyagoda, R. (1991). *Freshwater fishes of Sri Lanka*. Colombo: Wildlife Heritage Trust of Sri Lanka. Pethiyagoda, R., Meegaskumbura, M. and Maduwage, K. (2012). A synopsis of the South Asian fishes referred to Puntius (Pisces: Cyprinidae) *Ichthyological Exploration of Freshwaters* 23 (1): 69-95.

Piyadasa, H. T. N. I. and Thiruchelvam, S. (2005). An Estimation of the Recreational Value of ‘Bopath-Ella’ in Ratnapura: A Travel Cost Approach. *Tropical Agricultural Research* 17: 62–172.

Potts, S. G., Biesmeijer, J.C., Kremen, C., Neumann, P., Schweiger, O. and Kunin, W. E. (2010). Global pollinator declines: trends, impacts and drivers. *Trends in Ecology and Evolution* 25 (6): 345-353.

Prater, S. H. (1971). *The Book of Indian Animals*, 3<sup>rd</sup> edition. Bombay: Natural History Society Bombay, Oxford University Press.

Punyawardena, R., Dissanayake, T. and Mallawatantri, A. (2013). *Spatial variations of climate change induced vulnerability in Sri Lanka*. Colombo: Department of Agriculture. 40 pp.

Rajasuriya, A and Karunarathna, C. (2000). Post-bleaching status of the coral reefs of Sri Lanka. Pp

54-63 in Souter, D., Obrura, D., and O. Linden (eds). *Coral reef degradation in the Indian Ocean. Status report 2000. CORDIO*: Stockholm.

Rajasuriya, A., H. Zahir, K. Venkataraman, Z. Islam and Tamelander, J. (2004). Status of Coral Reefs in South Asia: Bangladesh, Chagos, India, Maldives and Sri Lanka. In C. Wilkinson (ed). *Status of coral reefs of the world: 2004. Volume 1*. Townsville, Queensland, Australia: Australian Institute of Marine Science.

Rajasuriya, A. (2005). Status of coral reefs in Sri Lanka in the aftermath of the 1998 coral bleaching event and 2004 tsunami. In D. Souter, & O. Linden, *Coral Reef Degradation in the Indian Ocean: Status Report 2000*: 83-96. Kalmar, Sweden: CORDIO. Department of Biology and Environmental Science, University of Kalmar.

Rajasuriya, A. (2008). Status of Coral Reefs in Northern, Western and Southern Coastal Waters. In Obura, D. O., Tamelander, J., and Linden, O. (eds.) (2008) Ten years after bleaching – facing the consequences of climate change in the Indian Ocean. *CORDIO Status Report 2008*. 489pp. Mombasa: CORDIO (Coastal Oceans Research and Development in the Indian Ocean)/Sida-SAREC. Mombasa.

Rajasuriya, A. Coordinator, Marine and Coastal Thematic Areas, personal communication.

Ramsar Convention Secretariat (2014). *About the Ramsar Convention*. <http://www.ramsar.org/about-the-ramsar-convention>. Accessed 6<sup>th</sup> Oct 2015.

Ramsar Convention Secretariat (2014). *Sri Lanka*. [www.ramsar.org/wetland/sri-lanka](http://www.ramsar.org/wetland/sri-lanka). Accessed 24<sup>th</sup> March 2016.

Ramsar Site Information Service (2013). *Wilpattu Ramsar Wetland Cluster*. <https://rsis.ramsar.org/ris/2095>. Accessed 5<sup>th</sup> Oct 2015.

Ramsar Site Information Service (2010). *Kumana Wetland Cluster*. <https://rsis.ramsar.org/ris/1931>. Accessed 6<sup>th</sup> Oct 2015.

Ramsar Site Information Service (2010). *Vankalai Sanctuary*. <https://rsis.ramsar.org/ris/1910>. Accessed 6<sup>th</sup> Oct 2015.

Ramsar Site Information Service (2003). *Maduganga*. <https://rsis.ramsar.org/ris/1372>. Accessed 6<sup>th</sup> Oct 2015.

Ramsar Site Information Service (2001). *Annaiwilundawa Tanks Sanctuary*. <https://rsis.ramsar.org/ris/1078>. Accessed 5<sup>th</sup> Oct 2015.

Rathnayake, R. M. W. (2015). Estimating Demand for Turtle Conservation at the Rekawa Sanctuary in Sri Lanka. *Working Paper No. 92–15*, South Asian Network for Development and Environmental Economics (SANDEE).

Rathnayake, R. M. W. and Gunawardena, U. A. D. P (2011). Estimation of Recreational Value of Horton Plains National Park in Sri Lanka: A Decision Making Strategy for Natural Resources Management. *Journal of Tropical Forestry and Environment* 1(1): 71-86.

Royal Institute of Natural Sciences of Belgium (2009). 52 tips for Biodiversity. [http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/biodiversity\\_tips/en.pdf](http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/biodiversity_tips/en.pdf). Accessed 13<sup>th</sup> Nov 2015.

Rice, J. (2016). *Compilation of experiences and lessons learned from scientific methodologies and*

approaches for the description of areas meeting the EBSA criteria. UNEP/CBD/SBSTTA/20/INF/20 <https://www.cbd.int/doc/meetings/sbstta/sbstta-20/information/sbstta-20-inf-20-en.pdf>. Accessed 9<sup>th</sup> May 2016.

Salazar, J. (2013). *Why SharePoint Social Features are Critical*. <https://www.credera.com/blog/technology-insights/microsoft-solutions/why-sharepoint-social-features-are-critical/>. Accessed 25<sup>th</sup> Nov 2015.

Samarakoon, J. and Samarawickrama, S. (2012). *An Appraisal of Challenges in the Sustainable Management of the Micro-tidal Barrier-built Estuaries and Lagoons in Sri Lanka*. Colombo: IUCN Sri Lanka Country Office. xxii+171pp.

SDD, MoMD&E (undated). *Integration of Forestry Sector Contribution to the System of National Accounts in Sri Lanka*. (Brochure.) Ethul Kotte, Sri Lanka: SDD, MoMDE.

Senanayake, F. R. and Moyle, P. B. (1982). Conservation of freshwater fishes of Sri Lanka. *Biological Conservation* 22: (1) 81-195.

Senarath, U. and Visvanathan, C. (2001). Environmental issues in brackish water shrimp aquaculture in Sri Lanka. *Environmental Management* 27(3): 335-348.

Shepherd, G. (ed.) (2008). *The Ecosystem Approach: Learning from Experience*. Gland, Switzerland: IUCN. x+190pp.

Simon, M. (2012). *Blue Carbon*. <http://www.earthtimes.org/climate/blue-carbon/2021/>. Accessed May 12<sup>th</sup> 2016.

Sivapalan, P. (1991). Eutrophication of the Kotmale Reservoir. *Tea Bulletin* 12 (1/2): 3-7.

Sri Lanka NEXT (2016). *What happens if we overshoot the two degree target for limiting global warming?* <http://www.srilankanext.lk/what-is-climate-change-3.php>. Accessed 9<sup>th</sup> May 2016.

SLTA (2014). *Annual Statistical Report 2014*. Colombo: Sri Lanka Tourist Development Authority.

Stokke, O. (2009). *The UN and Development: From Aid to Cooperation*. Bloomington and Indianapolis: Indiana University Press. p82.

Survey Department (2007). *The National Atlas of Sri Lanka*. Colombo: Government Press. 170 pp.

Swan, B. (1983). *An introduction to the coastal Geomorphology of Sri Lanka*. National Museum of Sri Lanka. 182pp.

TEEB (2009). 'The global biodiversity crisis and related policy challenge'. Chapter 1 in *The Economics of Ecosystems and Biodiversity for National and International Policy Makers*. Brussels: European Commission. Available: [www.teebweb.org](http://www.teebweb.org). Accessed 28<sup>th</sup> Mar 2016.

The REDD Desk (2016). *REDD in Sri Lanka*. [http://www.theredddesk.org/countries/sri\\_lanka/plans\\_and\\_policies/search?filters=type%3Apolicy&retain-filters=1](http://www.theredddesk.org/countries/sri_lanka/plans_and_policies/search?filters=type%3Apolicy&retain-filters=1). Accessed 28<sup>th</sup> October 2016.

Tyrrell, T. D. and Alcorn, J. B. (2011). *Analysis of possible indicators to measure impacts of REDD+ on biodiversity and on indigenous and local communities: A report to the Convention on Biological Diversity*. Tentera, Montreal, Canada. <https://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-21-en.pdf>. Accessed 8<sup>th</sup> May 2016.

Ukuwela, K. D. B., de Silva, A., Mumpuni, Fry, B. G., Lee, M. S. Y., and Sanders, K. L. (2013).

Molecular evidence that the deadliest sea snake *Enhydrina schistosa* (Elapidae: Hydrophiinae) consists of two convergent species. *Molecular Phylogenetics and Evolution* 66: 262–269.

UN (2015). *Millennium Development Goals Report 2015*. [http://www.un.org/millenniumgoals/2015\\_MDG\\_Report/pdf/MDG%202015%20rev%20\(July%201\).pdf](http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf). Accessed 13<sup>th</sup> Nov 2015.

UN (2015a). *Sustainable Development Goals*. <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>. Accessed 12<sup>th</sup> May 2016.

UNDP (2012). *About Sri Lanka*. <http://www.lk.undp.org/content/srilanka/en/home/countryinfo/>. Accessed 12<sup>th</sup> May 2016.

UNDP (2014). *The BIOFIN Workbook: A Tool to Mobilize Financial Resources for Biodiversity and Development*. New York: United Nations Development Programme. [www.biodiversityfinance.net](http://www.biodiversityfinance.net). Accessed 12<sup>th</sup> May 2016.

UNEP (2009). *Judges and environmental law: a handbook for the Sri Lankan judiciary*. Colombo, Sri Lanka: Environmental Foundation Limited. 224 pp.

UNEP (2016). *Building Resilience of Ecosystems for Adaptation*. <http://www.unep.org/climatechange/adaptation/EcosystemBasedAdaptation/tabid/29583/Default.aspx>. Accessed 30<sup>th</sup> April 2016.

UNEP-WCMC and IEEP. (2013). *Incorporating Biodiversity and Ecosystem Service Values into NBSAPs: Guidance to Support NBSAP Practitioners*. [http://www.ieep.eu/assets/1200/Guidance\\_doc\\_A4\\_FINAL.pdf](http://www.ieep.eu/assets/1200/Guidance_doc_A4_FINAL.pdf). Accessed 28<sup>th</sup> Mar 2016.

UNESCO (1972). *Convention Concerning the Protection of the World Cultural and Natural Heritage*. <http://whc.unesco.org/archive/convention-en.pdf>. Accessed 12<sup>th</sup> May 2016.

UNESCO (2006). *Biosphere Reserve Information*. <http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=SRL+03&mode=all>. Accessed 1<sup>st</sup> Oct 2015.

UNESCO (2015). *Sinharaja Forest Reserve*. <http://whc.unesco.org/en/list/405/>. Accessed 4<sup>th</sup> Oct 2015.

UNESCO (2016b). [www.unesco.org/mabdb/brdir/directory/rescount.asp](http://www.unesco.org/mabdb/brdir/directory/rescount.asp). Accessed 24<sup>th</sup> Mar 2016.

van Aaslst, M. K. (2006). The impacts of climate change on the risks of natural disasters. *Disasters* 30(1): 5-8.

Warakagoda, D. H. and Rasmussen, P. C. (2004). A new species of scops-owl from Sri Lanka. *Bulletin of the British Ornithologists' Club* 124 (2):85.

Watson, M. (1998). A review of the Man and the Biosphere programme in Sri Lanka. *Journal of the National Science Foundation of Sri Lanka*, 26(3): 163-183.

Wattage, P. (2011). Valuation of Ecosystem Services in Coastal Ecosystems: Asian and European Perspectives Ecosystem Services Economics (ESE). *Working Paper Series Paper No. 8*. 17 pp.

Werner, W. L. (1984). *Die Hohen- und Nebelwälder auf der Insel Ceylon (Sri Lanka)*. Franz Steiner Verlag, Wiesbaden.

Werner, W. L. (1985). Naturreserve im Hochland der Insel Ceylon (Sri Lanka)—Peak Wilderness und Horton Plains. *Natur und Museum*, 115(3), 65-76.

Weerakoon, D. and Gunawardena, K. (2012). The Taxonomy and Conservation Status of Birds in Sri Lanka pp 114-133 in: *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and*

*Flora*. Weerakoon, D.K. & S. Wijesundara Eds., Colombo, Sri Lanka: Ministry of Environment. v+451 pp.

Wickramasinghe, R. L. H. R. (2008). *Ecology of Puntius bandula at Galapitamada and Salgala in the Kegalle district, Sabaragamuwa Province Sri Lanka*. A thesis submitted for Master of Science, Faculty of Science, University of Colombo.

Wickramasinghe, L. J. M. and Munindradasa, D. A. I. (2007). Review of the genus *Cnemaspis* Strauch, 1887 (Sauria: Gekkonidae in Sri Lanka with the description of five new species.) *Zootaxa*, 1490: 1–63.

Wijesinghe, L. (2000). Forest resources. Pp 153-165 in *Natural Resources of Sri Lanka 2000*, K. D. Arudpragasam (ed.) Colombo: National Science Foundation. v+306 pp.

Wijesinghe, L. C. A. de S., Gunatilleke, I. A. U. N., Jayawardene, S. D. G., Kotagama, S. W. and Gunatilleke, C. V. S. (1993). *Biological Conservation in Sri Lanka: A National Status Report*. Colombo, Sri Lanka: IUCN World Conservation Union. 100 pp.

Wijesundara, S. (2012). Present Status of Montane Forests in Sri Lanka. Pp 181-185 in *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D. K. & S. Wijesundara Eds, Colombo, Sri Lanka: Ministry of Environment. v+451 pp.

Wikimedia Commons (2015). *File: Palaeontinidae Distribution (Late Jurassic).jpg*. [http://commons.wikimedia.org/wiki/File:Palaeontinidae\\_Distribution\\_\(Late\\_Jurassic\).jpg](http://commons.wikimedia.org/wiki/File:Palaeontinidae_Distribution_(Late_Jurassic).jpg). Accessed 12<sup>th</sup> May 2016.

World Bank (undated). *Stakeholder Analysis*. <http://www1.worldbank.org/publicsector/anticorrupt/PoliticalEconomy/PDFVersion.pdf>. Accessed 12<sup>th</sup> May 2016.

World Bank, IUCN, ESA and PWA (2010). *Capturing and Conserving Natural Coastal Carbon*. [http://siteresources.worldbank.org/EXTCMM/Resources/coastal\\_booklet\\_final\\_nospread11-23-10.pdf](http://siteresources.worldbank.org/EXTCMM/Resources/coastal_booklet_final_nospread11-23-10.pdf). Accessed 12<sup>th</sup> May 2016.

Wunder, S. (2005). *Payments for environmental services: some nuts and bolts* (CIFOR Occasional Paper no. 42, 24).

WWF (2016). *Together possible*. [http://wwf.panda.org/who\\_we\\_are/wwf\\_together\\_possible/](http://wwf.panda.org/who_we_are/wwf_together_possible/). Accessed 12<sup>th</sup> May 2016.

Yakandawala, D. (2012). Present Status of Fresh Water Aquatic Flora in Sri Lanka. pp 186-196 in *The National Red List 2012 of Sri Lanka; Conservation Status of the Fauna and Flora*. Weerakoon, D.K. & S. Wijesundara Eds., Colombo, Sri Lanka: Ministry of Environment. v+451 pp.





