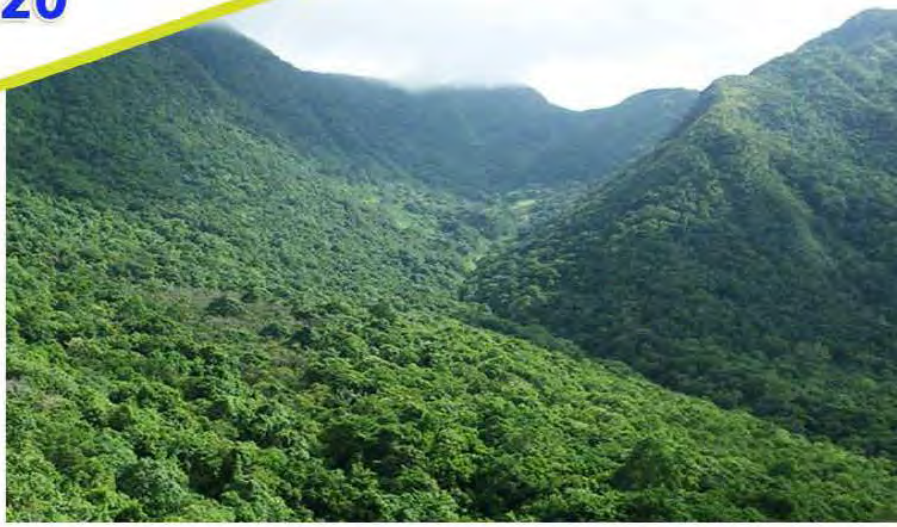# National Biodiversity Strategy and Action Plan 2015-2020

October, 2015

The Republic of the Union of Myanmar
Ministry of Environmental Conservation and Forestry

NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN
(2015–2020)

Prepared by
FOREST DEPARTMENT

Consulted by
IUCN (INTERNATIONAL UNION FOR CONSERVATION OF NATURE)

October 2015

Preface

Biodiversity underpins a range of ecosystem services which are central for sustainable development, supporting a range of human and ecosystem needs, and contributing to a more stable climate. The Republic of the Union of Myanmar is proud of its rich biodiversity, and of the way the country has sustainably managed this for centuries. However, biological resources are now being lost due to several factors such as unsustainable land use practices and unplanned and uncoordinated development. Loss of this biodiversity leads to degradation and deterioration of ecosystem services and Myanmar's rich ecological heritage. Myanmar now faces several challenges such as climate variability, water scarcity, decline of agricultural productivity, and energy security that threaten natural life support systems. In 2011, the Government of the Republic of Myanmar developed and adopted a National Biodiversity Strategy and Action Plan (NBSAP), as part of its commitment as a signatory to the Convention on Biological Diversity (CBD), and to the future of its people and natural environment. Adopted in 2012, the previous NBSAP served as the national guiding framework for biodiversity conservation, management and utilization in a sustainable manner.

The revised NBSAP (2015–2020) provides a strategic framework for the conservation of Myanmar's biodiversity to address new and emerging challenges arising from political, economic and social reform in Myanmar, as well as take into account new opportunities, and align targets and actions with the CBD's Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets.

This NBSAP provides a comprehensive account of and identifies the primary threats to the country's biodiversity; describes the key efforts, achievements and gaps in its management; presents strategic approaches, theme-specific strategies and associated priorities for actions; and outlines implementation arrangements. The strategies and priority actions consider national conservation needs, sustainable use, and equitable sharing of benefits deriving from biodiversity and natural resources. The strategy will be implemented in collaboration with all relevant stakeholders. I believe that this document will attract the attention of both national stakeholders as well as of the global community and set a clearer path forward for the conservation of biodiversity in Myanmar. With the great expectation on the sustainability of our biodiversity richness, I sincerely and earnestly urge all the segments of society to commit the effective implementation of the action plans prescribed in this NBSAP.

October 2015

H.E. U Win Tun
Union Minister
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Acknowledgements

Executive Summary

Myanmar is at a turning point. After a half-century of isolation the country has reengaged with the international community. Having embarked on a programme of economic liberalization and re-integration with the global economy, Myanmar is expected to continue to grow rapidly. This growth will bring much-needed development, including substantial foreign investment, but will inevitably increase pressure on natural resources and biodiversity. This change presents the country with both risks and opportunities. As it develops, increased pressure will be placed on the country's rich biodiversity and natural resources. This NBSAP provides a detailed framework to address these pressures and guide and direct activities with the potential to affect biodiversity in Myanmar. The document is the outcome of extensive data and information collection and analysis, as well as a series of workshops and working group meetings with participation from government departments, NGOs, and academic institutions. Based on the consultations, discussions, comments, suggestions and updated information of biodiversity and natural resources in the country, the NBSAP has been prepared and approved by national stakeholders.

The revised NBSAP takes advantage of a wealth of new data and information to set targets that preserve the species and habitats that are truly irreplaceable and influence decisions across multiple sectors that impact biodiversity conservation. The most significant change over the 2012 version is the use of the 20 Aichi Biodiversity Targets to structure the analysis. Under each global target there are several national targets. These targets were designed to be specific and realistic given the 5-year timeframe and available human resources. Some of the key targets relate to:

- Launching an initiative to restore millions of hectares of forest that are commercially exhausted and subject to conversion to plantations or agriculture.

- Expanding the protected area network to cover 15% of the country's coral reefs and key gaps in the terrestrial system, including mangrove forests, through both government and community based approaches.

- Developing an ecosystem-based fisheries management plan with private sector and civil society participation and endorsement and developing an inter-agency system to control illegal and destructive fishing in the Myeik Archipelago.

- Ensuring that national law recognizes customary tenure as a way to protect indigenous knowledge and genetic plant resources, and provide a practical incentive for community participation in biodiversity conservation.

The revised NBSAP will serve as a guide for biodiversity conservation from 2015 to 2020. Its goal is to establish a strategic planning framework, identify concrete actions, and ensure effective management and conservation of Myanmar's diverse ecosystems, species, and natural

resources. On TBD, the Government of the Republic of the Union of Myanmar adopted the Myanmar NBSAP at its Government Meeting No.(27/2015), held on 24-12-2015.The NBSAP is composed of four major chapters and three annexes, covering background information as well as a detailed action plan for achieving the national targets.

Chapter 1 provides background information on Myanmar, its geophysical characteristics and biodiversity, and biodiversity conservation activities. Chapter 2 gives a detailed account of the diversity of ecosystems and species found in Myanmar as well as important natural resources and human activities, such as agriculture, that depend on the country's rich biological endowment. In Chapter 3 there is an overview of the policy and legal framework, institutional arrangements, and international agreements relevant to biodiversity conservation in Myanmar. Chapter 4 reviews the previous NBSAP, covers the 20 Aichi Targets, and outlines detailed national targets and actions required to meet Myanmar's ambitious conservation goals. This chapter contains some of the most important content within the NBSAP. The Annexes provide detailed indicators for assessing progress on national targets, species lists, and more information on the revised NBSAP formulation process.

CONTENTS

Acronyms and Abbreviations

AAC	Annual Allowable Cut
ABS	Access and Benefit Sharing
ACB	ASEAN Centre for Biodiversity
ADB	Asian Development Bank
ASAP	Asian Species Action Partnership
ASEAN-WEN	ASEAN Wildlife Enforcement Network
BANCA	Biodiversity and Nature Conservation Association
BBOP	Business and Biodiversity Offset Programme
BET	Business Ecosystems Training
BIOFIN	Biodiversity Finance Initiative
BOBLME	Bay of Bengal Large Marine Ecosystem
CAS	California Academy of Sciences
CBD	Convention on Biological Diversity
CFIs	Community Forestry Instructions
CFiUGs	Community Fishery User Groups
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CR	Critically Endangered
DALMS	Department of Agricultural Land Management and Statistics (DALMS)
DAR	Department of Agricultural Research
DD	Data Deficient
DMDF	Dry Mixed Deciduous Forest
DOF	Department of Fisheries
DZGD	Dry Zone Greening Department
ECC	Environmental Conservation Committee
ECD	Environmental Conservation Department
ECL	Environmental Conservation Law
EIA	Environmental Impact Assessment
EITI	Extractive Industries Transparency Initiative
EN	Endangered
EP	Equator Principles
ETIS	Elephant Trade Information System
FD	Forest Department
FDI	Foreign Direct Investment
FFI	Fauna & Flora International
FOW	Friends of Wildlife
FPIC	Free, Prior, and Informed Consent
FRA	Forest Resources Assessment
FRI	Forest Research Institute