Prehistoric Cave Art of a Gecko, Tharulengala Cave



# Annexes



## **Annex 1. List of Stakeholders Consulted during the Process of Preparing the NBSAP**

<b>Name</b>	<b>Institute</b>
1. Mr. Vajira Narampanawa	Ministry of Mahaweli Development and Environment
2. Mr. N. K. G. K. Nammawatte	Ministry of Mahaweli Development and Environment
3. Mr. Gamini Gamage	Ministry of Mahaweli Development and Environment
4. Mr. Ajith De Silva	Ministry of Mahaweli Development and Environment
5. Mr. Waruna Sri Dhanapala	Ministry of Mahaweli Development and Environment
6. Mr. A. H. L. D. Gamini Wijesinghe	Ministry of Mahaweli Development and Environment
7. Mr. Kisantha Mahendra	Ministry of Mahaweli Development and Environment
8. Ms. R. H. M. P. Abeykoon	Ministry of Mahaweli Development and Environment
9. Prof. W. L. Sumathipala	Ministry of Mahaweli Development and Environment
10. Mr. Leel Randeni	Ministry of Mahaweli Development and Environment
11. Mr. R. S. S Ratnayake	Ministry of Mahaweli Development and Environment
12. Ms. Hasula Wickramasinghe	Ministry of Mahaweli Development and Environment
13. Ms. R. M. Nilmini Ranasinghe	Ministry of Mahaweli Development and Environment
14. Mr. Ranjith Rajapaksha	Ministry of Mahaweli Development and Environment
15. Ms. G. K. H. Madushani	Ministry of Mahaweli Development and Environment
16. Ms. H. M. H. E. Herath	Ministry of Mahaweli Development and Environment
17. Ms. P. A. S. I. Priyadarshani	Ministry of Mahaweli Development and Environment
18. Ms. M. P. Ranaweera	Ministry of Mahaweli Development and Environment
19. Mr. K. K. D. K. Gunaratna	Ministry of Mahaweli Development and Environment
20. Eng. K. K. Kithsiri	Ceylon Electricity Board
21. Mr W. A. N. S. Rajarathna	CC&CRMD
22. Mr. K. Pirapaharan	Central Environmental Authority
23. Ms. Priyangani Gunathilaka	Central Environmental Authority
24. Dr. Rohan Wijekoon	Department of Agriculture
25. Dr. W. M. A. D. B. Wickramasinghe	Department of Agriculture
26. Mr. W. G. M. G. Dayawana	Department of Agriculture
27. Dr. K. H. Sarananda	Department of Agriculture
28. Dr. K. Hettiarachchi	Department of Agriculture

29. Ms. Sudeepa Sugathadasa	Department of Ayurveda
30. Ms. Kalyani Hewapathirana	Department of Fisheries and Aquatic Resources
31. Dr. Manori Goonatilake	Department of National Museums
32. Ms. K. P. Lankani Somarathna	Department of National Museums
33. Mr. M. M. D. J. Senaratne	Department of National Botanic Gardens
34. Ms. Nadeeka Gunawardena	Department of National Botanic Gardens
35. Mr. U. L. Thaufeek	Department for Wildlife Conservation
36. Dr. Athula Senarathne	Institute of Policy Studies
37. Mr. Isuru Alawatte	Forest Department
38. Ms. D. V. K. Wijeweera	Mahaweli Authority of Sri Lanka
39. Mr. I. G. Madduma Banda	Mahaweli Authority of Sri Lanka
40. Ms. Dinushi Mohandiram	Marine Environment Protection Authority
41. Ms. J. M. M. W. Jayasinghe	Ministry of Housing and Construction
42. Ms. L. U. N. Sumanasekera	Ministry of Agriculture
43. Dr. Inoka Suraweera	Ministry of Health
44. Mr. H. D. Ratnayake	Ministry of Wildlife and Sustainable Development
45. Mr. Chandrasiri Bandara	Ministry of Wildlife and Sustainable Development
46. Dr. V. Pahalawattaarachchi	NARA
47. Mr. R. A. M. Jayathilaka	NARA
48. Dr. D. D. G. L. Dahanayaka	NARA
49. Mr. P. N. Chandraratne	National Aquaculture Development Authority
50. Mr. R. M. N. P. K. Ranathunga	National Aquaculture Development Authority
51. Mr. M. V. Dharmadasa	National Aquaculture Development Authority
52. Ms. H. T. J. Seneviratne	National Building Research Organisation
53. Ms. Thushani Senevirathne	National Building Research Organisation
54. Ms. H. A. Anoma Priyadarshani	National Zoological Gardens
55. Eng. S. K. L. S. Rupasinghe	National Water Supply and Drainage Board
56. Dr. S. A. V. Moothy	National Science Foundation
57. Ms. Sarani Meneripitiya	National Science Foundation
58. Dr. A. Wijesekera	Office of the Registrar of Pesticides
59. Dr. Gamini Samarasinghe	Plant Genetic Resources Centre
60. Mr. A. S. U. Liyanage	Plant Genetic Resource Centre

## Annex 1. Contd.

61. Ms. K. G. C. N. Jayarathna	Plant Genetic Resource Centre
62. Mr. S. H. U. De Silva	Road Development Authority
63. Ms. E. M. L. T. Ekanayaka	Road Development Authority
64. Mr. S. Mayadunnage	Road Development Authority
65. Ms. Chethika Gunasiri	Sri Lanka Land Reclamation and Development Corporation
66. Commander Y.R. Serasinghe	Sri Lanka Coast Guard Department
67. Mr. C. K. Muthumala	State Timber Corporation
68. Ms. T. K. Weerakkody	Urban Development Authority
69. Mr. D. Hettiarachchi	Urban Development Authority
70. Mr. M. Kaduyoda	BACC project
71. Ms. H. S. Wijethunga	BACC project
72. Mr. J. Chandrasiri	HHRI
73. Prof I. A. U. N. Gunatilleke	University of Peradeniya / BEC
74. Prof. C. V. S. Gunatilleke	University of Peradeniya
75. Prof. Siril Wijesundara	National Institute of Fundamental Studies / BEC
76. Mr. Jagath Gunawardana	National Biodiversity Experts Committee
77. Dr. Jine Dela	National Biodiversity Experts Committee
78. Dr. Magdon Jayasuriya	National Biodiversity Experts Committee
79. Dr. Nihal Atapattu	National Biodiversity Experts Committee
80. Dr. T. Jeyasingam	Eastern University / BEC
81. Dr. Nirmalie Pallewatta	University of Colombo / BEC
82. Mr. Tilan Hasaranga	University of Moratuwa
83. Prof. Buddhi Marambe	University of Peradeniya / BEC
84. Dr. Venura Herath	University of Peradeniya
85. Prof. D. K. N. G. Pushpakumara	University of Peradeniya
86. Dr. Terrence Madhujith	University of Peradeniya
87. Dr. Inoka Kudavidanage	University of Sabaragamuwa
88. Dr. U. K. G. K. Padmalal	Open University of Sri Lanka
89. Dr. D. I. Wijerathne	FAO

90. Dr. Sahan Dissanayake	Colby College/ PGIA
91. Dr. Danny Hunter	Biodiversity International
92. Ms. Dhanushki Abhayaratne	United Nations Development Programme
93. Ms. Shyara Bastiansz	United Nations Development Programme
94. Mr. Amila Sumanapala	Butterfly Conservation Society of Sri Lanka
95. Dr. Malik Fernando	Ceylon Sub Aqua Club/NBEC
96. Ms. Kanchana Weerakoon	Eco-V
97. Dr. Eric Wickramanayake	Environmental Foundation Limited
98. Ms. Manori Gunawardena	Environmental Foundation Limited
99. Mr. Dinal Samarasinghe	Environmental Foundation Limited
100. Mr. Milindu Tissera	Environmental Foundation Limited
101. Mr. Praveen Abhayaratne	Federation of Environmental Organizations
102. Ms. Nishanthi Perera	Field Ornithology Group
103. Mr. Lal Kumara Wakkumbura	Green Movement of Sri Lanka
104. Mr. Nimal Hewanila	Nirmanee Development Foundation
105. Mr. Prasanna Weerakkody	Ocean Resources Conservation Organization
106. Mr. Ajith Tennakoon	Sevalanka Foundation
107. Mr. N.M. Tharindu Gunathilaka	Sarvodaya
108. Mr. W. P. Jayathilake Perera	Small Fishers Federation
109. Mr. Douglas Thisera	Small Fishers Federation
110. Mr. S. Tharapalaraliram	Small Fishers Federation
111. Mr. Thushan Kapurusinghe	Turtle Conservation Project
112. Ms. Anjali Watson	Wilderness and Wildlife Conservation Trust
113. Dr. Andrew Kittle	Wilderness and Wildlife Conservation Trust
114. Ms. Sujeewa Thilakarathne	Wild Reach Trust
115. Prof. Lakdas Fernando	Wildlife and Nature Protection Society
116. Ms. Shiranee Yasaratne	Biodiversity Sri Lanka
117. Ms. Dimuthu Jayakodi	Dilmah Conservation
118. Ms. Saheyli Weerasinghe	Dilmah Conservation
119. Mr. Chalaka Fernando	Holcim Lanka Ltd

## Annex 1. Contd.

120. Ms. Farzana Khan	Holcim Lanka Ltd
121. Mr. Amila Prasad Silva	Holcim Lanka Ltd
122. Mr. Salinda Kandapola	Tokyo Cement
123. Mr. Jagath Karunadasa	Agarapathana and Kotagala Plantations PLC
124. Mr. Janaka Gunawardena	Kahawatte Plantations PLC
125. Mr. Sameera Abeyratne	Kahawatte Plantations PLC
126. Mr. Jeewantha Senarathne	Kahawatte Plantations PLC
127. Mr. Johann Rodrigo	Kelani Valley Plantations PLC
128. Mr. K. Balamurali	Kelani Valley Plantations PLC
129. Mr. Deepal Gunatilake	Horana Plantations PLC
130. Mr. T. P. Wickramasinghe	Horana Plantations PLC
131. Mr. D. M. P. H. Dissanayake	Horana Plantations PLC
132. Mr. Theja Dharmaratne	Talawakele Plantation PLC
133. Mr. Rohana Deshapriya	Watawala Plantations PLC
134. Mr. Kingsly Hemachandra	Watawala Plantations PLC
135. Mr. Kavintha Rajapaksha	Watawala Plantations PLC
136. Mr. Isuru Siriwardhena	Watawala Plantations PLC
137. Mr. Ranil Nanayakkara	Aitken Spence
138. Mr. Anoma Alagiyawadu	Jetwing Hotels
139. Mr. Palinda Perera	Hotel Tree of Life
140. Ms. Dilini Wijayagurusinghe	Duluxe Vacations
141. Mr. G. M. H. K. Gunathilake	Jetwing Hotels
142. Ms. Sashika Kaluwahewa	Jetwing Hotels
143. Ms. Irosha Weththasingha	Commercial Bank
144. Ms. Sasika Kaluwahewa	Commercial Bank
145. Mr. Hasrath Munasinghe	Commercial Bank
146. Mr. Hemantha Seneviratne	Hatton National Bank
147. Ms. Gayathrie Ganeshan	Hatton National Bank
148. Mr. Kasun Balasuriya	National Development Bank
149. Mr. Andy Ratnayake	People's Leasing Company
150. Mr. Nuwan Pathirana	Sampath Bank

151. Mr. Prajesh Dayarathne	Sampath Bank
152. Mr. Sandrine Gomes	Seylan Bank
153. Ms. Stephani Fernando	Walkers Tours
154. Mr. Yudesh Gunaratne	Walkers Tours
155. Mr. Dhanushka De Silva	Sri Lankan Airlines
156. Mr. Janaka Wijesekara	Abans
157. Ms. Lakmini Senadeera	Carbon Consultancy Company
158. Ms. Shermila Weragoda	Carbon Consultancy Company
159. Mr. J. D. J. Abayasekara	Ceylon Biscuit Limited
160. Mr. H. M. A. C. Gunarathna	Ceylon Biscuit Limited
161. Ms. Dilshi Gunasekara	Coca Cola Beverages
162. Mr. Chaturanga Deshapriya	Control Union
163. Ms. Deshika Kariyakarawana	Control Union
164. Ms. Nirantheri Kathireson	Dialog
165. Mr. Darren Adamally	Dailog
166. Ms. Thanusha Chandrasekara	DIMO
167. Ms. Ruwanthi Jayasinghe	DIMO
168. Mr. Vinod Malwatte	FEO
169. Mr. Suresh Mathangaweera	Forbes and Walkers Ltd
170. Mr. Daniel Schreiber	GIZ
171. Mr. Prince Manamperi	Wildlife Conservation Society
172. Mr. Hemantha Samarasinghe	Harishchandra Mills
173. Mr. Sampath Aruna	Hidramani Group of Companies
174. Mr. Dilshan David	Heritance Hotels
175. Mr. Lalith Herath	Linea Aqua
176. Ms. Hiru Jayatunge	MAS Intimates
177. Mr. Shahen Amaratunga	MAS Capitol
178. Mr. Kaushala Liyanage	Print Care
179. Ms. Zaneta Marcelline	Virtusa
180. Mr. L. Mawiwla Ariyaratna	



## Annex 2. Matrix of Stakeholders Listed in the Plan

(Sources: Vision or Mission extracted directly from each organization's website)