GAD	General Administration Department
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFW	Global Forest Watch
GMS	Greater Mekong Sub-region
GPFLR	Global Partnership on Forest and Landscape Restoration
HCVF	High Conservation Value Forest
IAS	Invasive Alien Species
IBCAS	Institute of Botany, Chinese Academy of Sciences
ICCA	Indigenous and Community Conserved Area
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
ITPGR	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
IZ	Industrial Zone
KBA	Key Biodiversity Area
LCG	Land Core Group
LMMA	Locally Managed Marine Area
MAT	Mutually Agreed Terms
MBK	Makino Botanical Garden
MEAs	Multilateral Environmental Agreements
MERN	Myanmar Environment Rehabilitation-conservation Network
METT	Management Effectiveness Tracking Tool
MFF	Mangroves for the Future
MFFed	Myanmar Fisheries Federation
MIC	Myanmar Investment Commission
MIKE	Monitoring the Illegal Killing of Elephants
MNPED	Ministry of National Planning and Economic Development
MOAI	Ministry of Agriculture and Irrigation
MOECAF	Ministry of Environmental Conservation and Forestry
MOEd	Ministry of Education
MOEP	Ministry of Electric Power
MOM	Ministry of Mining
MOT	Ministry of Transport
MRTV	Myanmar Radio and Television
MST	Ministry of Science and Technology
MSY	Maximum Sustained Yield
MTE	Myanmar Timber Enterprise
NBCC	National Biodiversity Conservation Committee
NBSAP	National Biodiversity Strategy and Action Plan
NCNPP	Nature Conservation National Park Project
NECC	National Environmental Conservation Committee
NEQG	National Environmental Quality (Emissions) Guidelines

NEQS	National Environmental Quality Standards
NIASP	National Invasive Alien Species Action Plan
NIBR	National Institute of Biological Resources
NISM-GPA	National Information Sharing Mechanism-Global Plan of Action
NMFC	Northern Mountain Forest Complex
NSDS	National Sustainable Development Strategy
NTFP	Non-Timber Forest Product
NWCD	Nature and Wildlife Conservation Division
PA	Protected Area
PES	Payments for Ecosystem Services
PFE	Permanent Forest Estate
PGR	Plant Genetic Resources
POINT	Promotion of Indigenous Nature Together
Ramsar Convention	Convention on Wetlands of International Importance especially as Waterfowl Habitat
REDD+	Reducing Emissions from Deforestation and Forest Degradation-plus
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zones
SIA	Social Impact Assessment
SMART	Spatial Monitoring and Reporting Tool
TSA	Turtle Survival Alliance
UF	Unclassified Forest
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNDRIP	United Nations Declaration on the Rights of Indigenous People
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VU	Vulnerable
WCS	Wildlife Conservation Society
WHC	World Heritage Convention
WHS	World Heritage Site
XTBG	Xishuangbanna Tropical Botanical Garden

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Chapter 1. Introduction

1.1   Background

Myanmar is the largest country in mainland Southeast Asia with a land area of 676,577 km2, bordered by Bangladesh and India to the northwest, the People's Republic of China to the northeast and the Lao PDR and Thailand to the southeast (see Figure 1). The Bay of Bengal and Andaman Sea lie to the south and west. More than 40% of Myanmar is mountainous. Prominent mountain chains include an extension of the eastern Himalaya, the Chin Hills, the Western Plateau/Rakhine Yoma, Bago Yoma, the Eastern Plateau/Shan Plateau and the Taninthayi Range. The Ayeyawady, Thanlwin/Salween, Chindwin, Sittaung and Kaladan are Myanmar's major rivers.

Figure 1: Location of Myanmar and state and region administrative boundaries.

The country has three seasons: wet (from mid-May to mid-October), cold (from early November to late February) and dry (from March to mid-May). Temperature, precipitation and humidity vary greatly; from the Taninthayi coast which receives about 5,000 mm of rain annually to the arid Central Dry Zone in the central plains which receives only 500–750 mm of rain a year (see Figure 2). This diverse topography and climatic conditions create numerous different ecosystems and support an incredibly wide range of associated species.
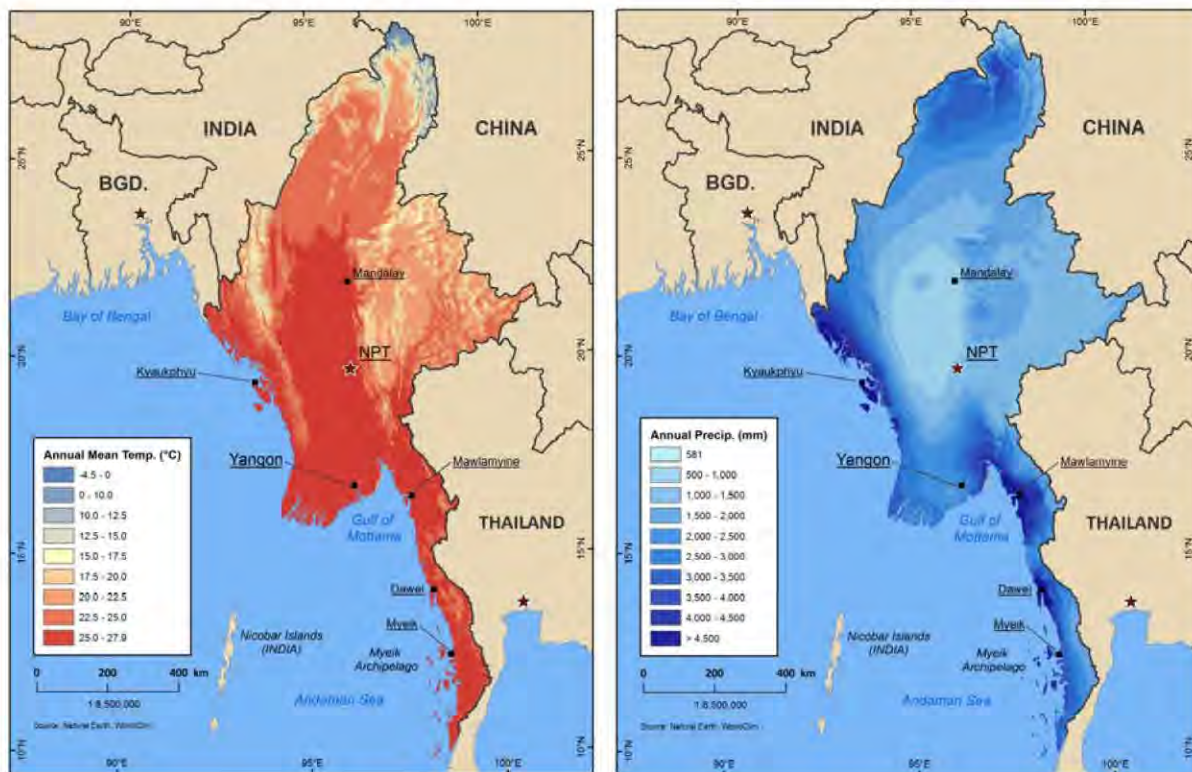
Figure 2: Annual Mean Temperature and Annual Precipitation in Myanmar.

1.2   Biodiversity Conservation Background

Environmental conservation has a long history in Myanmar, from religious practices that ban hunting and fishing in sacred areas to traditional cultivation systems that protect riparian and watershed forests. In the 1800s, multiple kings issued royal decrees protecting animal life. Starting in 1918, hunting was banned in some areas out of concern about declining wildlife populations. Modern conservation efforts are rooted in the early 1980s. Between 1981 and 1984, the Nature Conservation National Park Project (NCNPP) was launched and jointly implemented by the UN Development Programme (UNDP) and the government. During the NCNPP, the Ministry of Environmental Conservation and Forestry (MOECAF) established the Nature and Wildlife Conservation Division (NWCD), which is responsible for nature conservation and protected areas (PAs). Since then, several additional PAs have been established and expanded. Until 1996 PAs covered less than 1% of total land, ranging in size from 0.47 km2 to 2,150 km2. Starting in the mid-1990s, establishment of PAs shifted from a focus on protection of select species and habitats to protection of entire landscapes and ecosystems. Fifteen new PAs were added between 1996 and 2014, bringing the total area of Myanmar's PAs to more than 38,000 km2 (see Figure 3).

Forests within the Permanent Forest Estate (PFE) are under the authority of the Forest Department and are classified as either PAs (i.e. conservation areas), reserved forests (production for-

ests), or protected public forests (local natural resource supply areas). Currently more than 20 million hectares, approximately 30% of the country's total land area, are designated within the PFE. Forests outside the PFE may be classified as public forest or wasteland and are sometimes referred to as unclassified forest. While the land in unclassified forest is available for other uses by the state, all trees in the country are subject to regulations by MOECAF, including controls on harvesting and sale of restricted species.

Table 1: Reserved Forests, Protected Public Forests and Protected Areas of Myanmar.

Category	Area (km2)	Per cent of total land area
Reserved Forests	120,236	18.00
Protected Public Forests	47,492*	6.05
Protected Areas	38,906	5.75
Total	206,634	29.80

*Source: Planning and Statistics Division, FD, July 2014
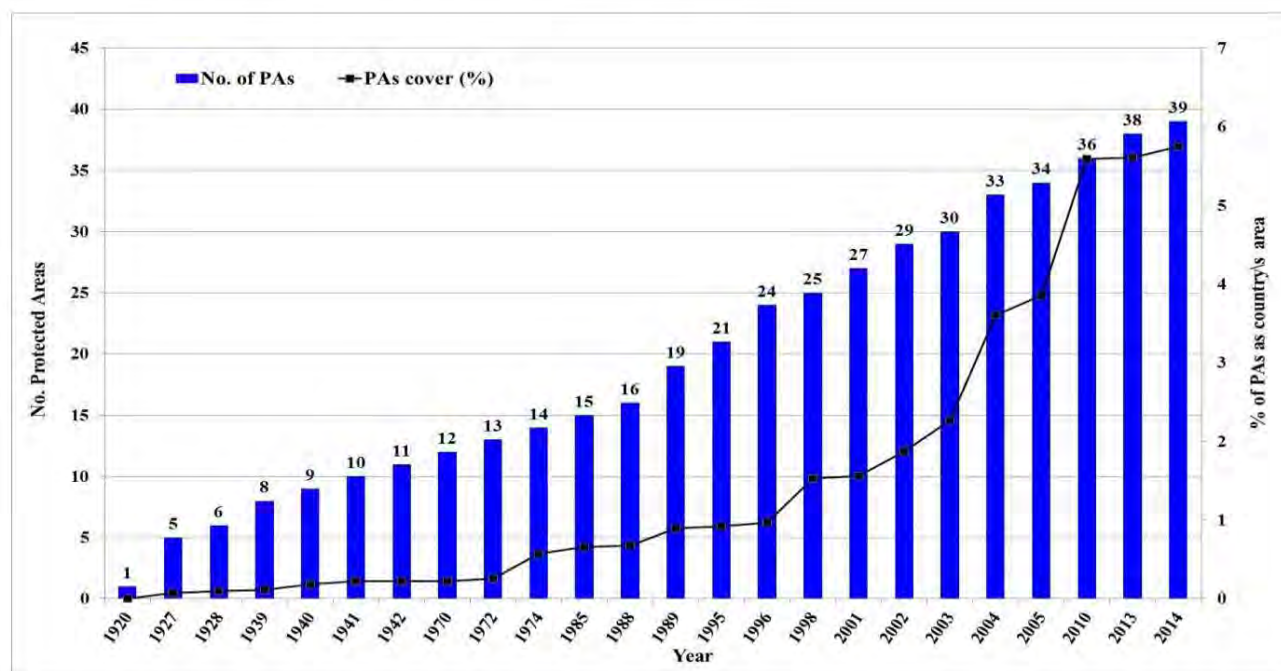
Figure 3: Establishment of Protected Areas between 1920 and September, 2015.

Among the 39 current PAs (see Figure 4), seven have been recognized as ASEAN Heritage Parks (AHPs), tying the Philippines for the most in the region. AHPs are recognized for their particular biodiversity value or uniqueness within ASEAN countries and in Myanmar are Hkakaborazi National Park, Indawgyi Lake Wildlife Sanctuary, Alaungdaw Kathapa National Park, Inlay Lake Wildlife Sanctuary, Meinmahla Kyun Wildlife Sanctuary, Lampi Marine National Park and Natmataung National Park. Myanmar also has a designated Ramsar site (Moeyungi Wetland) and

is exploring the potential to nominate seven other areas currently on the Tentative List (TL) as natural World Heritage Sites.
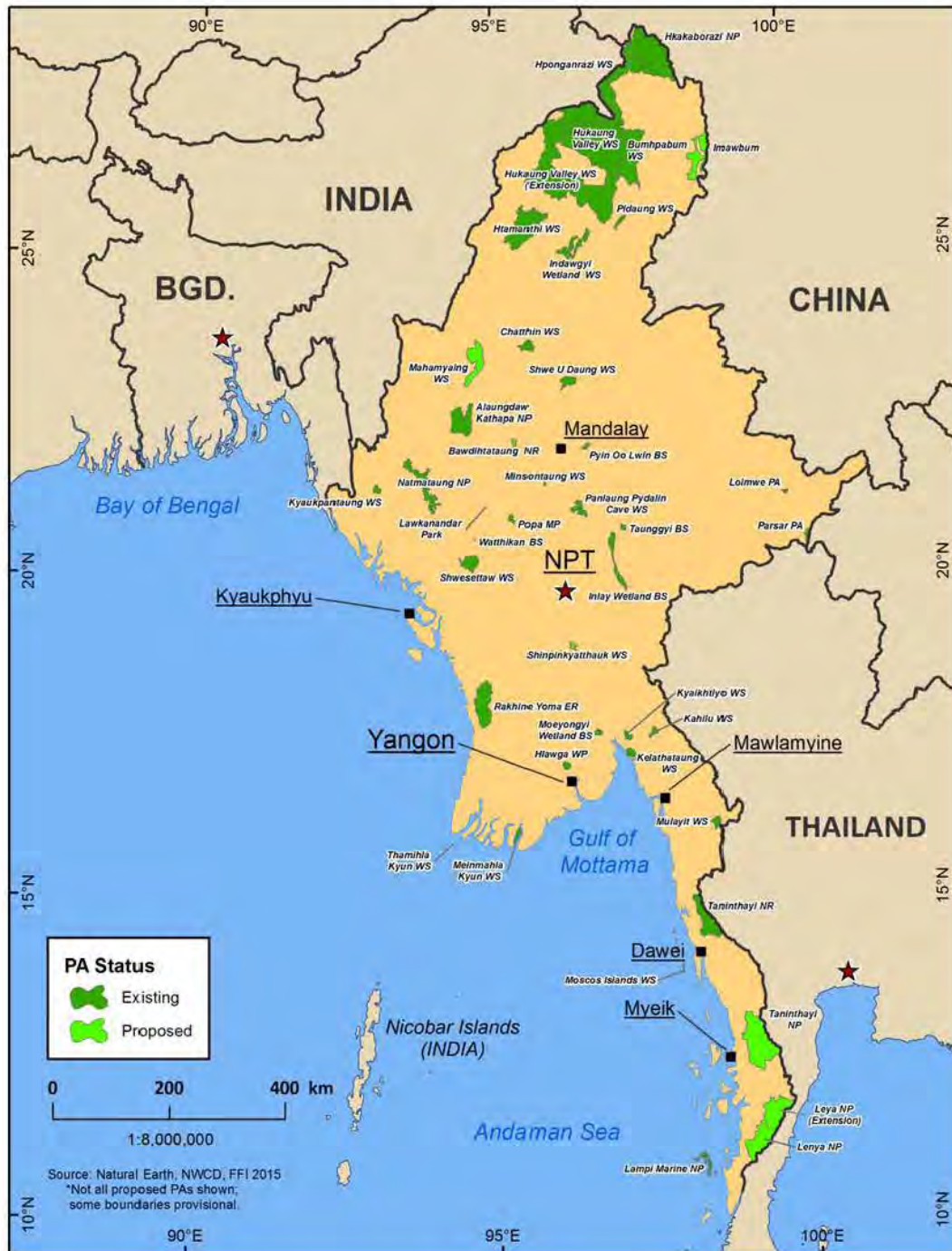
Figure 4: Location of Protected Areas in Myanmar.

Chapter 2
Biodiversity Status and Trends in Myanmar

2.1   Overview of Biodiversity of Myanmar

Myanmar is situated at the transition zone between three biogeographic regions: in the north, Indochina, the Indian sub-continent; and Eurasia; in the south, taninthayi forests cover the northern section of the transition between Indochina and Sundaic ecological zones. These transitional zones produce unique and diverse species assemblages. The region's most intact lowland Sundaic forests are found in Myanmar, along with patchy but regionally significant areas of dry deciduous forest. Birds that migrate on both the Central Asian and East Asian Flyways rest at globally important wetlands in the country. Myanmar contains almost 10% of global turtle and tortoise diversity, including seven endemic species. Some regions and taxa are relatively understudied, and surveys continue to identify new endemic species and range extensions of globally threatened species. Ongoing surveys are also developing a better understanding of the distribution and status of these species.