Promoter	Weak Promoter	Promoter/Latent	Defender	Latent	Weak Latent	Apathetic	
Stakeholders	Vision/mission of the institute (as applicable)		Influence	Interest	Resources	Position	Impact on biodiversity loss
Ministry of Mahaweli Development and Environment (MoMDE)	Mission: 'to provide leadership to manage the environment and natural resources in order to ensure national commitment for sustainable benefit of the present and future generations'.		High, mandated to facilitate implementation of NBSAP	High, lead agency in implementation of NBSAP	Moderate	Promoter	Positive
Biodiversity Secretariat, Ministry of Mahaweli Development and Environment (BDS)	Mission is to 'provide leadership for the nation in conservation of country's biodiversity without depleting natural stock and the environment while ensuring the national commitment to sustainable development'.		Very high, mandated with overseeing the island's biodiversity.	100% interest, mandated to prevent biodiversity loss	Has several ongoing projects and funding. Personnel capacity is likely inadequate.	Promoter	Positive
Department of Wildlife Conservation (DWC)	Mission is 'working with others to ensure conservation and wildlife heritage through professional management'		Very high, mandated to manage many protected areas in the island and the species within. Implements FFPO, CITES and Ramsar.	100% interest, mandated to protect biodiversity	Has had several major projects that focussed on bettering infrastructure. Personnel capacity is likely inadequate.	Promoter	Positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Forest Department (FD)	Mission is to 'conserve and develop the Forest Resources in Sri Lanka to ensure the prosperity of the nation'.	Very high, mandated with overseeing the island's forests.	100% interest, mandated to protect forests	Has had several major projects that focussed on bettering infrastructure. Personnel capacity is likely inadequate.	Promoter	Positive
Department of National Zoological Gardens (DNZG)	Policy to 'ensure conservation of species through <i>ex-situ</i> conservation of animals'.	High, mandated to practice <i>ex-situ</i> conservation of fauna	100% mandated to practice <i>ex-situ</i> conservation of fauna	Personnel capacity is likely inadequate.	Promoter	Positive
Department of National Botanic Gardens (DNBG)	Mission is to 'provide opportunities for the public to study, sustainably conserve, and admire plant resources in natural and man-made environments'.	High, mandated to practice <i>ex-situ</i> conservation of flora	100% mandated to practice <i>ex-situ</i> conservation of flora	Personnel capacity is likely inadequate.	Promoter	Positive
Department of National Museums (DNM)	Vision is to preserve the cultural and natural heritage inherited from the past, and its presentation in a more fruitful fashion for future generations in a manner that successfully addresses the challenges of globalisation'	High, mandated in the preservation of natural heritage. Is a source of reference.	High, mandated in the preservation of natural heritage.	Personnel capacity is likely inadequate.	Promoter	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Marine Environment Protection Authority (MEPA)	Mission is to 'be an agency with required skills, competence, organizational structure and infrastructure framework to prevent, control and manage marine pollution in Sri Lankan waters through effective enforcement of regulations, implementation of concerned International conventions, coordination and mobilization of stakeholder and other resources, for sustainable management of marine environment for present and future generations'.	High, mandated to enact the Marine Environment Protection Act, mandated to reduce marine pollution	High, mandated to manage the marine zone.	Has several ongoing projects and funding. Personnel capacity is likely inadequate.	Promoter	Positive
Environmental NGOs	Directly work with environmental issues at national, provincial and local levels.	High	High	Will vary	Promoter	Positive
Sri Lanka Customs (SLC)	Mission: 'dedicated to enforce revenue and social protection laws of the state while facilitating the trade with the objective of contributing to the national effort and in due recognition thereof'	High. The Biodiversity Unit is very active and has prevented many instances of smuggling	High	High	Promoter	Positive
National Research Council (NRC)	Mission: 'to promote, fund, facilitate and monitor fundamental and applied research and enhance human resource development for Sri Lanka to achieve science and knowledge based developed country status'.	High, mandated to fund science research and improve science knowledge	High	High	Promoter	Positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
International Union for Conservation of Nature (IUCN)	Mission is 'to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable'	High, IUCN is the world's oldest and largest global environmental network. The country office of IUCN in Sri Lanka has been involved in key national conservation projects since 1988	High, mandated to generate conservation-related knowledge, improve governance and empower communities	Moderate	Promoter	Positive
Plant Genetic Resources Centre (PGRRC)	Is 'responsible for planning, implementing and co-ordination activities related to conservation of plant genetic resources. It is actively engaged in exploration, collection, introduction, multiplication, evaluation, conservation, documentation and distribution of the genetic diversity of crops and their related species. Its facilities are also used to conduct biotechnology studies, especially for conservation, evaluation and enhancement of genetic resources. achieve an equitable and sustainable agriculture development through improved agriculture dissemination of improved agriculture technology'	High, mandated to conserve plant genetic resources, and is a major player in the preservation of germplasm	High, plays a major role in conserving wild varieties of crop plants	High	Promoter	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Sustainable Development Division of MoMD&E (SDD)	<p>Functions are to a) develop strategic plans for protection of the environment and environmental quality improvement and undertaking pilot programmes; b) disseminate knowledge on sustainable development among all sectors of the society; c) coordinate stakeholders to achieve Sustainable Development targets; d) ensure the promotion of Green Economy in national development agendas/ programmes; e) develop programmes for environmental valuation and Green Accounting f) facilitate promotion of cleaner production concepts and provide inter and intra agency coordination for incorporation of sub-sectoral cleaner production policies; g) implementation of sustainable water management initiatives; h) act as the focal point of implementation of the National Green Reporting System of Sri Lanka; i) provide a platform to develop policies and strategic plans related to sustainable development to integrate environmental concerns into national development processes to ensure long term sustainability.</p>	High, focal point for national green reporting system	High	High	Promoter	Positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Sri Lanka Land Reclamation & Development Corporation (SLLR&DC)	Mission: 'to reclaim and develop every reclamation and development area declared by order under section 2 of the amendment to the SLLRDC Act No. 15 of 1968; to ensure flood free habitat and improving the environment by rehabilitating creating and maintaining polluted free inland water bodies; to undertake consultancy work on drainage design, land filling and other related areas and establishing a benchmark of high standard for the industry; to improve and maintain the quality of our services and add value to our customers in particular and to the community at large'.	High, as is mandated to reclaim and develop land	High, Colombo Metropolitan Wetland Strategy is done by them. Aspirations are changing	Moderate	Promoter	Can be both positive or negative
NGOs (related to environmental law)	Focus is environmental law and governance so has a major role to play in ensuring enforcement of laws, and in assisting in drawing up legislation	High, see previous column	High	Moderate	Promoter	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
United Nations Development Programme (UNDP)	'UNDP is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life'	High, as it is committed to the Sustainable Development Goals (SDGs) of which, SDGs 6, 13, 14 and 15 have direct bearings and 7, an indirect bearing on biodiversity conservation. UNDP in Sri Lanka is currently involved in two projects that have a direct bearing on the NBSAP.	High	High	Promoter	Positive
Climate Change Secretariat (CCS)	Mission is 'An environmentally conscious nation and a prosperous Sri Lanka with a high level of resilience to global climate change'	Moderate, in relation to the implementation of the NBSAP, but high in relation to the topic of climate change	Moderate	Has several ongoing projects and funding. Personnel capacity is likely inadequate.	Weak Promoter	Positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Central Environmental Authority (CEA)	Mission to be 'the flagship of the nation, steering towards protecting and managing the quality of the environment by promoting public participation, enforcement, advanced technological interventions and environmental education	Moderate, although mandated with overseeing the environment, because of low capacity.	Moderate although mandated to protect the environment.	Has several ongoing projects and funding. Personnel capacity is likely inadequate.	Weak Promoter	Positive
National Science Foundation (NSF)	Mandate: to serve and strengthen the science and technology sectors in Sri Lanka, performs its tasks in accordance with the functions set out in the enabling Science and Technology Development Act , No 11 of 1994 and its activities conform to the National Science & Technology Policy. Accordingly, the National Science Foundation facilitates research, development and innovation to create a knowledge economy. It also facilitates capacity building, infrastructure development, technology transfer, knowledge creation and sharing in all fields of science and technology to improve the quality of life of the people.	High, mandated to strengthen science and technology	Moderate	Provides grants for research.	Weak Promoter	Positive
Biodiversity Sri Lanka (BDSL)	Objectives are: to add economic value to biodiversity conservation and integrate it into the core business of companies; to promote national cooperation and the exchange of ideas and information; and to strengthen and increase the involvement of the private sector in biodiversity conservation.	Moderate as it works with selected companies to increase private sector participation in biodiversity conservation	High	Low to moderate	Weak Promoter	Positive



## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Biodiversity Experts Committee (BEC)	A group of experts appointed by the MoMD&E to obtain advice on biodiversity conservation	Moderate	High	Low as does not meet regularly	Weak Promoter	Positive
National Species Conservation Advisory Group (NSCAG)	Appointed by the MoMD&E to obtain species specific advice	Moderate	High	Low as does not meet regularly	Weak Promoter	Positive
Land Use Policy Planning Department (LUPPD)	Mission: 'preparation of Scientific Land Use Plans and Policies by rational allocation of lands among competing demand for the optimum utilization of land resources maintaining sustainability and environmental balance'	High, as is mandated to maintain sustainability and environmental balance	Moderate	High	Weak Promoter	Can be either negative or positive
Institute of Post-Harvest Technology of NARA (IPHT of NARA)	Conducts research to ascertain and improve post-harvest technology applicable to the aquatic resources.	Indirectly high, as focus is to reduce post-harvest waste, which is one way of reducing over exploitation of fisheries resources	Indirectly high	High	Weak Promoter	Positive
Dept. of Education	Mission 'to develop competent citizens keeping with the global trends through innovative and modern approaches to education leading to efficiency, equity and high quality performance ensuring stakeholder satisfaction'.	High, has the power to include biodiversity conservation right through primary and secondary curricula	Moderate	Moderate	Weak Promoter	Can be positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Dept. of Animal Health and Production (DAPH)	Mission: to provide technical guidance and support to achieve sustainable development in the livestock sector by maintaining a healthy population and enhanced productivity, ensuring food safety and contributing to food security	High, it is risk assessment agency for exotic animals	Moderate	Moderate	Weak Promoter	Can be positive
Bandaranayake Memorial Ayurvedic Research Institute (BMARI)	Mission: 'focussed and well-planned research and development in every aspect of Ayurveda to enhance and improve the contribution of Ayurvedic medicine to the healthcare of mankind'.	Moderate, collects information through ethno botanical surveys. Collects germplasm to improve existing live herbarium; also propagates and cultivates medicinal plants.	Moderate	Moderate	Weak Promoter	Usually positive but can be negative if there is overexploitation of certain species.
Coast Conservation and Coastal Resources Management Department (CC&CRMD)	Vision is 'Sri Lanka to achieve prominence as a country with the sustainable management of coastal resources in the Asian Region'	High, mandated to conserve the coastal zone and its resources.	Moderate in relation to the conservation of biodiversity in other zones	Has several ongoing projects and funding. Personnel capacity is likely inadequate.	Promoter/ Latent	Positive
National Aquatic Resources Research and Development Agency (NARA)	Vision is 'to be the premier institution for scientific research in conservation, management and development of aquatic resources in the region'.	High, mandated to carry out research on aquatic resources.	Moderate in relation to the conservation of biodiversity	Has several ongoing projects and funding.	Promoter/ Latent	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Mahaweli Authority of Sri Lanka (MASL)	<p>The Mahaweli Master Plan in the Dry Zone of Sri Lanka has earmarked 365,000 ha of land for development of Agriculture in 13 Systems identified under the Mahaweli Development Programme. It was intended to construct a series of reservoirs and hydro-electricity plants and develop a large area of land with irrigation in order to facilitate the establishment of new settlements and development of agriculture. The implementation of the Mahaweli Development Programme is a mandate of the Mahaweli Authority of Sri Lanka established in 1979 by an Act of Parliament. The Mahaweli Development Authority's current task is to implement the envisaged project plan in the balance areas proposed by the Master plan and also Gazetted areas. This includes rehabilitating and maintenance of the irrigation network, administration of the land, enhancing the production of agriculture and the post settlement process. Further, MASL is responsible for managing irrigation water for 101,526 ha of Irrigable land in the dry zone'.</p>	High, as they have the ability to take over land for the Mahaweli Master Plan.	Moderate. However, in compensating the natural areas cleared by development, through its projects some 150,900 ha were declared as national parks under the Mahaweli Project	High	Promoter/ Latent	Both positive and negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Dept. of Archaeology (DoArch)	Mission: 'to function as Sri Lanka's apex institution and chief regulatory body for the management of its archaeological heritage'.	Moderate, not mandated to conserve biodiversity, but as areas conserved for archaeology benefit biodiversity	Moderate	Moderate	Promoter/ Latent	Positive
Schoolchildren	Not applicable	Low	High, enthusiastic but have to be guided properly	None, but enthusiasm	Defender	Both positive and negative
Universities	Not applicable	Low, have little direct influence on actions.	High, provide biodiversity and other experts, engage in research whose results can serve as the basis for conservation actions.	Little resources in terms of financial inputs, but high personnel capacity.	Defender	Positive
Individual experts	Not applicable	Low	High, depending on their field of expertise, can be very high, as they contribute to the generation of both theoretical and practical knowledge	Low	Defenders	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Indigenous peoples and local communities (IPLCs)	Not applicable	Low	Can be high, indigenous peoples and local communities can make significant contributions to biodiversity conservation as they are the primary users of natural resources	Low	Defender	Usually positive
National Institute of Fundamental Studies (NIFS)	Mission 'to initiate, promote and engage in advanced research in fundamental studies for the enhancement of scientific knowledge and development of human resources contributing to national development.'	Low, is a research organization, not a policy making or decision making one	High	Moderate	Defender	Usually positive
Research institutes	Not applicable	Low	Can be high. Role is to generate knowledge which feeds into decision-making	Generally low	Defender	Usually positive
Northwestern Provincial Environmental Authority (NWPEA)	Mission: 'to pave the way to create a Habitable Environment for the people of the NWP by means of Natural Resources Conservation and Environmental Management'.	High, within the province	Low in relation to the conservation of biodiversity in other provinces	Low	Latent	Usually positive within the province

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Civil society	Not applicable	Can be high, if all influence is harnessed	Low, minimal for a very large percentage, tendency is to blame the custodians of biodiversity for its loss	Will vary	Latent	Both positive and negative
Media personnel	Not applicable	High	Low for most. Minimal except for science correspondents, tendency is to have little knowledge.	Powerful resource at hand.	Latent	Both positive and negative
Road Development Authority (RDA)	Mission: 'to provide an adequate and efficient network of national highways, to ensure mobility and accessibility at an acceptable level of safety and comfort, in an environment friendly manner for the movement of people and goods for the socio-economic development of the nation'.	Very high, mandated to cut through habitats and make roads.	Low although mandated to be environmentally friendly, several recent projects have ignored environmental concerns.	High	Latent	So far negative

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Sri Lanka Tourism Development Authority (SLTDA)	Mission is 'to inspire, build and deliver 'Sri Lanka Tourism' to be a key driver of Sri Lanka's economic growth. Our goal is to delight our customers with passion and excellence, thus enriching incomes of our stakeholders and benefiting our community.'	Very high, there were 1,527,153 foreign tourists in 2014; of these, 454,053 visited national parks. Revenue earnings were 831.5 million rupees (SLTDA, 2014).	Very low, there is no mention of the environment in their mission. Some large hotels are concerned about biodiversity loss.	Many of the large hotel companies have large financial resources.	Latent	Some positive, largely negative
Individual hotels	Not applicable	See above	Mixed. There is a move now in the larger hotel chains to engage in sustainable practices and environmental management but this is largely lacking in mid-level and guest house level accommodation	See above	Latent	Some positive, largely negative
Tour operators	Not applicable	Can be high, as they can influence the selection of hotels or sites depending on a 'green' rating	Low	Low	Latent	Largely negative — can be heavy as much of Sri Lanka's tourism involves natural habitat

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Tour guides	Not applicable	Can influence tourists they are guiding to sustainable practices	Low	Low	Latent	Largely negative, as above
Private Sector	Not applicable	Very high. Impact through projects can be wide ranging and involve many people	Low. Involvement is through CSR programmes. However, much of 'environment' related work is one-off efforts, sometimes, mere 'green-washing', but now there is a need for triple P (people, planet and profits — sustainability reporting)	Large financial resources, a resource not sufficiently tapped into	Latent	Largely negative
Ministry of Finance (MoF)	Mission: 'design, propose, execute and evaluate, with efficiency and transparency, economic and fiscal policies of the country toward promoting investment and economic development to ensure quality living for the people.'	High, control the money allocated to biodiversity conservation	Not high enough, for example, valuation of biodiversity has not yet been mainstreamed into national accounting	High	Latent	Mostly negative



## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Ministry of Health (MoH)	Vision: 'a healthier nation that contributes to its economic, social, mental and spiritual development'	High, as some policies such as some dengue prevention methods damage biodiversity	Low	High	Latent	Can be negative
Board of Investment (BoI)	Mission 'contribute broadly to the national economy by attracting sustainable investments which would enable the optimum utilization of human resource talents, through vigorous promotion and excellent investor facilitation whilst preserving harmony with the natural environment'.	Very high, mandated to preserve harmony with the natural environment.	Low	High	Latent	Negative
Ministry of Indigenous Medicine	Vision: building up a healthy and prosperous nation which can contribute to the development of the country, through indigenous medical systems	High	Low	High	Latent	Positive
Ministry of Fisheries and Aquatic Resources Development (MoFARD)	Mission: 'managing the utilization of Fisheries and Aquatic Resources for the benefit of the present and future generations.'	High	Low	High	Latent	Negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Dept. of Agrarian Development (DAD)	Mission is the 'formulation and timely implementation of institutional, facilitator, legal and management services for optimum productivity of all agriculture lands as well as sustainable development of farming community of Sri Lanka'.	High, as there is the ability to influence farmers to change agricultural practices to a more sustainable approach, but focus can be on productivity at the cost of the environment.	Low	High	Latent	Largely negative
Dept. of Fisheries and Aquatic Resources (DFAR)	Mission: 'management of fisheries and aquatic resources by adopting new technologies in compliance with the national and international laws and treaties for the productive contribution to the Sri Lankan economy through sustainable development of the fishing industry'.	High	Low	High	Latent	Negative
Dept. of Legal Draughtsman	The main function of the Legal Draughtsman's Department is the drafting of principal legislation as well as amendments of existing legislation and drafting and revision of subsidiary legislation in order to facilitate the successful implementation of the Government.	Mixed, as all required amendments and new legislation will have to be carried out by this department, but it also drafts other legislation which can be incompatible with biodiversity conservation	Low	Moderate	Latent	Both positive and negative