2.1.1   Ecosystem Diversity

Forest Ecosystems

Forests constitute the dominant ecosystem in Myanmar, with 45 per cent of the country ecologically classified as forest (FAO 2015). Furthermore, as a result of a wide altitudinal range, with corresponding variation in climatic conditions, the country supports a range of forest types and vegetation zones. Broadly speaking, forests in Myanmar can be categorized into the types shown in Figure 5. These include the extensive teak forests for which Myanmar is renowned. In addition, one of the largest homogenous bamboo stands in the world is found in Rakhine State, covering an area of over 7,770 km2.

Tidal Forest
Beach and Dune Forest
Swamp Forest
Evergreen Forests
    Tropical Wet Evergreen
    Tropical Semi Evergreen
Mixed Deciduous Forests
    Moist Upper Mixed
    Lower Mixed
    Dry Upper Mixed
Dry Forests
    Than-dahat
    Thorn
Deciduous Dipterocarp or Indaing Forest
Hill and Temperate Evergreen Forests
    Sub Tropical Wet Hill
    Sub Tropical Mixed Hill and Savannah
    Alpine

Figure 5: Major Vegetation Types of Myanmar.Source: Adapted from Kress et al. 2003.

Freshwater Ecosystems

Myanmar supports a diversity of freshwater ecosystems, from fast-flowing mountain streams to wide, slow-flowing lowland rivers, as well as lakes and wetlands. These rivers, lakes, and wetlands provide enormous economic and cultural values. The Salween and the Ayeyawady Rivers are some of the most intact major rivers in Asia, providing livelihoods to the people living along their banks and rich with historical and cultural significance. The Chindwin River flows through Hukaung Valley and creates one of the largest seasonally flooded grasslands of the region. Indawgyi Lake is the largest freshwater lake in Myanmar, hosting globally significant aggregations of waterbirds and providing livelihoods for people who fish and grow unique varieties of rice around the lake.

Rivers

Myanmar is endowed with tremendous inland water resources in the form of rivers, streams, and springs (see Figure 6). Major rivers include the 1,800 km-long Ayeyawady River which arises from the confluence of the N'mai Kha and Mali Kha Rivers. The Chindwin River, with headwaters in the northwestern hills, is the main tributary of the Ayeyawady. The Sittaung River starts in the hills southeast of Mandalay, and the Thanlwin River, the last undammed river, races through deep gorges in the Shan Plateau. The Kaladan River is formed by tributaries discharging from the Arakan Mountains.

Figure 6: Major rivers of Myanmar.

Lakes

Myanmar contains several large lakes, which provide critical habitat for a range of species and a source of livelihood for local residents. Indawgyi Lake in Kachin State is the largest, with around 12,000 hectares of open water. The lake provides habitat for numerous endangered species

and for globally significant aggregations of migratory waterbirds. Inlay Lake on the Shan plateau is the most famous lake in Myanmar, known for its floating gardens and the leg-rowing Intha people who live around the lake. The country also contains numerous small and medium-sized lakes, including glacial lakes in the north that are crucial sources of freshwater. Lakes within urban areas provide freshwater, flood control, and opportunities for recreation.

Mountain Lake in Northern Myanmar

Coastal and Marine Ecosystems

Myanmar has a large marine territory. The coastline stretches from the Naf River, the dividing line between Bangladesh and Myanmar, to Kawthaung at the border with Thailand, 2,831 km to the south (see Figure 7). Along the southern coastline the Myeik Archipelago is made up of more than 800 islands. The continental shelf covers 225,000 km2, and the Exclusive Economic Zone covers 512,000 km2. Coastal areas also include 5,000 km2 of brackish and freshwater swampland that provides essential ecological habitat for spawning and as a nursery and feeding ground for fish, prawns and other aquatic fauna and flora of economic and ecological importance. Mangroves are found in many coastal regions, particularly near estuaries in Rakhine State, Taninthayi Region and Ayeyawady Region. Other coastal habitats include intertidal mud and sand flats, which are very important for migratory water birds, as well as sand dunes and beach forest. The Gulf of Mottama contains one of the largest intertidal mudflats in the world and is thought to be key for the survival of the critically endangered spoon-billed sandpiper.
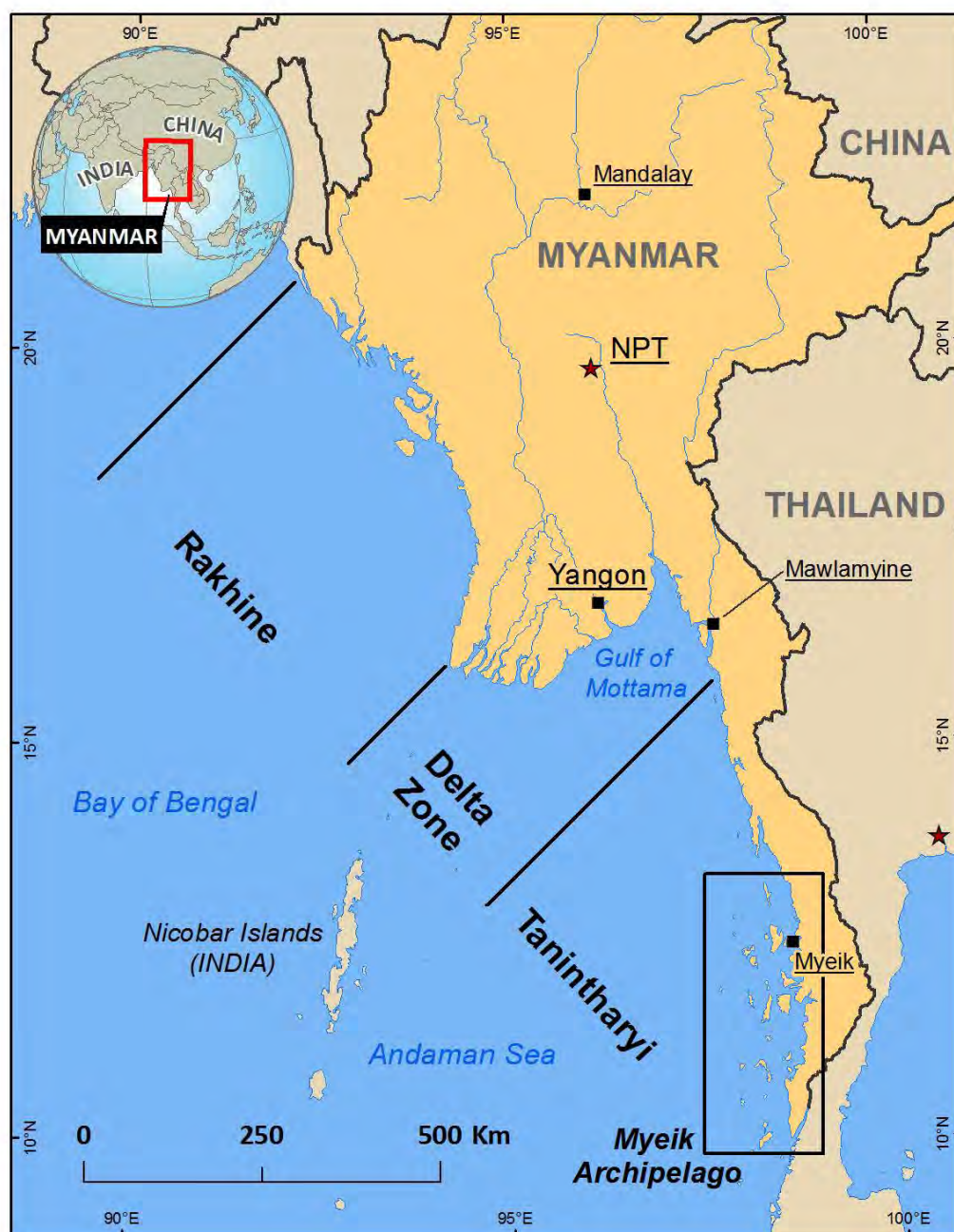
Figure 7: Coastal areas of Myanmar.

Mountain Ecosystems

Forty-two per cent of Myanmar is mountainous and these areas form some of the most important landscapes in terms of biological, cultural, traditional and ethnic diversity and identity (see Figure 8). Mountainous areas are also important for the country's economy, providing most of the fresh water for the country. In addition, three-quarters of Myanmar's 132 Key Biodiversity Areas (KBAs), areas identified as being particularly important for biodiversity, are located in

mountainous areas, and are home to several endemic and globally important species. In the far north, with an elevation of 5,881 m, Hkakaborazi is the highest peak as well as part of the only permanently snow-capped mountain range in the Indo-Burma region. These mountain ranges are home to diverse ethnicities who practice traditional upland cultivation systems and are dotted with peaks and caves of cultural and historical importance.

Karst formations can be found in Taninthayi Region, Kayin State, Shan State, and stretching along the upper Ayeyawady River in Kachin State. Karst formations are home to species with severely restricted ranges, some of which are confined to a single cave or peak. This high rate of endemism makes karst systems particularly important for biodiversity conservation. Limestone quarrying for cement production threatens karst ecosystems.
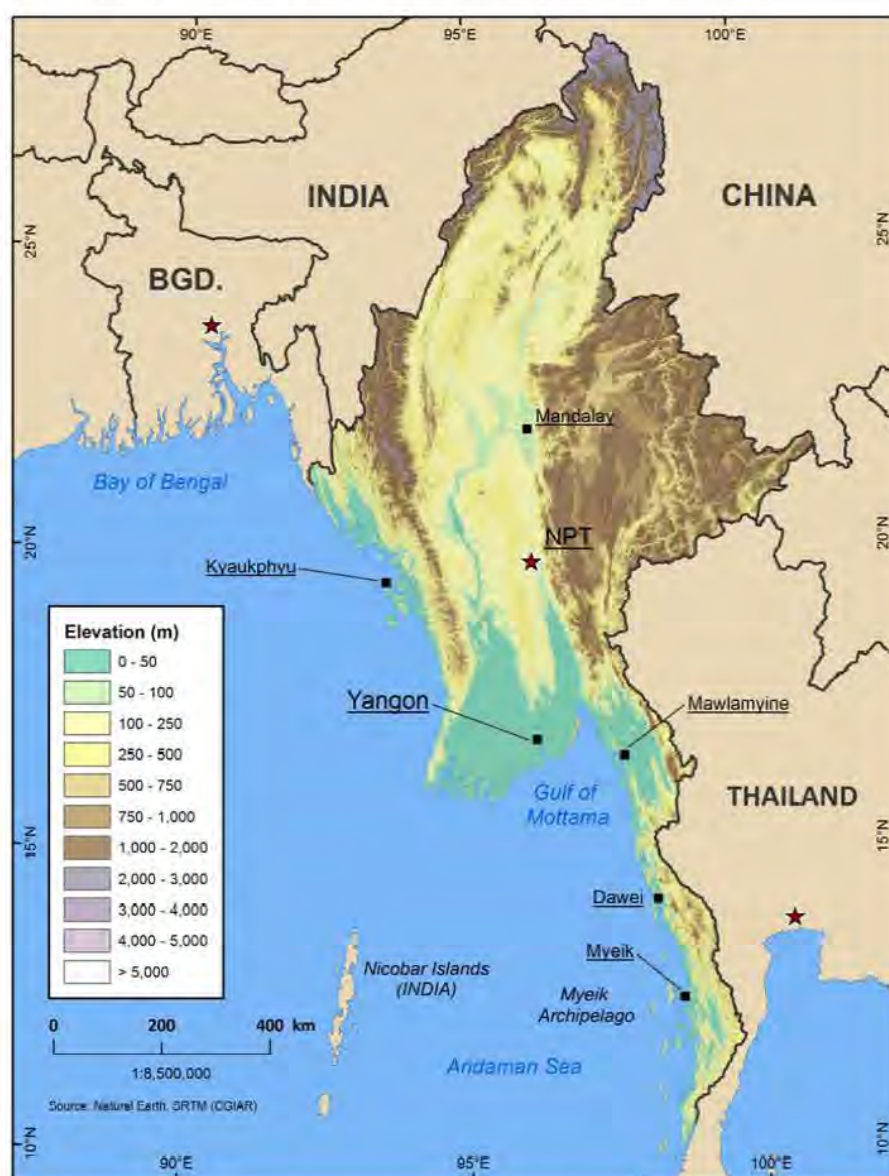
Figure 8: Elevation gradient and major mountain ranges of Myanmar.

Table 2: Major mountain ranges in Myanmar.

Mountain Range	Location	Notable Features
Eastern Himalayan Extension	Northern part of country, eastern extent of the Himalayan range	This range contains the highest peaks in Southeast Asia, unique forest habitat and rich bird biodiversity
Chin Hills	Western part of Myanmar, extending to south of India	Natmataung National Park, in the Chin Hills, is an alpine island that is home to rich plant diversity and an endemic bird species.
Western Plateau/ Rakhine Yoma	Between the Ayeyawady River and Bay of Bengal	Acting as a barrier to the monsoon, western slopes of the Rakhine Yoma can receive 1 m of precipitation per month in the wet season. This range extends under water to the south and later emerges to form the Nicobar Islands
Bago Yoma	Between the Ayeyawady and Thanlwin Rivers	Largely forested, these mountains supply many reservoirs and provide habitat to a resident elephant population. The Bago Yoma is a historically important source of high-quality teak.
Eastern Plateau	North-east, bordering with China, Laos and Thailand	The Shan Hills cover mountainous Shan State with forest, karst formations, and agricultural land.
Taninthayi Range	South, bordering with Thailand	Covering the northern transition zone between Indochina and Sundaic zones, this range is home to a variety of threatened species. PAs in Thailand are connected to this forest complex across the border.

Myanmar Northern Mountain Forest Complex

Agricultural Ecosystem

Myanmar has six major agro-ecological zones corresponding to topographical variation and climatic conditions (see Table 3).

Table 3: Major agro-ecological zones of Myanmar.

Name	Geographical description	Administrative units	Main agricultural crops
A. Bago and Kachin riparian areas and flood-plains	Upper Delta, Kachin Plain, flat plains adjacent to Ayeyawady and Sittaung rivers; moderate rainfall (1,000–2,500 mm)	Ayeyawady Region, Kachin State, Sagaing Region, Mandalay Region and Bago Region	Rice, pulses, oilseeds, sugarcane, tobacco and alluvial/island cultivation
B. Central Dry Zone	Central Dry Zone, rainfall less than 1,000 mm, highest temperatures in summer, flat plains, some areas with rolling hills	Magway Region, Mandalay Region, and Sagaing Region	Upland crops, oilseeds, pulses, rice, cotton, irrigated agriculture and alluvial/island cultivation
C. Delta and Coastal Lowland	Delta, lowland and coastal river outlets and estuaries; heavy rainfall (more than 2,500 mm)	Ayeyawady Region, Yangon Region, Bago Region, Mon State, Kahyin State, Taninthayi Region and Rakhine State	Rice, pulses, oilseeds and nipa palm
D. Kachin and Coastal Upland	Mountainous, sloping land; heavy rainfall (more than 2,500 mm)	Kachin State, Rakhine State, Taninthayi Region, Mon State, Kayin State, Kayah State, Yangon Region and Bago Region	Orchards, plantation crops, and upland agriculture
E. North, East and West Hills	Hilly areas, uneven topography, moderate to heavy rainfall, sloping land	Kachin State, Chin State, and Shan State	Upland crops, shifting cultivation and fruit trees
F. Upper, Lower Myanmar and Shan Plain	Upper and lower plains outside of central dry zone, Shan Plain	Sagaing Region, Kachin State, Shan State, Bago Region, Magway Region, Mandalay Region and Yangon Region	Upland crops, oilseeds, pulses, vegetables and wheat

Source: Adapted from FAO/WFP (2009).

2.1.2 Species Diversity

Wild species diversity

Plants

Myanmar's variations in latitude, altitude and climate create a variety of habitats and support correspondingly rich plant biodiversity. To date, more than 18,000 plant species have been recorded in Myanmar. These include more than 800 orchid species, 80 bamboo species, numerous rattan species, and more than 800 medicinal plant species. However, there are large research and information gaps for several species groups. On-going collaborative botanical surveys by the Wildlife Conservation Society (WCS; USA), National Institute of Biological Resources (NIBR; Republic of Korea), Institute of Botany, Chinese Academy of Sciences (IBCAS) and Xishuangbanna Tropical Botanical Garden (XTBG) (People's Republic of China), and Makino Botanical Garden (MBK; Japan) will likely identify additional plant species, including endemic species. Enhanced coordination of these efforts is required.

There are 61 globally threatened plant species known to occur in Myanmar. Of these, 16 are assessed on the IUCN Red List of Threatened Species (hereafter referred to as the "Red List") as Critically Endangered (CR), 24 as Endangered (EN) and 21 as Vulnerable (VU) (see Annex 2, Table 43). The main threats to plant species in Myanmar are overexploitation by legal and illegal logging, conversion to agriculture—especially commercial plantations, and degradation and fragmentation from road construction and small scale agriculture (WCS 2013). Illegal logging for valuable timber species is a driver of deforestation. Rosewood species (Padauk, Pterocarpus macrocarpus and Tamalan, Dalbergia oliveri) are highly valued and increasingly sold illegally across the border as rosewood supplies are exhausted in neighbouring countries. Orchids are also threatened by unregulated collection and sale across the borders.