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Department of Agriculture (DoA)	Mission: 'formulation and timely implementation of institutional, facilitator, legal and management services for optimum productivity of all agriculture lands as well as sustainable development of farming community of Sri Lanka.'	Very high as there is one third of the land under cultivation (Survey Dept. 2007).	Low, although the word sustainable is used, there are perverse subsidies in for pesticides and fertilizers.	Has several ongoing projects and funding.	Latent	Mostly negative although the PGRC and NPQS are institutes of the DoA.
Department of Ayurveda (DoAyur)	Mission: 'formulation of policies required for the conservation of the people's health and maintaining good health conditions through the extension of Ayurveda system island wide, maintain services for prevention of diseases, health care rehabilitation and development on an exemplary level, identify and implement strategies necessary for the propagation of Ayurvedic Medical System globally'.	Moderate. Certain species can be overexploited and collection methods may be damaging.	Moderate	Personnel capacity and resources inadequate	Latent	Positive
Sri Lanka Police Department (SLPD)	Mission: 'Sri Lanka Police is committed and confident to uphold and enforce the law of the land, to preserve public order, prevent crime and terrorism with prejudice to none – equity to all'.	High	Low. No direct involvement, except through the Environment police		Latent	Neutral
NGOs related to community and economic development	Not applicable	High	Mostly low, little direct involvement although they work at national, provincial and local levels	Varies	Latent	Both positive and negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
NGOs related to policy and advocacy	Not applicable	High	Mostly low, little direct involvement although they work at national level	Varies	Latent	Both positive and negative
Ceylon Electricity Board (CEB)	To develop and maintain an efficient, coordinated and economical system of electricity supply to the whole of Sri Lanka, while adhering to our core values: quality; service to the nation; efficiency and effectiveness; commitment; safety; professionalism; and sustainability	High as with the impacts of climate change, there is more dependence on coal power.  Also large areas of natural habitats are cleared for establishment of power stations.	Low although the environmental policy is to 'actively pursue a policy of incorporating and integrating environmental considerations into . . . activities'.	High	Latent	Largely negative
Coast Guard (CG)	Mission is to 'ensure the security, safety and serenity of the maritime environment whilst enforcing the law at sea. The Coast Guard is further committed towards the sustainable management and development of marine resources'	High	Moderate	High	Latent	Can be positive or negative
Disaster Management Centre (DMC)	Mission: 'to create a culture of safety among communities and the nation at large through systematic management of natural, technological and man-made disaster risks'.	High	Low	High	Latent	Positive

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Geological Survey and Minerals Board (GSMB)	Mission: 'to provide geoscientific information, advice and services to the policy makers and the community and to promote and manage the mineral resources of the country for economic development while ensuring environmental sustainability. It regulates exploration, extraction, value addition, transportation and trading of minerals.'	High, as there is a possibility to make extractive practices sustainable	Low	High	Latent	Negative
Irrigation Department (ID)	Vision: 'to enhance the development and management of land and water resources towards the socio-economic development of Sri Lanka. Irrigation Department will plan out, design, control and manage land and water resources to derive optimum benefits for irrigated agriculture, hydro power and flood control by harmonizing the modern technologies and human resources.'	High as almost 90% of the country's water resources are applied in the irrigation sector.	Low. Sometimes this supply is provided at the cost of the environment.	High	Latent	Largely negative
Institute of Policy Studies (IPS)	Mission 'to contribute to the economic development of a democratic Sri Lanka and enhance the quality of life of its people by informing policy-makers and contributing to the public debate through timely, independent, and high quality research-based analysis of medium and long-term national policy issues.'	High as can support the development of policies recommended in the actions.	Low, no mention of the environment in their mandate.	High	Latent	Positive

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Provincial councils (PC)	The Provincial Council list, which includes environmental protection, comprises fully devolved subjects. PCs can pass statutes on these subjects without any further requirements.	Very high within the province.	Usually very low.	Low, dependent on the Central Government for finances	Latent	Usually negative
Local authorities	Run by elected not appointed officials. Environment is a devolved subject	High, as the elected local authority can have either a positive or negative impact.	Invariably low	Usually limited, as financial control is with the central government.	Latent	Can be either positive or negative
Dept. of Meteorology (DoM)	Mission: 'to provide services pertaining to Meteorology, Aeronautical Meteorology, Ocean Meteorology, Hydro Meteorology, Agricultural Meteorology, Climatology and Astronomy to government agencies, private sector and the general public in keeping with national interest and international standards'	High, their forecasts feed knowledge about damage to biodiversity from extreme weather events	Low	Moderate	Latent	Can be either positive or negative
National Aquaculture Development Authority (NAQDA)	Mission: 'to contribute to the improvement of the socio-economic conditions of rural societies through alleviation of poverty by increasing freshwater and brackish water fish production and introducing new technologies for utilization of aquatic resources for small, medium and large scale enterprise development.'	High, as their policies (such as promoting the aquaculture of some invasive alien species) can be damaging to biodiversity.	Low, the mission does not include any mention of sustainable practices	Moderate	Latent	Largely negative

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
National Gem & Jewellery Authority (NG&JA)	Mission: 'to effectively utilize learning, resources and "state of the art technology" together with the traditionally inherited excellent craftsmansmanship facilitating optimal value addition through regulation, development and promotion of Sri Lankan Gemstone and Jewellery industry accomplishing unmatched stakeholder delight, delivering a conspicuous return to the nation'.	High, process of gem mining severely degrades ecosystems	Low, no reference to sustainability in the mandate	High	Latent	Negative
National Institute of Education (NIE)	Mission: 'to provide state of the art education to students in the school system of Sri Lanka by way of innovative curriculum and competent teachers who are educated and trained appropriately through research and modern technologies for the purpose of enriching the systems of learning in schools to enable the students realize their goals of education for life'.	High, ability to include in the curriculum different aspects of biodiversity conservation and inculcate a sense of responsibility in future generations	Low, technically sound inputs in the curriculum on the subject of biodiversity conservation is lacking, although it is included in the syllabus at various levels.	High	Latent	Largely neutral
University Grants Commission (UGC)	Mission: 'to guide, establish and develop through good governance and management a sustainable, widely acclaimed and accessible higher education system dedicated to quality teaching-learning, high impact research, innovative enterprise, constructive community engagement, peace and harmony and strategic international cooperation in line with national development'.	High, as it provides grants, some of which contribute to biodiversity conservation	Low	Low	Latent	Largely neutral

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
National Water Supply & Drainage Board (NWSDB)	Mission is 'to serve the nation by providing sustainable water and sanitation solutions ensuring total water satisfaction'	High, mandated to provide sustainable solutions.	Low, no mention of pollution in the NWSDB law and amendment	High	Latent	Can be negative
Department of National Planning (DNP)	Mission is to 'stimulate socio-economic development by guiding the public sector for appropriate policies, programmes and strategies and provide enabling environment for the private sector incorporating adequate safeguard to ensure equity and improve living standards'.	High, develops policies in relation to money allocated to biodiversity conservation	Not high enough, for example, there is no policy requiring valuation of biodiversity	High	Latent	Mostly negative
National Plant Quarantine Service (NPQS) of DoA	Vision: to 'facilitate the international movement of healthy plants and plant products for the development of national agriculture and related industries.'	High, controls the movement of plants into the country and can prevent the entry of invasive alien species	Low, capacity and knowledge related to invasive species needs improvement for better vigilance	High	Latent	Can be positive or negative
Postgraduate Institute of Agriculture (PGIA)	Mission 'to be a national and regional centre for postgraduate education, research and outreach by providing a theoretically sound and practically oriented training to produce competent, innovative and dedicated persons to foster national development of agriculture and allied fields'.	High, one third of the land area of Sri Lanka is cultivated. The PGIA produces research and training for the persons who, in turn, influence farmers.	Low, the mandate does not mention sustainability.	High	Latent	Neutral, can be positive as it offers training courses on natural resource management and environmental economics



## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Institute of Post-Harvest Technology (IPHT)	Mission: 'to enhance competitiveness of the agribusiness sector through development, dissemination and commercialization of improved and appropriate post-harvest technologies among the relevant and interest parties.'	Indirectly high, as focus is to reduce post-harvest waste, which is one way of reducing over-use of agrochemicals and reduce habitat destruction	Low	High	Latent	Can be positive
Religious institutions	Not applicable	High, these institutions wield a lot of influence among their followers	Low, there is a general lack of awareness about the scale of the issues related to biodiversity loss	Low	Latent	Can be positive or negative — but all religious institutions should promote environmental conservation
Dept. of Export Agriculture (DoEA)	Mission: 'Planning and Implementation of an appropriate Research and Development Programme with the prime objective of earning more foreign exchange through enhancement of quality and quantity of Export Agricultural Crop Production for sustainable development of economic and social standards of all the stakeholders of the Export Agricultural Crop (EAC) sector while ensuring the safeguards to environment'	High, as mandated to safeguard the environment, and will be important for the establishment of conservation of germplasm of crops and livestock	Low	Moderate	Latent	Can be positive or negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Rice Research and Development Institute (RRDI)	Mission: 'to be the national centre for the development and primary dissemination of technologies to improve the productivity and profitability of rice farming and quality of rice'.	High, as about 50% of the total land cultivated — is under paddy cultivation.	Low, as there is no mention of sustainable practices in their mission	Low	Latent	Largely negative
Coconut Research Institute (CRI)	Mission: to 'generate knowledge and technology through excellence in research towards increasing productivity and profitability of coconut'.	High, as 6% of the land area is under coconut cultivation	Low	High	Latent	Negative
Tea Research Institute (TRI)	Mission: 'to generate and transfer scientific knowledge and technologies appropriate for the stakeholders to improve productivity and quality of Sri Lankan tea in a most profitable manner.	High, as their research contributes to the production of tea which extends over ~ 3.4% of the land area, and tea exports are the second highest foreign exchange earner, but has impact on downstream habitats and ecosystems as well. Some large tea growing companies are now turning to more environmentally-friendly practices	Low	Moderate	Latent	Largely negative

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
National Physical Planning Department (NPPD)	Mission: 'to formulate national physical policies, plans and strategies and to ensure and monitor the implementation of such national policies and plans through regional and local plans with the objective of promoting and regulating integrated planning of economic, social, physical and environmental aspects of land and territorial waters of Sri Lanka'.	High	Low	Moderate	Latent	Can be positive or negative
National Building Research Organization (NBRO)	Mission: 'to promote and sustain research and development and provide technical services for disaster risk reduction and safer built environment'.	High, as their inputs can reduce damage from natural hazards to build infrastructure, which in turn can damage natural habitats	Low	Moderate	Latent	Can be positive or negative
Industrial Development Board (IDB)	Mission: 'to provide the strategic, technological and commercial foundation needed to encourage, promote and develop all industries all over Sri Lanka.'	High, has the ability to influence sustainable use of natural resources and sustainable practices	Low — no mention of sustainability in its mission	Moderate	Latent	Usually negative but can be positive if sustainability is prioritised.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Sri Lanka Ports Authority (SLPA)	Vision: 'envisioning the future of Sri Lankan Ports, Sri Lanka Ports Authority is shifting its original thought of container hub to global logistic hub, expecting the boom in international trade that opens up a range of opportunities and challenges. The Ports Authority expects to strengthen complex logistic approaches with 'one touch' information flow of all activities while sustaining the best practices at national and international levels in order to improve overall economic conditions in Sri Lanka'.	High, as coastal areas are developed for ports.	Low	High	Latent	Negative — there is coastal habitat loss when ports are developed.
Agrochemical marketing agencies	Not applicable	High, as the better their marketing is, the more agrochemicals are sold and used	Low, most of the agrochemicals that are marketed are damaging to biodiversity conservation	High	Latent	Negative — the impacts of agrochemical pollution affects soil and water and the organisms that live it them, not only in the location of use but in downstream areas as well.

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Shipping companies	Purpose is to transport goods from one country to another	High, as 1,650 million USD were spent in Dec 2015 to import various materials from petroleum to machinery ( <a href="http://www.tradingeconomics.com/sri-lanka/imports">http://www.tradingeconomics.com/sri-lanka/imports</a> )	Low	High	Latent	Negative — bilge water may contain IAS, discharged engine oil pollutes the marine environment, and ships have a direct impact on marine mammals, through collisions.
Aquaria owners	Purpose is to collect, breed and sell ornamental fish	High, as there is overexploitation of species, habitat destruction in the process of collection, and the spread of invasive species through unintentional release	Low	Moderate	Latent	Negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Fish exporters	Purpose is to export native fish	Can be high, if they buy into the NBSAP, then unsustainable collection of native fish and habitat destruction while collection (for example, dynamiting coral reefs for collection) will reduce.	Low	High	Latent	Negative — there is overexploitation and habitat destruction
Central Cultural Fund (CCF)	Vision: 'Preserving the ancient grandeur of Sri Lanka for the future generation'	High, as they can be directly involved in the preservation of evolutionarily important sites	Low	Moderate	Latent	Usually positive
Department of Divinaguma Development (formerly Samurdhi Authority)	Mission: 'to contribute towards a stable national development with the least possible poverty through development based on public participation'.	High, as a range of poverty alleviation projects are implemented	Low, as there is little effort to include sustainable practices that are supportive of biodiversity conservation	High	Latent	Can be positive or negative

## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Communities (near forests, around lagoons etc.)	Not applicable	High, as they use the resources of the ecosystems around them	Low	None	Latent	Usually negative as there is overexploitation and sometimes habitat destruction and degradation
Public Service Commission (PSC)	Mission: 'To establish and promote an efficient, disciplined and contented public service to serve the public with fairness, transparency and consistency	Moderate, because they indirectly influence cadre of promoters	Low	Low	Weak Latent	Neither positive nor negative
Timber Corporation (TC)	Mission: 'to produce timber and timber-based products for our customers through the goodwill, updated knowledge and skills gained over time, within the acceptable quality and legal frame work and by contributing to national and environmental demands of Sri Lanka' .	Mandate is to harvest, but can be supportive in development projects where timber from the cleared areas is provided for other projects.	Low	Moderate	Weak Latent	Largely Negative

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
Rubber Research Institute	Mission 'to revitalize the rubber sector by developing economically and environmentally sustainable innovations and transferring the latest technologies to the stakeholders through training and advisory services'.	Moderate, although there is a current effort to use environmentally friendly energy sources in production, which is an indirect benefit to biodiversity conservation	Low	Moderate	Weak Latent	Usually negative as the focus is on one species
Sri Lanka Institute of Nanotechnology (SLINTEC)	Mission includes 'Collaborate with research institutes and universities to develop Sri Lanka's technology and research capability to a world class standard and contribute towards setting up a knowledge based economy'.	Moderate as their role will be restricted to assessing new technologies	Low	High	Weak Latent	Neutral
Fish collectors	Purpose is to collect native fish	Low	Low, collect fish and deplete populations and also damage marine and freshwater ecosystems while they do so	High	Apathetic	Negative
Fishermen	Use fisheries resources as a source of livelihood	Low	Low, can over-exploit resources and damage ecosystems through usage of illegal gear	Low	Apathetic	Negative



## Annex 2. Contd.

Stakeholders	Vision/mission of the institute (as applicable)	Influence	Interest	Resources	Position	Impact on biodiversity loss
National Engineering Research and Development Centre (NERD)	Mission: 'to engage in research and development activities that would have a direct bearing on the industrial development of Sri Lanka and on the improvement of the living standards of the people, and thereby develop technologies that would help in the sustainable utilization of her human and material resources towards the economic development of the country.'	Low, but research related to sustainable material indirectly contributes to biodiversity conservation	Low	Low	Apathetic	Can be negative
Community-based organizations (CBO)	Depends on their focus	Usually low	Can be low	Low	Apathetic	Can be either negative or positive
Farmer and fisher organizations	To enhance the welfare of membership	Low	Usually low	Low	Apathetic	Negative— as the former rely heavily on agrochemicals and the latter overexploits fisheries resources
Hospitals	Focus is to cater to the sick and improve their health	Low	Low	High	Apathetic	Can be negative — through disposal of hazardous and other waste



### Annex 3. The NBSAP Communication and Capacity Building Strategy for the Action Plan: a preliminary proposal

Communication Action /Indicator	Capacity Building /Indicator
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a) Preparatory steps needed as soon as the NBSAP is approved.

Step	Communication activity	Done/disseminated how	Target group	Time frame	Indicator	Remarks
1	Branding and slogan (in all three languages for the NBSAP developed	Hire a professional advertising agency.	All stakeholders.		Brand and slogan developed.	To be done as soon as the NBSAP is accepted, to create a recognisable identity.
2	Developing a brochure about the NBSAP along the lines of the brochure produced for the Aichi targets (CBD, undated b) and translate into both vernacular languages	<ul style="list-style-type: none"> <li>Start an email campaign to disseminate this as widely as possible by using tools such as Mailchimp;</li> <li>Publish brochure content as a blog or in other shareable online forms;</li> <li>Press and TV releases, press articles, discussions on TV;</li> <li>Upload onto the Ministry website (press release with the brochure);</li> <li>Printed and distributed at Ministry meetings, to key private sector individuals, NGOs, INGOs, BINGOs, donor agencies, school, key media personnel and universities.</li> </ul>	All stakeholders		<ul style="list-style-type: none"> <li>Brochure printed and disseminated /disseminated electronically/ uploaded on social media;</li> <li>Number of hits on social media;</li> <li>Number of media events.</li> </ul>	To be done as soon as the brand and slogan are completed in order to publicise the targets of the NBSAP.
3	Starting a hashtag based on the slogan	Share the brochure with the hashtag on different social media platforms.	All social media users.		<ul style="list-style-type: none"> <li>Hashtag commenced;</li> <li>Number of hits on social media.</li> </ul>	The idea is to hook the social media users and get them primed for action that will follow.

Step	Communication activity	Done/disseminated how	Target group	Time frame	Indicator	Remarks
4	Using the brochure and the hashtag, start a campaign to identify biodiversity ambassadors and champions	Hire a professional marketing agency to publicise and run this campaign.	School children and large private sector companies.		<ul style="list-style-type: none"> <li>10 ambassadors identified and trained;</li> <li>5 champions identified and brought in as partners.</li> </ul>	Some form of incentive will have to be provided — i.e., what is the benefit in being a champion or ambassador?
5	Providing champions and ambassadors opportunities to experience nature first hand.	Experts take them on field trips, providing them with a rare experience.	Champions and Ambassadors.		<ul style="list-style-type: none"> <li>Number of field trips.</li> </ul>	Will benefit them in terms of experience, gain kudos, which they will share via social media and also make them better informed, and potentially more committed to issues.
6	Developing a short information brief about the NBSAP, including targets and actions.	<ul style="list-style-type: none"> <li>Targeted dissemination of print versions;</li> <li>By email.</li> </ul>	All government agencies and authorities, universities, private sector groups identified in the action plan.		<ul style="list-style-type: none"> <li>Number of emails sent;</li> <li>Number of prints distributed.</li> </ul>	Again, this is to prime these groups about what needs to be done, highlighting their roles as well.
7	Developing a pithy 30 seconds to a minute videos about biodiversity loss (one driver per video), in all three languages	<ul style="list-style-type: none"> <li>Upload on YouTube;</li> <li>Vimeo;</li> <li>Telecast on national television channels at a strategic time (i.e., just before the news).</li> </ul>	All stakeholders.		<ul style="list-style-type: none"> <li>Number of views on YouTube;</li> <li>Number of telecasts.</li> </ul>	The idea is to present the problem and lead them towards 'What can you do to stop biodiversity loss' and then say 'Coming soon'.

## Annex 3. Contd.

Step	Communication activity	Done/disseminated how	Target group	Time frame	Indicator	Remarks
8	Adapting the European Union '52 tips for biodiversity' (Royal Institute of Natural Sciences of Belgium, 2009) to suit Sri Lanka and its problems of biodiversity loss and turn it into '12 tips for biodiversity'. Release one tip per month. Prepare new list and repeat each year.	<ul style="list-style-type: none"> <li>Upload each tip with the hashtag developed in step 3;</li> <li>Telecast on national TV/press release on the process;</li> <li>By email;</li> <li>School programmes;</li> <li>Forms on the Ministry's website.</li> </ul>	<ul style="list-style-type: none"> <li>Social media users;</li> <li>Schoolchildren;</li> <li>Youth ambassadors.</li> </ul>		<ul style="list-style-type: none"> <li>Social media analytics;</li> <li>Ministry website.</li> </ul>	This is where you engage the general public into action. If the tip concerns the reduction of pollution, then an answer is elicited on what they did to reduce pollution. (Tell us what you did)
9	Accumulating these actions on the Ministry website, much the same as Earthday.org has done with a billion acts of Green <sup>1</sup>	<ul style="list-style-type: none"> <li>The response per month to be aggregated on the website;</li> <li>Forms on the Ministry's website.</li> </ul>	General public.		<ul style="list-style-type: none"> <li>Social media analytics;</li> <li>Ministry website.</li> </ul>	The aggregated figure of actions can be added like ticking clock on to the website.
10	Use the power of listicles to raise awareness on various topics 'Top threatened fish' 'Ten things you can do to reduce pollution' 'Ten things you should know about IAS' etc.	<ul style="list-style-type: none"> <li>Upload each tip with the hashtag developed in step 3;</li> <li>Telecast on national TV/press release on the process;</li> <li>By email;</li> <li>School programmes;</li> <li>Forms on the Ministry's website;</li> <li>Tie in to actions from Targets 2, 3 and 4 in Annex 3 b);</li> <li>Supply listicles to widely accessed websites and online news services.</li> </ul>	<ul style="list-style-type: none"> <li>General public;</li> <li>Youth ambassadors.</li> </ul>		<ul style="list-style-type: none"> <li>Number of views on YouTube;</li> <li>Number of telecasts;</li> <li>Social media analytics;</li> <li>Ministry website.</li> </ul>	The aggregated figure of actions can be added like ticking clock on to the website.
11	Use traditional methods of communication to communicate this to local communities	<ul style="list-style-type: none"> <li>Prepare a ballad or street drama regarding the twelve NBSAP targets.</li> </ul>	<ul style="list-style-type: none"> <li>Communities</li> </ul>		<ul style="list-style-type: none"> <li>Number of performances in different locations.</li> </ul>	

b) The detailed communication and capacity building plan

It is expected that capacity building will take the form of short-term courses, over a pre-determined period (say three months), rather than one-off training workshops, where participants rarely retain what they have learned. It is also expected that such training workshops will include new technologies and tools currently available, such as smart phones in the use of georeferencing and social media groups for exchange of information.

Strategic objective 1: To ensure the long-term conservation of biodiversity									
Target 1: By 2022, a system established and ongoing for inventoring species (taxonomy conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision making.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Establish a national list of species and ecosystem types with annual updating	BDS, BEC, DWC, FD, IEOs, NARA, DNBG, DNMI, CC&CRMD, NGO's, individual experts, universities	Publicise new list of ecosystems identified in the NBSAP to all stakeholders; Disseminate information of species as it becomes available to all stakeholders.	Information briefs prepared and disseminated by email and regular mail.  Use available tools such as GPS embedded in smart phones to enlist the help of the general public to transfer photographs of species to a central site where georeferences can be added easily to improve distribution maps.	As needed, train officers in use of incorporating photos and GPS reference into GIS.	Georeferenced photographs sent incorporated into distribution maps.	Number of information briefs disseminated.  Number of photographs received;  Number of officers trained in the transfer of information from smart phones to GIS.		Unless the new categories are accepted, there won't be interest in research related to these

## Annex 3. Contd.

Target 1: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
	Action 1 Contd.	General public	Publicise the new list of ecosystems.	Put up on Ministry website Introduce with hashtag produced in action 3 Annex 3 a) Introducing ecosystem terms as 'Ecosystem of the month' blog.	None needed		Number of hits on the website Social media analytics.		
2	Establish a national biodiversity database to document biodiversity in all designated areas under FD and DWC	BDS, DWC, FD, DNM, NBEG, NARA, universities NGOs and other groups working on this, individual experts	None needed.	—	Training course to strengthen capacity on content management, maintenance of databases and protocols for data sharing.	Workshops.	Number of persons trained.		To be carried out after implementation actions such as Workshop to introduce the need for such a database; Workshop to detail database, database management system, values, meta data etc. (protocols).
3	Populate the database with existing data sets and update continuously	BDS, DNM, FD, DNBG, DWC, individual experts, IEOs, NARA, CC&CRMD, NGOs, universities	None needed.	—	Training course to strengthen capacity on protocols for data sharing.	Workshops.	Number of persons trained.		There needs to be a dedicated content manager for the database.

4	Develop a research agenda to address identified information gaps on sites, taxa and valuation of ecosystem services and share this information with relevant stakeholders	BDS NSF, NRC, UGC, DWC, FD, universities, NGO's, individual experts, DNP	Research agenda uploaded on BDS, NSF, and NRC websites. News items regarding research agenda on websites Research agenda shared via email to relevant departments in universities, individual researchers.	Website; Email.	Capacity developed for gap analysis.	Workshops.	Number of workshops.  Number of workshops; Agenda uploaded on websites; Number of emails sent.	This is a key input as without sound science, decision-making is hampered. Communication and capacity actions to be developed after implementation such as targeted workshops with relevant researchers to identify site and valuation gaps
5	Establish a national botanical and zoological survey programme to conduct baseline surveys for subsequent monitoring of sites identified in action 4	BDS, NRC, NSF, DNBG, DNM, DNZG, universities, individual scientists	Publicise need for surveys to elicit responses from researchers.	Start an email campaign to elicit response by using tools such as Mailchimp. Upload applications and information on NSF and BDS websites.  Using apps for different species (say higher plants, vertebrates) that include locational data, date and time sent, to enlist the help of the general public to send in their contributions towards the baseline surveys.	Development of apps (externally) and training of officers to use the App and incorporate the information received into databases.	Apps for different species.	Number of emails sent; Number of downloads on websites.  Number of photographs received; Number officers trained in the transfer of information from smart phones to GIS.	It is necessary to get the widest possible group of scientists involved in conducting these surveys.



## Annex 3. Contd.

Target 1: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
6	Provide seed grants for contract research on identified sites, taxa and ecosystem services, where information is not presently available	BDS, NSF, NRC, UGC, NARA, DNBG, DNIM, CC&CRMD, universities, private sector	Flyer about grant availability publicised to a larger audience	Email of flyer to wide range of person; Use hashtag to upload flyer on social media; Flyer on websites of target groups.	None needed.	—	Number of emails sent; Social media analytics; Flyer up-loaded on websites.		
7	Provide training for local experts on lesser known taxa	BDS, NSF, universities, DNBG, DNIM, TRD, DNZG, NARA, DWC, FD, NGOs, IPLCs	Database of taxonomic experts developed.	Database development.	Capacity on lesser known taxa developed; Training workshops with foreign experts; Trainer of trainers workshops (for local level dissemination); Local level taxonomic training workshops.	Training workshops introducing innovative methods such as use of smart phones and social media groups to expedite research.	Number of training workshops; Number of training of trainer workshops; Number of local level workshops and geographic spread of such workshops. Database developed and publicised.		



## Annex 3. Contd.

Target 2: By 2022, habitat loss, degradation and fragmentation are significantly reduced									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Conduct Strategic Environment Assessments for all nine provinces and identify the best possible pathway to achieve national development goals with the least amount of habitat loss and fragmentation	CEA, NPPD, UDA, CEB, ID, MASL, RDA, GSMB, DoA, SLTDA, NG&JA, CC&CRMD, NWS&DB, NAQDA, NARA, SLLR&DC, DFAR	Initially educate the provincial governor and governments, then engage them. Provide all officials with the information brief produced in Annex 3 a) action 5.	Initial one on one meetings Then work-shops.	Capacity for conducting SEAs strengthened at provincial level through training workshops at local level.	Workshops.	Number of meetings; Number of briefs disseminated.  Number of training work-shops held.		Ecosystems valuation results are critical in these discussions and workshops
2	Develop a national ecosystem (terrestrial, coastal and marine) conservation plan to identify the best possible strategies for afforestation, enhancement, restoration and establishing connectivity, with reference also to ecosystem-based climate change adaptation	BDS, NSCAG, BEC FD, DWC, SLLR&DC, NARA, MEPA, CC&CRMD, CEA, NBG, NZG, NGO's, IPLCs, MASL, universities, private sector CG, PC	Each department/ organization initially submits a list of possible actions under each theme. Focus group discussions with CBOs to elicit responses. Actions collated and circulated Make key elements of the plan as an information brief available to the general public through methods described in Annex 3 a)	Lists; Focus group discussions; Workshops ; See Annex 3 a) for tools	Capacity of target groups strengthened in relation to ecological restoration and connectivity.	Workshop	Number of lists; Number of focus-group discussions; Social media analytics; Number of workshops.  Number of workshops.		Workshop(s) to discuss and consolidate action; and formulate plan. The plan must be practically manageable. Often management plans are too ambitious. The management plan must have ecosystem benefits in terms of valuation

3	Implement the national ecosystem conservation plan by integrating it with provincial and local development plans as well as ensuring private sector participation.	BDS, FD, DWC, PC, UDA, local chambers of commerce, IDB, CEA, NWEA, NARA, CBO's NGO's, IPLC's, NBG, NZG, MEPA, CC&CRMD, SLTDA, MASL, SLLR&DC, private sector	It is assumed that because provincial governments are engaged in 2.1 and 2.2 that implementation is a given. However, multi-stakeholder platforms for management will have to be established, and implemented. Face-to-face meetings with the private sector and tie up with Annex 3 a) Action 4 to elicit private sector cooperation.	Leverage through biodiversity champions; Face to face meetings with information brief in hand; Multi-stakeholder management platforms set up.	None needed.	—	Number of bio-diversity champions engaged in implementation; Number of pilot projects; Number of joint management sites; Number of MSPs established.	This will be difficult to achieve and will be dependent on establishment and maintenance of horizontal linkages between departments, provincial governments and the private sector.
4	Develop and implement a national programme that reduces reliance on agrochemical usage	DoA, MASL, ID, DAD, SLPD, local government, farmer organizations, agrochemical companies, IPLCs, CBOs, NGOs, Moh, research institutes related to agriculture and farming	This will need a separate communication and capacity building strategy of its own. This should include guidelines for reducing use (widely publicized); an information booklet on the damages to human and ecosystem well-being from excessive use.	Tools should include A tie into Annex 3 a) action 7 and the methods used thereof.	The strategy should include training workshops to reduce reliance on agrochemicals.			This will need a strong public commitment and engagement and these should be elicited.
5	Develop and implement a national strategy that reduces the release of pollutants and solid waste into wetlands (as defined by RAMSAR)	CEA; BOI; local authorities; SLLR&DC, NWPEA NWS&DB; MEPA, DWLC, CC&CRMD, ID, MASL,	Same as above with adjustments to suit the topic.	Same as above.				Same as above.

## Annex 3. Contd.

Target 2: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
6	Develop and implement of a set of guidelines to reduce the impact of tourism on natural habitats	SLTDA, FD, DWC, CEA, CC&CRMD, provincial authorities, hotels, tour operators, tour guides, MEPA, local communities (NGOs, CBOs), pradeshhiya sabha	(To be carried out after capacity building.) Targeted distribution of guidelines, through the SLTDA to all registered hotels, tour operators, tour guides; Developed guidelines publicized.	Guidelines disseminated via methods described in Annex 3 action 2; Tie with champions described in Annex 3 a) action 4 ; Video clip on the guidelines developed and played on inbound flights of national carriers.	Training workshop to introduce the problem and develop guidelines (include press); Training workshops on the guidelines for hoteliers (with a clear focus on small and medium enterprises as well), tour guides and tour operators	Training workshop for hoteliers, tour operators and tour guides.	Number of workshops held; Number of training workshops held.  Same indicators as Annex 3 action 2; Number of champions associated with implementing guidelines; Number of tourists exposed to in-flight movie on guidelines.		It is critical that the SLTDA, tour operators and tour guides feel ownership of these guidelines. There will need to be a workshop to develop guidelines.
7	Conduct a national level awareness campaign on alien invasive species and their impacts on natural habitats	BDS, DWC, FD, DAD, DoA, shipping companies, DNBG, DNZG, importers, SLC, MEPA, NARA, NAQDA, CC&CRMD, universities, media, research institutes, DAPH, NPQS, DoH	This will need a separate communication strategy of its own.	—	This will need a separate plan of capacity building.	—	—		This communication plan should include Clear information on what an invasive species is, as there is rampant misuse of the word. An introduction to the priority species of IAS of fauna and flora in Sri Lanka



## Annex 3. Contd.

Target 2: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
12	Strengthen the implementation of special management areas, conservation areas and affected areas as defined by the CC&CRMD Act	CC&CRMD, CEA, UDA, SLTDA; CBO, MoFARD, MEPA;DWC; FD; universities, DFAR, MEPA, DWC, FD, CBOs, NGOs, NARA, research institutes, local authorities, fish exporters	None needed.	—	Capacity building for CC&CRMD staff to strengthen management, as well as other line agencies and local government.	Workshops.	Number of workshops held.		Workshops will be needed to elicit issues of concern related to on-the-ground management, and for formulating solutions for these problems.
13	Carry out a national assessment of the impact of climate change on identified vulnerable species and ecosystems and develop potential mitigation and adaptation strategies and ensure that this assessment feeds into the climate change national adaptation planning for Sri Lanka.	BDS, CCS, Met Dept, FD, DWC, NARA, CC&CRMD DFAR, DMC, CBOs, NGOs, civil society, universities	Flyer emailed and uploaded on social media See Annex 3 a) action 3 and 5 to invite researchers Universities, researchers invited to carry out targeted research; Report prepared synthesizing results) Report shared with CCS of the Ministry to feed into climate change adaptation planning.	Flyers Synthesis report.	Capacity building may be needed depending on the gaps identified.	—	Number of flyers sent; Numbers of researchers engaged in researching to topic.		There will be a need to share current knowledge on the subject of climate change in Sri Lanka, vulnerable species and ecosystem and to identify gaps in knowledge. There will also be a need to flesh out adaptation strategies.