Taung-zalat-ni *(Rhododendron arboretum)*

Mammals

Nearly 300 mammal species have been recorded in Myanmar, but a number of these have not been sighted in recent years, including the Sumatran rhinoceros (Dicerorhinus sumatrensis), Javan rhinoceros (Rhinoceros sondaicus) and Indian water buffalo (Bubalus arnee). Myanmar is home to the Western Hoolock gibbon (Hoolock hoolock), Eastern Hoolock gibbon (Hoolock leuconedys) and Myanmar snub-nosed monkey (Rhinopithecus strykeri), discovered in the mountains near the Chinese border in north-east Kachin State in 2010.

There are 47 globally threatened mammal species in Myanmar; five Critically Endangered, 17 Endangered and 25 Vulnerable (see Annex 2, Table 44).

Bengal Tiger (*Panthera tigris*)

Two large mammals, the Asian elephant (*Elephas maximus*) and tiger (*Panthera tigris*) are threatened, mainly due to illegal trafficking, and their populations are thought to be decreasing. Black musk deer (*Moschus fuscus*), sun bear (Helarctos malayans), Malayan pangolin (*Manis javanica*) and Chinese pangolin (*Manis pentadactyla*) are also severely threatened by illegal trafficking. On the other hand, camera trap surveys have shown that Htamathi Wildlife Sanctuary, and the proposed Taninthayi, Lenya and Lenya (*extension*) National Parks are home to a considerable number of tigers and prey species, as well as the Asian elephant.

The population of the Irrawaddy dolphin *(Orcaella brevirostris)* has been decreasing, mainly due to destructive electrofishing practices. Another large aquatic mammal, the dugong *(Dugong dugon)*, has been sighted in the Myeik Archipelago and off the Rakhine coast.

Myanmar is also home to at least five endemic mammal species, including: Anthony's pipistrelle *(Hypsugo anthonyi)*, Joffre's pipistrelle *(Hypsugo joffrei)*, Myanmar pipistrelle *(Hypsugo lophurus)* and the Popa soft-furred rat *(Millardia kathleenae)*. Dry mixed deciduous forests in Myanmar are home to the largest remaining population of the endangered Eld's deer *(Rucervus eldii)*.

Avifauna

Myanmar is recognized as having possibly the greatest diversity of bird species in Southeast Asia, with at least 1,096 avifauna species recorded including 6 endemic species and 46 bird species listed on the Red List. Although some of these species have not been recorded for decades they may be present in low numbers. Jerdon's babbler *(Chrysomma altirostre)*, was rediscovered in grassland near Yangon in 2014, with the first recorded sighting in 73 years.

Bird species endemic to Myanmar include Jerdon's minivet *(Pericrocotus albifrons)*, hooded treepie *(Crypsirina cucullata)*, Burmese bush lark *(Mirafra microptera)*, Burmese tit *(Aegithalos sharpie)*, white-throated babbler *(Turdoides gularis)* and white-browed nuthatch *(Sitta victoriae)*.

Of the 45 globally threatened bird species in Myanmar, eight are listed as Critically Endangered (Annex 2, Table 45). Of these, five have globally significant populations which depend on the country as a critical refuge or wintering area. These include the white-bellied heron (Ardea insignis), spoon-billed sandpiper *(Calidris pygmaea)*, white-rumped vulture *(Gyps bengalensis)*, slender-billed vulture *(Gyps tenuirostris)* and red-headed vulture *(Sarcogyps calvus)*. Myanmar is home to the bulk of the world's population of Gurney's pitta *(Pitta gurneyi)*, an endangered species, which, outside of Myanmar, is only known from very small populations in southern Thailand.

Asian Golden Weaver (*Ploceus hypoxanthus*)

Herpetofauna

Ongoing surveys indicate that Myanmar hosts a high diversity of reptiles and amphibians. Myanmar has exceptional turtle and tortoise diversity, with seven endemic species. A herpetofauna survey, jointly conducted between 1999 and 2010 by the Forest Department (FD) and the California Academy of Sciences (CAS), marked an initial effort to understand diversity in Myanmar and subsequent surveys have filled in gaps and discovered new species. The number of reptile and amphibian species currently recorded in Myanmar is presented in Table 4.

Table 4: Numbers of reptile and amphibian species recorded in Myanmar.

Group	Species	No.	Group	Species	No.
Reptile	Snakes	172	**Amphibian**	Frogs and toads	116
	Lizards	87		Caecilians	2
	Turtles and tortoises	32		Salamanders	2
	Crocodiles	4			
Total		291			119

Twenty-one reptile species and three amphibian species endemic to Myanmar have been recorded, including the Burmese frog-faced softshell turtle (*Chitra vandijki*), Myanmar star tortoise (*Geochelone platynota*), Rakhine forest turtle (*Heosemys depressa*), Burmese roofed turtle (*Batagur trivittata*), Myanmar flapshell turtle (*Lissemys scutata*), Burmese-eyed turtle (*Morenia ocellata*) and Burmese peacock softshell turtle (*Nilssonia formosa*). Wildlife trafficking and consumption are major threats to these species. Geochelone platynota is considered functionally extinct in the wild, and conservation efforts focus on assurance colonies and reintroduction. The status of several species including Manouria emys, Manouria impressa, Batagur baska, Gharial crocodile (*Gavialis gangeticus*), Crocodylus palustris and Tomistoma schlegelii remains poorly understood (WCS 2013).

Invertebrates

Invertebrates are one of the least studied taxa in Myanmar. A joint study by FD and Smithsonian Institution identified 1,197 butterflies in Myanmar (Kinyon 2004), about 12% of the global total, which makes Myanmar the fifth richest country in the world in terms of butterfly diversity. This also includes six of the rarest known butterfly species in the world (see Table 5). The diversity of other invertebrate species such as beetles, bees and spiders are largely unknown.

Table 5: Rare butterfly species found in Myanmar.

Scientific Name	Common Name
Parnassius imperator	Apollo
Troides helena cerberus	Common birdwing
Troides aeacus praecox	Golden birdwing
Bhutanitis ledderdalii	Bhutan glory
Teinopalpus imprrialis	Kaiser
Euthalia phemius phemius	White edge baron,
(Euthalia phemius)	white-edged blue baron

Freshwater Fish

Freshwater fish is one of the least studied fauna in Southeast Asia (Kullander et al. 2004). Nevertheless, Myanmar is already known to be rich in freshwater fish species, with 520 species recorded, including a number of endemic species (Fish Base 2015). Recent studies conducted by FD and Fauna & Flora International (FFI) revealed some species new to science (*Lepidocephalichthys* spp., *Acanthocobitis* spp. and *Physoschistura* spp. from Indawgyi Lake). Freshwater endemic fish species in Myanmar are presented in Table 6. Notable areas for endemic freshwater species are Inlay Lake and Indawgyi Lake.

Table 6: Endemic freshwater fish species in Myanmar.

No.	Species	No.	Species	No.	Species
1	Akysis pictus	21	Garra poecilura	41	Neolissochilus blythii
2	Akysis prashadi	22	Garra propulvinus	42	Neolissochilus compressus
3	Caragobius burmanicus	23	Garra rakhinica	43	Neolissochilus stevensonii
4	Chaca burmensis	24	Garra spilota	44	Olyra burmanica
5	Channa harcourtbutleri	25	Garra vittatula	45	Osteochilus sondhii
6	Clupisoma prateri	26	Gonialosa modesta	46	Parasphaerichthys ocellatus
7	Cyprinus intha	27	Gonialosa whiteheadi	47	Physoschistura brunneana
8	Danio choprae	28	Gudusia variegate	48	Physoschistura rivulicola
9	Danio erythromicron	29	Hemibagrus peguensis	49	Physoschistura shanensis
10	Danio nigrofasciatus	30	Hemibagrus variegatus	50	Proeutropiichthys macrop-thalmos
11	Devario auropurpureus	31	Homaloptera rupicola	51	Pseudolaguvia tuberculate
12	Devario sondhii	32	Ilisha novacula	52	Puntius burmanicus
13	Devario spinosus	33	Labeo stolizkae	53	Sawbwa resplendens
14	Esomus ahli	34	Macrognathus caudiocellatus	54	Schistura acuticephalus
15	Esomus altus	35	Mastacembelus oatesii	55	Sicamugil hamiltonii
16	Exostoma berdmorei	36	Microdevario gatesi	56	Toxotes blythii
17	Exostoma stuarti	37	Microphis dunckeri	57	Trichogaster labiosa
18	Garra flavatra	38	Microrasbora rubescens	58	Yunnanilus brevis
19	Garra gravelyi	39	Mystus leucophasis		
20	Garra nigricollis	40	Mystus rufescens		

Marine fauna

Myanmar has a long coastline and large marine territory. Its marine resources play an important role in the country's development. A growing understanding of coral reef resilience and species composition is helping to identify key areas for conservation. The initial result of a marine ecosystem survey by the Research Vessel RV Fridtjof Nansen conducted November–December 2013 indicated that the maximum sustained yield (MSY) in Myanmar's marine territory has been significantly reduced compared to the MSY calculated in the early 1980s. The recorded marine diversity of Myanmar is presented in Table 7. With the exception of marine fish species, the majority of the data is collected from the Myeik Archipelago.