## Annex 3. Contd.

Target 3: By 2022, the PA network is made representative of all critical ecosystems and species and managed effectively.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Update the protected area gap analysis based on the recommendations of the provincial SEAs and develop and implement a strategy to protect the critical habitats outside the PA network with reference also to ecosystem-based climate change adaptation	DWC, FD, CEA, NARA CC&CRMD, BDS, MASL, ID, universities, individual experts	Identified new protected areas and reasons for protection detailed in a series of information briefs.	Information briefs disseminated via methods described in Annex 3 a).	None needed, as gap analysis capacity would have been developed under Target 1, action 4.	—	See Annex 3 a) for methods of assessment.		
2	Conduct a status assessment of the PA network and identify sites that need to be upgraded or downgraded based on their current status	DWC, FD, CEA, NARA CC&CRMD, BDS, universities, individual experts	Identified upgraded or downgraded protected areas and reasons for action detailed in a series of information briefs.	Information briefs disseminated via methods described in Annex 3 a).	None needed.	—	Annex 3 a) for methods of assessment.		
3	Carry out an assessment of the coastal and marine sector and identify and designate the areas that need to be protected and further up scaling existing and new marine PAs to internationally recognize marine PAs such as Ecologically or Biologically Significant Marine Areas (EBSAs)	DWC, FD, CEA, NARA CC&CRMD, BDS, universities, individual experts	Identified new protected areas and reasons for protection detailed in a series of information briefs.	Information briefs disseminated via methods described in Annex 3 a) actions 2, 3, 5 and 9.	Concept of EBSAs introduced to target groups.	Information brief.	See Annex 3 a) actions 2, 3, 5 and 9 for methods of assessment.		
							Number of information briefs disseminated.		

4	Establish a marine division in the Department of Wildlife Conservation and implement effective management of MPAs and marine species	DWC and Coast Guard, BDS, NARA, CC&CRMD	The division and its functions publicized.	Through media.	Capacity will have to be developed for the marine sector.	Short-term training course overseas for the staff of the marine department.	Number of articles on the topic.													
5	Prepare adaptive management plans for all areas declared as protected under action 2 and 3 and ensure that these plans are implemented effectively.	FD, DWC, CEA, CC&CRMD, BDS, universities, individual experts, private sector	Key elements of the plan disseminated to general public in an information briefs/ video clip.	Information briefs / video clip disseminated via methods described in Annex 3 a) 2, 3, 5 and 9.	Capacity must be developed for effective management.	Get down a protected area management expert and conduct a series of training workshops that will highlight recurrent problems of management and provide solutions to overcome them.	See Annex 3 a) actions 2, 3, 5 and 9 for methods of assessment.	Number of training workshops held.	Action 2 & 3 will be worthless unless there is effective management.											
6	Protect sites that harbour key evolutionary links such as fossils, sub-fossils or living organisms	BDS, Dept of Arch, CCF, DWC, FD, CC&CRMD, CEA	List of protected sites and the reason for protection communicated among promoters.	An e-brochure developed and circulated among target group.	None needed.	—	E-brochure circulated.													
7	Promote community-based conservation using sui-generis tools for community owned land	BDS, IEOs, CBOs, NGOs, IPLCs	Use ethnobiological and cultural knowledge to develop the tools.	Focus group discussions.	None needed.	—	Number of focus group discussions.													

## Annex 3. Contd.

Target 4: By 2022, the loss of species is significantly reduced.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Update the national Red List every five years and ensure the revision of the global Red List accordingly	BDS, NSCAG, BEC, IUCN, DWC, FD, NBG, NZG, NARA, universities, NGOs, individual experts, DNM	Key findings of the Red List and analyses shared (Top ten list etc.)	See Annex 3 a) actions 3, 5 and 9 for dissemination.	None needed, it is assumed the Red Listing capacity is adequate.	—	See Annex 3 a) actions 3, 5 and 9 for methods of assessment.		Awareness about the red list must be increased.
2	Establish an interactive web portal on threatened species to create awareness on threatened species of Sri Lanka and ensure that this portal is continually updated.	BDS, FD, DWC, CEA, NBG, NZG, NARA, DNM	'Get to know threatened species' established on portal	A blog or fact sheet developed every fortnight on a threatened species and shared as shown in Annex 3 a) actions 3, 5 and 9; The same effected with a short video clip disseminated the same way.	Capacity of selected staff for content management and maintenance of web portal needs to be increased.	Training programmes	See Annex 3 a) actions 2, 3, 5 and 9 for methods of assessment. Number of training programmes.		Awareness about the red list must be increased.
3	Identify research needs with respect to prioritized threatened species and develop a funding mechanism to facilitate such research	BDS, NSF, NRC, NSCAG, BEC, private sector, universities, UGC, NGOs	Prioritized needs shared and disseminated A campaign on the lines of 'adopt a species' to enlist the financial support from the private sector developed and run by a marketing company, with support from biodiversity experts.	An information list of priority threatened species and needs for research developed and publicized via methods described in Annex 3 a) actions 3, 5 and 9 with a specific focus on universities; Information brief uploaded onto portal listed in Annex 3 a) action 2.	None needed.	—	Information list of priority threatened species developed; See Annex 3 a) actions 3, 5 and 9 for methods of assessment.		This will need a workshop to prioritize species. Contingent on part funding from the NSF.

4	Develop and implement recovery plans for prioritized threatened species	BDS, NSCAG, BEC, DNBG, DNZG, DWC, FD, NARA, CEA, universities, NGOs, private sector,	Recovery plans shared and disseminated.	Key elements of the recovery plan publicized via methods described in Annex 3 a) actions 3, 5 and 9;	None needed.	—	See Annex 3 a) actions 3, 5 and 9 for methods of assessment.	Implementation of recovery plans will be critical.
5	Establish an <i>ex-situ</i> breeding and research facility for breeding/propagation of threatened species under the Department of National Zoological Gardens and National Botanic Gardens	NZG, NBG, NARA, NAQDA, BDS, universities, private sector, DWC, FD, D of Indigenous Medicine, aquaria, NGOs, individual experts	None needed.	—	It is imperative that the capacity in departments mandated with <i>ex-situ</i> conservation is improved by improving technical knowledge on captive breeding, molecular genetic techniques for improving crops.	Short-term technical training abroad for staff, on a rotational basis.	Number of staff trained.	
6	Regularize turtle hatcheries with appropriate guidelines for scientific management and a monitoring system established	DWC, CC&CRMD, NARA, BDS, NAQDA, universities, individual experts, NGOs, private sector	Guidelines publicized to elicit public support in implementation and monitoring.	Guidelines publicized via methods described in Annex 3 a) actions 3, 5 and 9; System established on portal (form) for complaints about infractions.	Capacity building of turtle hatcheries owners carried out to explain guidelines.	Training workshop to explain guidelines.	See Annex 3 a) actions 3, 5 and 9 for methods of assessment.	There is no point legalising turtle hatcheries and developing guidelines unless they are followed. There has to be a mechanism for monitoring the efficacy of the guidelines.
							Workshop held.	

## Annex 3. Contd.

Target 4: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
7	Establish animal care shelters under the Department of Wildlife Conservation for rehabilitation of confiscated, injured and displaced animals in each wildlife region and develop guidelines for reintroduction of rehabilitated species back to the wild	DWC, BDS, NGOs, CC&CRMD, DFAR, Dept. of Customs, Coast guard, FD, NARA, NZG	Not relevant except to establish a mechanism whereby the general public can report finding an injured or displaced animal and be assured of a ready response.  This can be developed once the modalities of the care shelters are worked out.	—	Capacity has to be developed in the DWC for reintroduction and rehabilitation. Training provided for relevant staff on animal care  Workshop to train the relevant DWC staff about the developed guidelines.	Overseas training for selected officials to learn about reintroduction and rehabilitation from suitable overseas agencies;  Trained officers to train their colleagues and staff about methods learned overseas.  Training workshop of developed guidelines.	Number of officers trained overseas.  Number of other officers trained by the trained officers.  Number training workshops held re guidelines.		
8	Develop and implement species level management plans for mitigation of conflicts caused by threatened species	DWC, FD, BDS, universities, individual experts, NGOs	Key elements of management plans highlighted in an e-brochure.	Brochure disseminated to key promoters and target groups via methods de-scribed in Annex 3 a) action 2	Once key elements of the plans are known, gaps in capacity can be identified and target training provided.	Training workshop(s), hopefully, using innovative methods.	Number of workshops held.		Identification of species, development and implementation of management plans will be necessary.

9	Establish <i>ex-situ</i> conservation facilities such as botanic gardens, zoos, aquaria, wetland parks, arboreta, medicinal gardens, urban parks, natural history museums, plant herbaria etc., or upgrade and improve existing facilities in each bioclimatic zones for recreation, conservation, education and research	NBG, NZG, PGRG, Museum, UDA, SLLRDC, MASL, DoAYur, BDS, FD, DWC, NARA, CEA, NIFS, private sector, NGOs, municipal councils, hospitals, universities	Once facilities are established, their purpose, location and description publicized.	Once facilities are established, short video clips highlighting their purpose and what they have on display developed and uploaded on social media /played as clips on national TV.	Capacity among organizations mandated in <i>ex-situ</i> conservation improved in conservation education.	Short-term technical training abroad for staff, on a rotational basis.	Social media analytics; Number of times clips are aired on TV.  Number of staff trained.								
10	Identify gaps in enforcement of tracking, monitoring and prosecuting illegal trade of scheduled species and update current legislation and regulations to address identified gaps, as well as alignment with international conventions such as CITES	BDS, DWC, Dept. of Customs, FD, CCD, DFAR, Coast guard, CC&CRMD, NARA, IEOs, NGOs, individual experts, DOA	Once legislation is formulated, key elements disseminated to a wide audience.	Media articles; Social media.	Once gaps are identified, gaps in capacity can be then identified and target training provided.	Training workshop(s).	Number of media articles; Social media analytics.  Number of workshops held.								

## Annex 3. Contd.

Strategic objective 2: To promote sustainable use of biological resources									
Target 5: By 2022, the valuation of biodiversity and its sustainable use is mainstreamed.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Conduct programmes to capture and create awareness on value of Biodiversity and Ecosystem Services (BES)	BDS, IEOs, IPS, media, universities, DWC, FD, NGOs, NIE	Sharing of BES information to a larger audience.	Short video clip on the MEA framework prepared and disseminated. Information brief prepared and disseminated by mean of methods described in Annex 3 a) actions 2, 5, 6 and 9.	Capacity building to introduce BES to all target groups (promoters/ latents/ defenders apathetics). (With information tailored for each group).	Workshops; presentations; video clips.	Assessed by means of methods described in Annex 3 a) actions.  Number of workshops; Others as above.		There is a critical need to increase awareness, across the board, across all target groups, about this topic.
2	Undertake TEEB type valuation studies to determine the value of key ecosystems and their services in Sri Lanka	PGIA, universities, BDS, IEOs, IPS	Meetings with private sector	Use of information brief or video clip to get private sector to sponsor one ecosystem for valuation. [Tie in with Annex 3 a) action 4.]	Initial capacity building for training on TEEB (training workshop(s)).	Workshop(s).	Number of meetings held; Number of sponsorships.  Workshop(s) held.		The idea will be to persuade private sector to fund as it will benefit them in terms of sustainability reporting.
3	Integrate biodiversity and ecosystem service values in to educational curricula for meaningful engagement	BDS, NIE, UGC, universities	Creating awareness about BES among secondary and tertiary students.	Presentations/ School/university programmes.	Targeted capacity building for NIE and UGC on BES.	Workshop(s).	Number of presentations/ School/university programmes made.  Workshop(s) held BES incorporated into curricula.		Will extend beyond the period and the NIE and UGC will need support in developing curricula.





### Annex 3. Contd.

Target 5: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
7	Develop guidelines to incorporate Biodiversity and Ecosystem Services values into regional/ national/ local level planning and plan implementation	NPD, SPD, BDS, UNDP, IEOs, DWC, FD, BDSL	Once guidelines developed, disseminated to national, regional and local level planners.	Print/e-brochure about the guidelines disseminated via mail, email and social media.	Training workshops on the how to incorporate BES into planning (essentially the guidelines) conducted at all levels.	Training workshops.	Number of brochures disseminated; Social media analytics.  National workshop held; Regional workshop held (for province-level officers); Local workshops held, at province level.		There will need to be a workshop to develop guidelines and modalities.

Target 6: By 2022, mechanisms are established to ensure sustainable use of biodiversity									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Develop innovative financing mechanisms to generate sustainable self-financing for biodiversity and ecosystem services conservation	BDS, FD, DWC, CC&CRMD, private sector, CBO, universities, IPS	Call for proposals to develop mechanisms.	Posted on Ministry website Call for proposal emailed through Mailchimp and shared via other social media.	None needed.	—	Number of proposals submitted.		

2	Introduce appropriate economic instruments for biodiversity and ecosystems conservation	BDS, FD, DWC, MoF, CC&CRMD, universities, IPS	Mechanisms established and communicated widely.	Develop a short brochure in all three languages introducing the subject and disseminated via the website and via social media.	Capacities developed under Target 5 actions 1, 2, 3 and 7 will contribute to this action.	Workshop held.	Mechanisms posted on Ministry website; Number of hits for brochure.  Workshop conducted.	Workshops will be needed to identify a long list of perverse incentives, short list them, and then develop a mechanism to remove them.
3	Identify and remove perverse incentives that damage biodiversity and ecosystem services	BDS, FD, DWC, MoF, CC&CRMD, IPS, universities,	Mechanisms established and communicated widely.	Develop a short brochure in all three languages introducing the subject and disseminated via the website and via social media.	Conduct a workshop for target groups to introduce the topic of perverse incentives and damage to biodiversity.	Workshop held.	Mechanisms posted on Ministry website; Number of hits for brochure.  Workshop conducted.	Workshops will be needed to identify a long list of perverse incentives, short list them, and then develop a mechanism to remove them.
4	Promote best practices to minimize the destructive harvesting methods used for biological resources from terrestrial, aquatic and marine systems	DFAR, CG, DWC, CC&CRMD, SLPD	Communication materials developed for prioritized destructive harvesting methods	Develop a short video clip of prioritized destructive harvesting methods and play it at programmes; Develop and print in both vernacular languages a brochure of prioritized destructive harvesting methods and give target groups to disseminate.	Community training.	Community focus group discussion and community training workshops at which the tools developed under communication will be used.	Video developed; Number of brochures disseminated.  Number of community focus group discussion and training programmes.	