Table 7: Marine diversity in Myanmar.

Marine diversity	Number	Marine diversity	Number
Phytoplankton	136	Crab (crustacean)	42
Zooplankton	150	Coral	287
Meroplankton	47	Marine fish	578
Seagrass	12	Marine invertebrates	230
Seaweed	38	Sharks	57
Gastropods (molluscs)	50	Rays	71
Bivalves (molluscs)	41		

Domesticated Biodiversity

Crops

Plants play a vital role for the survival of human society. Plant Genetic Resources (PGR) provide enormous potential for food security, biofuel and biopharmaceutical production and play a critical role in adaptation to climate change. More than 60 different crops are grown in the country and they can be grouped into seven categories as follows (Myint 1989):

- Cereals: Rice, wheat, maize and millet.
- Oil seeds: Groundnut, sesame, sunflower and mustard.
- Pulses: Black gram, green gram, butter bean, red bean, pigeon pea, chickpea, cowpea and soybean, etc.
- Industrial crops: Cotton, sugar cane, tobacco, rubber and jute.
- Culinary crops: Potato, onion, chilli, vegetables and spices.
- Plantation crops: Tea, coffee, coconut, banana, oil palm, toddy palm and other fruits.
- Other crops: other crops that are not listed in the above groups.

Inter- and intraspecific genetic variations are also observed among crops sown nationwide, especially for rice, maize, sorghum, millet, sesame, groundnut, ginger, turmeric, custard apple, okra, chilli, pepper, tomato, citrus, water melon, mango, jack-fruit, banana and medicinal plants (Tun and Than 1995).

Myanmar is also home to important crop species such as rice, mango, banana and sugarcane. Wild relatives and local landraces (varieties developed through traditional breeding methods and adapted to local conditions) of these cultivated crops are also found in Myanmar. According to genetic, geographical and molecular studies, Myanmar is believed to be in the centre of diversity of cultivated rice, O. *sativa indica* (Londo et al. 2006, quoted in DAR 2011). Several wild legume species related to cultivated mung bean, black gram and azuki bean are distributed in different ecosystems of Myanmar, including coastal sandy soils, lime stone hills and high lands of Shan state (Tun and Yamaguchi 2007). These wild legume species could provide useful genes for legume crop improvement. Moreover, several lesser used plant species are grown and used by diverse ethnic groups in Myanmar.

Recognizing the great value of PGR and the increasing threat of the loss of plant genetic diversity from natural habitats and farm lands, the seed bank of the Ministry of Agriculture and Irrigation (MOAI) has made efforts to collect and conserve the agro-biodiversity of Myanmar. Currently, the seed bank is conserving more than 12,000 accessions of important crops in Myanmar (see Table 8).

Table 8: Plant genetic resources conserved by the Myanmar Seed Bank.

Crop species	Number of accessions	Crop species	Number of accessions
Rice	7,367	Maize	100
Wild rice	184	Wheat	1,607
Black gram	128	Sorghum	219
Chick pea	617	Millets	123
Pigeon pea	143	Sesame	37
Green gram	189	Groundnut	665
Cow pea	181	Niger	1
Soybean	80	Safflower	1
Lima bean	66	Jute	42
Kidney bean	69	Vegetables	109
Wild Vigna spp.	101	**Total**	**12,029**

Livestock

The genetic variations of livestock in Myanmar are still largely unknown. Some livestock breeds are common across the country but some are much more localized. For example, mithun (*Bos frontalis*) are bred only in Chin State. Mithun are semi-domesticated cattle that play an important role in the day to day socio-economic life of the local tribal population. The Department of Animal Biotechnology of Kyauk Se Technical University has initiated systematic mithun breeding to maintain the declining population. Myanmar Myin (horse) and Inbinwa chicken are considered at risk because of a population decrease nationwide (LBVD 2011). The major livestock breeds in Myanmar are presented in Table 9.

Table 9: Major livestock breeds in Myanmar.

Species	Scientific Name	Local Name	Region/Location
Cattle	*Bos indicus*	Pya Sein, Shwe Ni, Shan Nwa, Katonwa, Kyaukphyu	Mandalay, Magway, Sagaing, Shan, Kayin, Rakhine
Mythun	*Bos frontalis*	Nwa Nauk	Chin
Buffalo	*Bubals bubals*	Myanmar Kywe, Shan Kywe	Ayeyawady, Sagaing, Shan
Horse	*Equus caballus*	Myanmar Myin, Shan Myin	Magway, Mandalay, Sagaing, Shan
Ass	*Equus asinus*	Myanmar Mye	Shan
Pig	*Sus domesticus*	Bo cake, Chin wet	Badoung, Akhar, Wet taung Magway, Mandalay, Sagaing, Shan
Sheep	*Ovis aries*	Myanmar Thoe, Karla Thoe	Magway, Mandalay, Sagaing
Goat	*Capra hircus*	Seik Ni, Jade Ni, Nyaung Oo, Htain San, Hkway Seik	Magway, Mandalay, Sagaing, Rakhine
Chicken	*Gallus gallus*	Taik Kyet, Tainyin Kyet, Kyet Lada, Inbinwa Kyet	Widespread
Turkey	*Meleagris gallopavo*	Kyet Sin	Widespread
Duck	*Anas platyrbynchos*	Khayan Be, Taw Be	Widespread
Duck, Muscovy	*Cairina Maschata*	Mandarli	Widespread
Goose	*Anser cygnoides*	Ngan	Widespread
Quail	*Coturnix spp*	Ngown	Widespread

Buffalo (*Bulbals bubals*)

Invasive Alien Species

The information on the status of invasive alien species (IAS) is still incomplete for Myanmar. The impact of IAS has not been comprehensively assessed. However, some studies indicated some socio-economic and environmental problems are being faced due to IAS. Golden apple snail *(Pomacea canaliculata)* is a major threat to rice crops across the country, introduced grass carp *(Ctenopharyngodon idella)* destroys native species, and water hyacinth *(Eichhornia crassipes)* degrades river and wetland ecosystems.

Legislation and regulations to control and manage IAS are not yet implemented in Myanmar. Some legislation, such as the Forest Law (1992), Protection of Wildlife and Protected Areas Law (1994), and Plant Pest Quarantine Law (1993, amended in 2011) provide regulations to control IAS, but these are not adequate to fully address IAS issues. At the same time, public awareness of IAS is relatively limited.

Some IAS were intentionally imported for research, forest restoration, food production, while some may have been unintentionally introduced. The available information on IAS in Myanmar is presented in Annex 2, Table 46.

Chapter 3
Policy, Legal Framework and Institutions for Biodiversity Conservation

3.1 Policy and Legal Framework

The Constitution of the Republic of the Union of Myanmar (2008) sets a clear policy direction on environmental conservation. Article 45 of the Constitution states that "The Union shall protect and conserve the natural environment." and Article 390 states that "Every citizen has the duty to assist the Union in carrying out the following matters:

  a) preservation and safeguarding of cultural heritage;
  b) environmental conservation;
  c) striving for development of human resources;
  d) protection and preservation of public property.

Myanmar has a number of policies and regulations to safeguard the environment, summarised below:

National Environment Policy (1994) aims to integrate environmental considerations into the development process to enhance the quality of life of all citizens and states that environmental protection should always be the primary objective of development.

Forest Policy (1995) ensures that Myanmar's forest resources and biodiversity are managed sustainably to provide a wide range of social, economic and environmental benefits, and aims to maintain 30 per cent of the country's total land area under Reserved Forests and Public Protected Forest and 5 per cent of total land area as Protected Areas. The 30-year National Forestry Sector Master Plan (2001/02 to 2030/31), prepared in the year 2000, has a goal of expanding PAs to 10 per cent of the country's total land area.

Myanmar Agenda 21 (1997) is a blueprint for all natural resource management and environmental conservation work and the pursuit of the activities contribute to biodiversity conservation throughout the country.