### Annex 3. Contd.

Target 6: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
5	Assess the present levels of harvesting of freshwater and marine finfish/ shell fish and develop and implement recovery plans for finfish/ shell fish species stocks that are depleted due to overexploitation	NARA, NAQDA, DFAR, MoFARD	Communication materials developed for prioritized overexploited species.  Recovery plans publicized.	Develop a short video clip of prioritized overexploited species nationally and upload on social media ; Prepare a video of one recovery project and televise (like the Bandula barb story) and upload on social media.	Community training	Community focus group discussion and community training workshops at which the tools developed under communication will be used.	Video developed and televised, uploaded on social media; Recovery project documentary televised, uploaded on social media; Social media analytics.  Number of community focus group discussion and training programmes.		Overexploited species will have to be prioritized.

Target 7. By 2022, traditional sustainable uses of biodiversity is promoted and established									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Promote and mobilise cultural practices and traditional wisdom related to biodiversity	BDS, NSF, IPLCs, universities, CBOs, IPLCs, DoA, NARA	Prioritised traditional practices disseminated widely.	Develop short video clips of selected traditional practices and televise nationally and upload on social media.	Community training	Street dramas /ballads developed on prioritised traditional practices.	Number of times the clip is aired; Social media analytics.  Number of street drama performance and locations.		

2	Establish a searchable database on traditional knowledge, beliefs and practices of biodiversity	BDS, NARA, IEOs, IPLCs, DFAR, CBOs, universities, MoH, Ministry of indigenous medicine, NARA	Existence of database informed to all users.	Publish an e-brochure about the database as a blog or in other shareable form and disseminate this as widely as possible by using tools such as Maichimp; Upload onto the Ministry website; Ensure distribution to key private sector individuals, NGOs, INGOs, BINGOs, donor agencies, and universities.	Same capacity needs as Target 1 Action 2 for a different target group.	Workshop.	Number of hits on social media; Number of visitors to database.  Same indicators as Target 1 Action 2.								
3	Promote bio-prospecting of both animal and plant genetic resources through the application of traditional knowledge	BDS, universities, PGR, IEOs, NGOs, IPLCs	Pilot project for sustainable bioprospecting followed through with a documentary, which should include lessons learned.	Prepare a video of the pilot project televise and upload on social media.	Capacity needs to be developed for developing policy and legal mechanisms necessary for this action.  Community training.	Get down an expert on the topic and have targeted capacity building for selected targets groups. Street dramas /ballads developed on Pilot project for sustainable bioprospecting.	Number of times documentary is aired; Social media analytics.  Capacity building workshop held; Number of street drama performance and locations.								
4	Develop policy tools for repatriation of traditional knowledge and artefacts which are related to biodiversity and mainstreaming suasive behaviour related to biodiversity conservation	BDS	None needed.		Same as above.										

## Annex 3. Contd.

Target 7. By 2022, traditional sustainable uses of biodiversity is promoted and established									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
5	Introduce an outgrowing system for medicinal plants with the involvement of private sector	MoH, DoAyur, private sector, IEOs, CBOs, NGOs, IPLCs	Brochure about identified outgrowing species, how to grow them, mechanism for buy-back detailed within. Pilot project for outgrowing system followed through a documentary, which should include lessons learned.	Brochure Prepare a video of the pilot project televise and upload on social media.	Training needed for participants of pilot projects on how to cultivate.	Training programmes.	Number of brochures disseminated; Recovery project documentary televised, uploaded on social media; Social media analytics.		This will only work if there is an effective plan for buy-back.
6	Identify gaps in Fishery Management Areas (FMA) and implement programs to address the identified gaps	DFAR, MFAR, BDS, universities, NARA, NGO's	Once new FMAs are identified, publicized.	Media articles; Blogs.	None needed.	—	Number of media articles; Number of blogs.		

Strategic Objective 3: To conserve agrobiodiversity									
Target 8: By 2022, sustainable agriculture practices are promoted and established									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1.	Improve conversion efficiency of raw material to final products	DFAR, TC, FD, IPHT, DoAyu, IPHT of NARA, RPRDC, NERD universities, BMARI	Methods to improve conversion efficiency disseminated	A series of brochures on preventing post-harvest loss and other conversion efficiency improvements in all three languages prepared and published; Disseminated at training programmes; Uploaded on website in a downloadable form.	Training programmes in the topic.	Training programmes.	Number of brochures disseminated; Number of downloads from websites.		This is an areas which needs considerable improvement. Post-harvest and other loss is considerable.
							Number of training programmes.		
2.	Promotion and mainstreaming of underutilized, lesser known or neglected food crops, livestock and food fishes which provide nutrition	BDS, DoA, CBOs, NGOs, IPLCs, media, PGRC, DFAR	Identified species publicized.	Booklets prepared and published about each species: their nutritive value; where to get seedlings; how to grow etc. in all three languages; Media articles/short documentaries/ video clips about each species published/televised/ uploaded, in all three languages.	Community capacity on how to cultivate these crops increased.	Focus group meetings and community training programmes	Number of booklets disseminated; Number of newspaper articles/ documentary/ videos uploaded; Number of views of uploaded videos.		A workshop will be needed to identify species of underutilized fruits and vegetables.
							Number of focus group meetings and training programmes held.		

**Target 8: Contd.**

3.	Identify and conserve useful BES such as natural enemies, pollinators and soil microorganisms for sustainable agricultural productivity	DoA, BDS, FD, NGOs, CBOs, IPLCs, universities	Raising general awareness about sustainable agriculture and its benefits.	A series of short blogs on a single aspect of sustainable agriculture: minimizing use of synthetic fertilizer; water conservation; soil conservation etc.; Blogs converted to brochures/ and published in all three languages; Media articles/ videos on the above; An interactive map of Sri Lanka showing current sites of sustainable agriculture with locations of pilot projects and other sites added continually published on both the BDS and Dept. of Agriculture websites.	Communication tools will raise awareness and capacity.	—	Number of blogs published; Number of brochures disseminated. Number of media articles/ videos.	
4.	Promote useful elements of traditional knowledge/practices of unique agroecosystems (related to systems such as Kandyan home gardens, cascade systems, <i>chena</i> , <i>owita</i> and <i>mavee</i> lands) to address current issues	BDS, DoA, universities, IEOs, NGOs, CBOs, IPLCs	Same as above	Same as above, tailored to suit the topic.	Communication tools will raise awareness and capacity.	—	Same as above.	

5	Establish and maintain a searchable database linked with global databases on nutritional quality of food	BDS, DoA, universities NGOs	Searchable database established Existence of database informed to all users.	Publish an e-brochure as a blog or in other shareable form and disseminate this as widely as possible by using tools such as Maichimp; Upload onto the Ministry website; Ensure distribution to key private sector individuals, NGOs, INGOs, BINGOs, donor agencies, and universities.	Capacity for developing and maintaining a database as per Target 1, action 2.	See Target 1, action 2.	Number of hits on social media; Number of visitors to portal.									
6	Establish a database on traditional knowledge	DoAyur, DoA	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above								

Target 9: By 2022, genetic diversity of crop wild relatives, cultivated species and livestock are conserved.												
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks			
1	Establish and strengthen genetic resource centres such as field gene banks, seed banks etc., for both short and long-term conservation of genetic diversity of crops, poultry and livestock	BDS, PGRC DAPH, CRI, Rice RI, DoEA, DoAyur, DoA NGOs, CBOs	None needed.	—	Capacity for such expansion will also have to be developed as needed.							



## Annex 3. Contd.

Target 9: Contd.							
2	Promote conservation of neglected, lesser known and under-used food crops, livestock and their wild relatives such as vegetables, seeds, fruits, poultry, livestock and food fish	BDS, B4FN, BACC, PGRC, DoA, NGOs, FD, DWC	Raising general awareness about neglected, lesser known and under-used food crops, livestock and their wild relatives.	Booklets prepared and published about each species: their nutritive value; where to get seedlings; how to grow etc. in all three languages; Media articles/ short documentaries/ video clips about each species published/televised/ uploaded, in all three languages.	Capacity for cultivation of such crops, rearing of such animals will have to be increased.	Training programmes.	Number of booklets disseminated; Number of newspaper articles/ documentary/ videos uploaded; Number of views of uploaded videos.
3	Carry out molecular genetics research to identify and use beneficial genes of wild relatives and traditional varieties with aim of improving cultivated crop varieties and animal varieties	RRDI, DoA, research institutes, PGRC, BDS	Call for proposals to carry out such research posted on Ministry website.		Capacity for molecular genetics research carried out as needed.	This will have to be short-term training overseas.	Number of training programmes.  Number of research projects funded. Number of staff trained.

4	Implement on-farm conservation for traditional crop varieties and land races and encourage promotion of farmer-based crop varieties and livestock	DoA, BDS, NGOs, CBOs, IPLCs	Develop communication materials about in-farm conservation.	Booklets prepared and published about each species: what practices and how to conserve on farm; Media articles/short documentaries/ video clips about each species published/televised/uploaded, in all three languages.	Capacity of farmers to practise on-farm conservation will have to be increased.	Focus group discussions, training programmes.	Number of booklets disseminated; Number of newspaper articles/documentary/videos uploaded; Number of views of uploaded videos.  Number of focus group discussions, training programmes.						
5	Create new protected areas or special management zones within existing protected areas for <i>in-situ</i> conservation of crop wild relatives	DWC, FD, BDS, PGRC, universities, DoA NGOs, CBOs, IPLCs	New zones demarcated and objectives, expectations of such zones disseminated to the custodians of <i>in-situ</i> areas.	Information briefs.	Capacity of DWC, FD to conserve crop wild relatives <i>in-situ</i> increased.	Training programmes.	Number of information briefs disseminated.  Number of training programmes.						

## Annex 3. Contd.

Strategic objective 4: To promote equitable sharing of benefits from biodiversity									
Target 10: By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1	Enactment of necessary legislation or amend existing legislation for the smooth implementation of the Nagoya protocol	BDS, MoMD&E, DWC, FD, IEOs, NGOs IPLC	Publicize legislation once enacted or amended.	Media articles/ press releases/ blogs about what the legislation entails.	Strengthening capacity about access and benefit sharing of genetic resources will be needed in order to enact or amend legislation.	Training programme on the topic by an expert from the CBD.	Number of media articles /blogs.  Training programme conducted.		Capacity related to this topic needs much strengthening.
2.	Develop regulations, procedures, guidelines and benefit sharing mechanisms for biological resources	BDS, MoMD&E, IEOs, NGOs , IPLCs	Same as above for regulations, procedures and mechanism.	Same as above.	Same as above for regulations, procedures, guidelines and benefit-sharing mechanisms.	Training programme on the relevant topics by an expert from the CBD.	Same as above.  Same as the above.		
3.	Develop and implement bio-prospecting programmes and establish relevant mechanism	BDS, MoMD&E, MoF, IPLCs PSC	Same as above for programmes establish and mechanism.	Same as above.	Same as above for developing bio-prospecting programmes.	Same as above.	Same as above.  Same as above.		
4	Prepare guidelines, handbook for all stakeholder groups for use of genetic resources that includes economic, social, cultural, legal and ethical considerations	BDS, MoMD&E, IEOs, NGOs	Guidelines and handbook published in all three languages and publicised.	Availability of handbook publicized through media, email and social media.	None needed.	—	Number of media articles/ press releases about the guidelines and handbook; Social media analytics.		

5	Establish a mechanism to ensure benefit sharing at the grass roots level and piloting the biocultural protocols in field level	BDS, MoMD&E, CBOs, IPLCs	Awareness created about the mechanism.	Information about the mechanism publicised through media, email and social media.	None needed.	—	Number of media articles/ press releases about the mechanism; Social media analytics.											
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Strategic objective 5: To improve human well-being through an ecosystem approach																			
Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced																			
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks										
1	Initiate research and monitoring programmes on the impacts of climate change, infrastructure development, and natural hazards on biodiversity	BDS, CCS NSF, Dept of Meteorology, NBRO, universities, IEOs, NGO's, FD, DWG, CCD NWS&DB CEA, ID, DMC	Call for proposal for research and programmes.	Posted on Ministry website; Call for proposals emailed through Mailchimp and shared via other social media.	Capacity related to climate change and hazard shave increased considerably after the Indian Ocean tsunami of 2004. There is no need to further increase capacity. Research must, however, be initiated.	-	Number of proposals submitted.												

## Annex 3. Contd.

Target 11: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
2	Develop or enrich home garden carbon stocks and both urban and rural green spaces to improve ecosystem services provided by them and resilience to climate change	BDS, CCS, Samurdi, DoA, UDA, MoM&WD, IEOs, NGOs CBOs FD,	Create awareness about home garden enrichment to enhance carbon stocks.	Handbooks prepared and published about how to increase resilience to climate change by enriching home gardens in all three languages; Media articles/short documentaries/ video clips about the subject published/televised/ uploaded, in all three languages.  Traditional methods of communication (street dramas, ballads) used for communities as well as the above.	Capacity related to home garden enrichment increased.	Focus group discussions, training programmes.	Number of booklets disseminated; Number of newspaper articles/ documentary/ videos uploaded; Number of views of uploaded videos.  Number of traditional communication methods used and locations.		
							Number of focus group discussions, training programmes.		

3.	Implement mangrove and river bank restoration and forest conservation projects for watersheds	CC&CRMD, FD, MASL, BDS, DWLC, DF DoA, FD, CBOs, NGOs, IEOs, SLTDA, private sector,	Create awareness about ecologically sound restoration.	Handbooks prepared and published about mangrove and river bank restoration, forest conservation in watersheds, giving explicit information on where restoration should and should not be carried out; how it should be carried out and how it should be monitored. To be published in all three languages.	Increase capacity of ecological restoration. Ties in with Target 2 Action 2.	Training workshops, field visits and training.	Same as above.  Number of field visits; Number of training programmes; Number of participants for both.	This is very necessary. A lot of well-meaning projects carry out unplanned restoration in the wrong place using the wrong species and incorrect methods.
4	Identify and promote species with enhanced resilience to extreme conditions in agriculture and reforestation	DoA, FD, universities, CBOs, NGOs, CRI, TRI, RRI, Rice RI	Once resilient species are identified, they are publicized.	Booklets prepared and published about each species: where to obtain seeds/seedlings; and how to grow them; Media articles/short documentaries/ video clips about each species published/televised/ uploaded, in all three languages.	Training programmes on how to cultivate such species.	Training programmes.	Number of booklets disseminated; Number of newspaper articles/ documentary/ videos uploaded; Number of views of uploaded videos.  Number of training programmes held.	

### Annex 3. Contd.

Target 11: Contd.									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
5	Mainstream EbA and EcoDRR for all development planning and education system	CCS, DMC, Coast Guard, MEPA, NARA, CC&GRMD	Concept of EbA and EcoDRR disseminated widely.	Blogs/media articles/videos introducing EbA and EcoDRR and detailing benefits.	Capacity of target groups on EbA and EcoDRR increased across target groups.	Training workshop(s).	Number of persons trained; Number of newspaper articles/ documentary/ videos uploaded; Number of views of uploaded videos.		
							Number of training workshops.		

Target 12: To ensure biosafety									
No	Action	Target Groups	Communication action	Tool /activity	Capacity building	Tool/ activity	Indicator	Time frame	Remarks
1.	Strengthen the policy on biosafety	BDS, NSF, MoMD&E, universities	Publicise policy once developed.	Media articles/ press releases/ blogs about what the policy entails.	Capacity related to biosafety strengthened among relevant target groups.	Capacity building workshop.	Number of media articles / blogs.		
							Workshop held.		
2.	Develop and implement a National Biosafety Master Plan and formulate biosafety legislation	BDS, MoMD&E, universities, CEA, individual experts, NGOs	Publicise gist of master plan and legislation once developed/ enacted.	Media articles/ press releases/ blogs about what the plan/ legislation entails.	Capacity needs would have been met under action 1.		Number of media articles / blogs.		

3.	Establish risk assessment procedures for new technologies	BDS, MoH, NSF, SLINTEC, CEA, universities, individual experts	Handbook developed.	Handbook on risk assessment and risk management.	Strengthen capacity for risk assessment and risk management for new technologies.	Training workshop.	Number of handbooks disseminated. Training workshop held.											
4.	Strengthen capacity for risk assessment and risk management	BDS, CEA, MoMD&E, universities, individual experts	As above.	As above.	As above.	As above.	As above.	As above.	As above.	As above.								
5.	Develop and implement legal instruments to protect native biodiversity and indigenous crops from contamination of GMOs	BDS, DoA, MoMD&E, Legal Draughtsman, universities, individual experts, NGOs, IPLCs, CBOs	Publicise laws once developed.	Media articles/ press releases/ blogs about what the laws entail.	None needed.	—	Number of media articles / blogs.											
6.	Enhance Sri Lanka's scientific capacity on biosafety	BDS, DoA, universities, research Institutes	None needed.	—	Scientific capacity strengthened by a training workshop by an expert brought down from the CBD.	Training workshop/ or staggered training overseas.	Number of staff trained.											



## Annex 4. Budget Estimates for Implementing the NBASP 2016-22

No.	Action	Estimated Budget (LKR)	Remarks
<b>Target 1. By 2022, a system established and ongoing for inventoring species (taxonomy conservation status), ecosystems (structure, function, composition and distribution), their services and values, to inform conservation planning and decision making</b>			
1.	Establish a national list of species and ecosystem types with annual updating	2,000,000.00	Hold Expert meetings, hire an Ecologist, GIS expert, field surveys, purchase software and hardware, hold biannual meetings to update the list
2.	Establish a national biodiversity database to document biodiversity in all natural areas	2,000,000.00	Purchase software, hardware, hire a data base expert and GIS expert and possibly hosting in the web
3.	Populate the database with existing data sets and update continuously	5,000,000.00	Hire a temporary staff to collate and enter data into the database
4.	Develop a research agenda to address identified information gaps on sites, taxa and valuation of ecosystem services and share this information with relevant stakeholders	500,000.00	Hold a series of meetings
5.	Establish a national botanical and zoological survey programme to conduct baseline surveys for subsequent monitoring of sites identified in action 4	250,000,000.00	Cover the cost biodiversity surveys throughout Sri Lanka
6.	Provide seed grants for contract research on identified sites, taxa and ecosystem services, where information is not presently available	50,000,000.00	Provide about 15 grants at 0.5 million for 7 years
7.	Provide training for local experts on lesser known taxa	100,000,000.00	Cover the cost of foreign experts, hold workshops, provide scholarships for post graduate training
8.	Provide financial support for local experts to communicate their findings related to biodiversity of Sri Lanka both nationally and globally	25,000,000.00	Providing 10 -15 travel grants per year
9.	Develop and implement a communication strategy to disseminate the information collected to relevant stakeholders	10,000,000.00	Hire a communication expert and produce communication material

**Target 2: By 2022, habitat loss, degradation and fragmentation are significantly reduced.**

No.	Action	Estimated Budget (LKR)	Remarks
	Conduct Strategic Environment Assessments for all nine provinces and identify the best possible pathway to achieve national development goals with the least amount of habitat loss and fragmentation	100,000,000.00	10 million per province
	Develop a national ecosystem (terrestrial, coastal and marine) conservation plan to identify the best possible strategies for afforestation, enhancement, restoration and establishing connectivity	10,000,000.00	Hiring biodiversity and GIS experts, consultation workshops, limited field surveys
	Implement the national ecosystem conservation plan by integrating it with provincial and local development plans as well as ensuring private sector participation.	1,000,000,000.00	Carry out reforestation/ restoration, establish nurseries, restoration of coastal habitats
	Develop and implement a national programme that reduces reliance on agrochemical usage	100,000,000.00	Hiring communication expert, hold workshops, produce communication material, promote organic farming pilot projects demonstration projects
	Develop and implement a national strategy that reduces the release of pollutants and solid waste into wetlands (as defined by Ramsar)	75,000,000.00	Baseline studies for developing strategies, meetings, workshops, hiring experts
	Develop and implement of a set of guidelines to reduce the impact of tourism on natural habitats	5,000,000.00	Hold meetings, data gathering, hiring experts
	Conduct a national level awareness campaign on invasive alien species and their impacts on natural habitats	7,000,000.00	Prepare communication material, updating existing material, holding meetings
	Strengthen regulatory mechanisms to prevent entry of invasive alien species	7,000,000.00	Training for risk assessment, producing material, workshops
	Establish early warning system for invasive alien species	2,000,000.00	Prepare material, awareness, meetings
	Establish mechanism for updating National IAS lists every four years	8,000,000.00	Meetings, data collection, collation of published information data entry
	Develop and implement species-specific management plans for identified invasive alien species	70,000,000.00	Identify priority species, develop management plans and implement priority actions for at least 5 species

## Annex 4. Contd.

<b>Target 2: Contd.</b>		
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKR)</b>
	Strengthen the implementation of special management areas, conservation areas and affected areas as defined by the CC&CRM Act	300,000,000.00
	Carry out a national assessment of the impact of climate change on identified vulnerable species and ecosystems and develop potential mitigation and adaptation strategies and ensure that this assessment feeds into the national adaptation plan for Sri Lanka.	50,000,000.00
	Carry out an assessment of species that are undergoing range expansion due to climate change and examine their impacts on ecosystems and develop and implement mitigation measures	50,000,000.00
	Prepare and implement wetland conservation management plans for wetlands that are identified as critical systems lying outside the PA network	15,000,000.00
	Preparation of the Red List of Ecosystems for Sri Lanka and updated every five years	5,000,000.00
<b>Target 3: By 2022, the PA network is made representative of all critical ecosystems and species and managed effectively.</b>		
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKA)</b>
	Update the protected area gap analysis based on the recommendations of the provincial SEAs and develop and implement a strategy to protect the critical habitats outside the PA network	3,000,000.00
	Conduct a status assessment of the PA network and identify sites that need to be upgraded or downgraded based on their current status	5,000,000.00

	Carry out an assessment of the coastal and marine sector and identify and designate the areas that need to be protected	10,000,000.00	Hiring experts, data collection
	Establish a marine division in the Department of Wildlife Conservation and implement effective management of MPAs and marine species	10,000,000.00	Purchasing equipment, training people
	Prepare adaptive management plans for all areas declared as protected under action 2 and 3 and ensure that these plans are implemented effectively	75,000,000.00	Prepare plans, capacity building for management plan preparation, providing technical support
	Protect sites that harbour key evolutionary links such as fossils or sub-fossils	10,000,000.00	Identification, boundary demarcation, declaration
	Promote community-based conservation using <i>sui-generis</i> tools for community owned land	10,000,000.00	To establish 10 sites
<b>Target 4: By 2022, the loss of species is significantly reduced.</b>			
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKR)</b>	<b>Remarks</b>
	Update the national red list every five years and ensure that the data is shared in an appropriate format with the IUCN Global Red List Unit	20,000,000.00	Holding workshops, publication cost, data entry, GIS work
	Establish an interactive web portal on threatened species to create awareness on threatened species of Sri Lanka and ensure that this portal is continually updated	10,000,000.00	Hiring web designer, data entry, collation of data
	Identify research needs with respect to prioritized threatened species and develop a funding mechanism to facilitate such research	35000,000.00	At least provide 10 grants per year with a maximum of 0.5 mill
	Develop and implement recovery plans for prioritized threatened species	100,000,000.00	At least prepare 25 plans
	Establish an <i>ex situ</i> breeding and research facility for breeding/ propagation of threatened species under the Department of National Zoological Gardens and National Botanic Gardens	300,000,000.00	Build 3 breeding facilities each (wet, dry, and montane) for plants and animals

## Annex 4. Contd.

Target 4: Contd.			
No.	Action	Estimated Budget (LKR)	Remarks
	Regularize turtle hatcheries with appropriate guidelines for scientific management and a monitoring system established	350,000.00	Meetings and monitoring cost
	Establish animal care shelters under the Department of Wildlife Conservation for rehabilitation of confiscated, injured and displaced animals in each wildlife region and develop guidelines for reintroduction of rehabilitated species back to the wild	70,000,000.00	Training of veterinary assistants, Establish seven centers
	Develop and implement species level management plans for mitigation of conflicts caused by threatened species	70,000,000.00	Develop for threatened species other than elephants
	Establish <i>ex situ</i> conservation facilities such as botanic gardens, zoos, aquaria, wetland parks, arboreta, medicinal gardens, urban parks, natural history museums, plant herbaria etc., or upgrade & improve existing facilities in each bioclimatic zones for recreation, conservation, education and research	600,000,000.00	100 million LKR per bioclimatic zone for the seven year period
	Identify gaps in enforcement of tracking, monitoring and prosecuting illegal trade of scheduled species and update current legislation and regulations to address identified gaps as well as alignment with international conventions such as CITES	2,000,000.00	Research, legal consultation, coordination, training

<b>Target 5: By 2022, the valuation of biodiversity is mainstreamed.</b>			
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKR)</b>	<b>Remarks</b>
	Conduct programmes to capture and create awareness on value of Biodiversity and Ecosystem Services (BES)	4,000,000.00	Conduct meetings, workshops, printing material
	Undertake TEEB type valuation studies to determine the value of key ecosystems and their services in Sri Lanka	20,000,000.00	Conduct studies for at least 5 ecosystems
	Integrate biodiversity and ecosystem service values in to educational curricula for meaningful engagement	1,000,000.00	Holding workshops and meetings
	Capture and share biodiversity and ecosystem service values embedded in religion and culture	1,000,000.00	Holding workshops and meetings
	Link existing databases and develop and maintain a searchable database/web portal for ecosystems, ecosystem services, their values	10,000,000.00	Hiring an expert to design database, entering data
	Integrate biodiversity and ecosystems service values to national accounts	10,000,000.00	Hiring experts, data collection
	Develop guidelines to incorporate Biodiversity and Ecosystem Services values into regional/national/ local level planning and plan implementation	5,000,000.00	Holding workshops, developing guideline
<b>Target 6: By 2022, mechanisms are established to ensure sustainable use of biodiversity.</b>			
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKA)</b>	<b>Remarks</b>
	Develop innovative financing mechanisms to generate sustainable self-financing for biodiversity and ecosystem services conservation	7,500,000.00	Prepare at least 3 mechanisms
	Introduce appropriate economic instruments for biodiversity and ecosystems conservation	15,000,000.00	2 pilot projects
	Identify and remove perverse incentives that damage biodiversity and ecosystem services	2,000,000.00	Hire an expert for the study

## Annex 4. Contd.

<b>Target 6: Contd.</b>		
No.	Action	Estimated Budget (LKR)
	Promote best practices to minimize the destructive harvesting methods used for biological resources from terrestrial, aquatic and marine systems	2,000,000.00
	Assess the present levels of harvesting of freshwater and marine finfish/ shell fish and develop and implement recovery plans for finfish/ shell fish species stocks that are depleted due to overexploitation	100,000,000.00
<b>Target 7: By 2022, traditional sustainable uses of biodiversity are promoted and established.</b>		
No.	Action	Estimated Budget (LKR)
	Promote and mobilise cultural practices and traditional wisdom related to biodiversity	2,000,000.00
	Establish a searchable database on traditional knowledge, beliefs and practices of biodiversity	10,000,000.00
	Promote bio-prospecting of both animal and plant genetic resources through the application of traditional knowledge	10,000,000.00
	Promote policy tools for mainstreaming suasive behaviour related to biodiversity conservation	1,000,000.00
	Introduce an outgrowing system for medicinal plants with the involvement of private sector	1,000,000.00
	Identify gaps in Fishery Management Areas (FMA) and implement programs to address the identified gaps	5,000,000.00
<b>Target 8: By 2022, sustainable agriculture practices are promoted and established.</b>		
No.	Action	Estimated Budget (LKR)
	Improve conversion efficiency of raw material to final product	10,000,000.00
	Promote and mainstream underutilized, lesser known or neglected food crops, livestock and food fishes which provide nutrition	7,000,000.00

	Identify and conserve useful BES such as natural enemies, pollinators and soil microorganisms for sustainable agricultural productivity	7,000,000.00	Conduct meetings, pilot projects
	Promote useful elements of traditional knowledge/practices of unique agroecosystems (related to such as Kandyan home gardens, cascade systems, <i>chena</i> , <i>owita</i> and <i>mavee</i> lands) to address current issues	6,000,000.00	Conducting workshops, meetings and preparation of awareness material
	Establish and maintain a searchable database linked with global databases on nutritional quality of food	10,000,000.00	Hiring an expert to design database, entering data
	Establish a database on traditional knowledge	10,000,000.00	Hiring an expert to design database, entering data
<b>Target 9: By 2022, genetic diversity of crop wild relatives, cultivated species and livestock is conserved.</b>			
<b>No.</b>	<b>Action</b>	<b>Estimated Budget (LKR)</b>	<b>Remarks</b>
	Establish and strengthen genetic resource centres such as field gene banks, seed banks etc., for both short and long-term conservation of genetic diversity of crops, poultry and livestock	70,000,000.00	10 million LKR per year
	Promote conservation of neglected, lesser known and under-used food crops, livestock and their wild relatives such as vegetables, seeds, fruits, poultry, livestock and food fish	70,000,000.00	10 million LKR per year
	Carry out molecular genetics research to identify and use beneficial genes of wild relatives and traditional varieties with aim of improving cultivated crop varieties and animal varieties	20,000,000.00	At least 5 species
	Implement on-farm conservation for traditional crop varieties and land races and encourage promotion of farmer-based crop varieties and livestock	14,000,000.00	2 million LKR per year
	Create new protected areas or special management zones within existing protected areas for <i>in situ</i> conservation of crop wild relatives	2,000,000.00	Survey, boundary demarcation, declaration



## Annex 4. Contd.

<b>Target 10: By 2022, a mechanism for equitable sharing of benefits arising from biodiversity is established and implemented</b>			
No.	Action	Estimated Budget (LKR)	Remarks
	Enact necessary legislation or amend existing legislation for the smooth implementation of the Nagoya protocol	500,000.00	Hire an expert
	Develop regulations, procedures, guidelines and benefit sharing mechanisms for biological resources	500,000.00	Hire an expert
	Develop and implement bio-prospecting programmes and establish relevant mechanism	2,000,000.00	Hire an expert
	Prepare guidelines, handbook for all stakeholder groups for use of genetic resources that includes economic, social, cultural, legal and ethical considerations	1,000,000.00	Hire an expert
	Establish a mechanism to ensure benefit sharing at the grass roots level	3,000,000.00	3 pilot studies covering different systems
<b>Target 11: By 2022, the capacity of ecosystems to deliver goods and services and provide protection from hazards is enhanced</b>			
No.	Action	Estimated Budget (LKR)	Remarks
	Initiate research and monitoring programmes on the impacts of climate change, infrastructure development and natural hazards on biodiversity	5,000,000.00	Hire an expert
	Development or enrich home garden carbon stocks and both urban and rural green spaces to improve ecosystem services provided by them	140,000,000.00	20 million per year
	Implement mangrove and river bank restoration and-forest conservation projects for watersheds	140,000,000.00	20 million per year
	Identify and promote species with enhanced resilience to extreme conditions in agriculture and reforestation (at least 10 species identified)	10,000,000.00	Hire an expert
	Mainstream EbA and EcoDRR in all development planning and the education system	5,000,000.00	

**Target 12: By 2022 Biosafety is assured**

No.	Action	Estimated Budget (LKR)	Remarks
	Strengthen the policy on biosafety	1,000,000.00	
	Develop and implement a National Biosafety Master Plan and formulate biosafety legislation	2,000,000.00	Hire an expert, workshops
	Establish risk assessment procedures for new technologies	2,000,000.00	Hire an expert, workshops
	Strengthen capacity for risk assessment and risk management	3,000,000.00	Training workshops
	Develop and implement legal instruments to protect native biodiversity and indigenous crops from contamination of GMOs	2,000,000.00	
	Enhance Sri Lanka's scientific capacity on biosafety	2,000,000.00	
<b>Total Budget</b>		<b>4,330,350,000.00</b>	



**National Biodiversity Strategic  
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