National Sustainable Development Strategy (2009) supports the goals of sustainable management of natural resources, integrated economic development and sustainable social development.

The legislation mainly concerned with the natural resources and biodiversity are presented below:

  • Law Relating to Aquaculture (1989)
  • Pesticide Law (1990)
  • Freshwater Fisheries Law (1991)
  • Forest Law (1992)
  • Law Relating to Fishing Rights of Foreign Fishing Vessels (1989, amended in 1993)

- Myanmar Marine Fisheries Law (1990, amended in 1993)
- Myanmar Mines Law (1994)
- Protection of Wildlife and Protected Areas Law (1994)
- Fertilizer Law (2002)
- Plant Pest Quarantine Law (1993, amended in 2011)
- Seed Law (2011)
- Conservation of Water Resources and River Law (2006)
- Environmental Conservation Law (2012)
- Animals Health and Development Law (2012)

3.2 Existing Institutional Arrangements

Ministry of Environmental Conservation and Forestry (MOECAF), formed from the Ministry of Forestry in September 2011, is the focal ministry for environmental and biodiversity related matters. The Forest Department (FD), Environmental Conservation Department (ECD) and Dry Zone Greening Department (DZGD) under MOECAF are focal organisations of three Rio Conventions: Convention on Biological Diversity (CBD), UN Framework Convention on Climate Change (UNFCCC) and UN Convention to Combat Desertification (UNCCD), respectively.

Other key ministries involved in conservation, management and utilization of natural resources and biodiversity are:

- Ministry of Agriculture and Irrigation
- Ministry of Livestock, Fisheries and Rural Development
- Ministry of Science and Technology
- Ministry of National Planning and Economic Development
- Ministry of Mines
- Ministry of Health

Furthermore, a goal has been set by the government to achieve harmony and balance between economic development and environmental conservation across multiple sectors via the coordination efforts of the Environmental Conservation Committee (ECC). In 2011, the ECC was initially formed as National Environmental Conservation Committee (NECC), and it was reformed as ECC in 2014. ECC is chaired by the MOECAF Minister, and its members include deputy ministers from related ministries.

There are five working committees (WC) under the ECC:

- Policy, Law, Rules, Procedures and Quality Standard
- Industry Planning, Urban and Rural
- Natural Resource and Cultural Heritage Conservation
- Climate Change Adaptation and Mitigation
- Environmental Education and Awareness Raising.

ECC also has Special Task Forces (STF) as presented below:

- Land Use
- Rivers, Streams and Wetlands

- Industrial Projects, Large Industries and Urban and Rural Areas
- Environmental Policy, Law and Procedures
- Environmental Education and Awareness; Climate Change.

3.3 International Cooperation for Biodiversity Conservation

Myanmar is party to several regional and international environment agreements, treaties and protocols on natural resources, ecosystems and biodiversity conservation, management and utilization, (see Table 10).

Table 10: International and regional environmental agreements, treaties and protocols signed by Myanmar.

Agreements/Treaties/ Protocols	Date of Signature/ Ratification/Acceded
Regional	
Plant Protection Agreement for the Southeast Asia and the Pacific Region	**4 November 1959**
ASEAN Agreement on the Conservation of Nature and Natural Resources	**16 October 1997**
ASEAN Agreement on Transboundary Haze Pollution	**13 March 2003**
International	
United Nations Framework Convention on Climate Change (UNFCCC)	**25 November 1994**
Convention on Biological Diversity (CBD)	**25 November 1994**
International Tropical Timber Agreement (ITTA)	**31 January 1996**
Vienna Convention for the Protection of the Ozone Layer	**24 November 1993**
Montreal Protocol on Substances that Deplete the Ozone Layer	**24 November 1993**
London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	**24 November 1993**
The Convention for the Protection of the World Culture and Natural Heritage	**29 April 1994**
United Nations Convention to Combat Desertification (UNCCD)	**2 January 1997**
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	**13 June 1997**
Cartagena Protocol on Biosafety	**11 May 2001**
Kyoto Protocol to the Convention on Climate Change	**13 August 2003**
Stockholm Convention on Persistent Organic Pollutants (POPs)	**18 April 2004**
Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity	**9 January 2014**

Leopard (*Panthera pardus*)

Chapter 4

National Biodiversity Strategies and Action Plans

4.1 Review of the past NBSAP

Myanmar's first NBSAP was developed in 2011 and adopted by the government in 2012. The NBSAP is a national-level framework for guiding effective management and utilization, and has been disseminated to relevant organisations. One of the limitations of the first NBSAP was out of date data, mainly derived from sources published in 2000–2003. This data gap was particularly significant for freshwater and marine ecosystems. The 2011 NBSAP was not directly aligned with the Strategic Plan for Biodiversity 2011–2020 or the Aichi Biodiversity Targets.

4.2 Process of developing the updated NBSAP

The baseline information and data used for the revised NBSAP were provided by government departments, NGOs and academic institutions, as well being derived from national and regional reports of biodiversity projects. Issues related to biodiversity and ecosystems were identified and prioritized through consultations at the central level, as well as at state and region levels, and they were considered in setting national targets and linking these with global targets. Consultations on national targets and indicators were conducted with central government departments, NGOs, research institutes and academic institutions (for more information on the development process, see Annex 3). The revised NBSAP draft was shared with international organisations to obtain their feedback and comments. The revised NBSAP (2015–2020) was subsequently adopted by the government as the national guiding document to conserve, manage and use biodiversity for the economic, environmental and social wellbeing of present and future generations of Myanmar.

4.3 Vision

Conservation, management and utilization of biodiversity in a sustainable manner for sound and resilient ecosystems and national posterity.

4.4 Mission

By 2020, biodiversity is valued, effectively conserved, sustainably used, and appropriately mainstreamed to ensure the continuous flow of ecosystem goods and services for the economic, environmental and social wellbeing of the present and future generations.

4.5 Strategies and National Targets

The Strategic Plan for Biodiversity 2011–2020 adopted by the CBD COP includes 20 targets for 2015 and 2020 (the "Aichi Biodiversity Targets"), organised under five strategic goals. Each of these strategic goals includes a number of global targets such as halving or halting the loss of natural habitats, or protecting 10% of terrestrial land area in a country. The goals and targets comprise both (i) aspirations for achievement at the global level; and (ii) a flexible framework for the establishment of national or sub-national targets. Recognizing the varying circumstances faced by different countries, these targets can be modified and made more appropriate for unique national circumstances, while still contributing to the global targets. A key component for the implementation of these Targets is through NBSAPs. As of late 2015, 196 countries are party to the CBD, of which 184 have developed NBSAPs. The majority, 127, of these NBSAPs were developed before the Aichi Biodiversity Targets were adopted or have not been subsequently revised. Myanmar has chosen to base the NBSAP around the Aichi Targets. The development of national targets is intended to be guided by this flexible framework, taking into account national needs and priorities, while also bearing in mind national contributions to the achievement of the global targets. The global Aichi Targets, and associated strategic goals, are outlined below.

Strategic Goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1:	By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
Target 2:	By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.
Target 3:	By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

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

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

Target 5:	By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
Target 6:	By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.
Target 7.	By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
Target 8:	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
Target 9:	By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
Target 10:	By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

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

Target 11:	By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.
Target 12:	By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
Target 13:	By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

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

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

Target 15: 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.

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

Strategic Goal E. Enhance implementation through participatory planning, knowledge management and capacity building

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

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

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

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

4.6 Targets, Indicators and Action Plans

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

Myanmar's Fifth National Report, submitted to the CBD in 2014, identified that limited grass-

roots support for conservation and undervaluation of ecosystem services and biodiversity are among the major threats to biodiversity. Building on the diverse range of knowledge held by local communities, government staff, and citizens could help increase this support and facilitate attainment of the remaining national biodiversity targets. However, increasing awareness without addressing underlying drivers will not necessarily lead to enhanced biodiversity conservation outcomes. In order to improve outcomes, awareness raising will be approached in a strategic context that identifies key audiences, leverages existing knowledge, and acknowledges other incentives that influence actions. The focus will be on targeted efforts to couple outreach and awareness raising with a **change in behaviour** of select groups.

It is important to note that 'awareness raising' should be seen not as a top down education of the ignorant, but as an exchange of what different groups understand and value about the natural environment. In addition, although awareness of the values of biodiversity must ultimately be raised among the greater Myanmar population, a first step will be to focus on a representative selection of stakeholders, partners, and appropriate communication channels. In Myanmar, these key audiences include political decision-makers, line department staff, communities in and around key biodiversity areas, educational institutions, the private sector, and media.

Making relevant information on the value of biodiversity and potential policy linkages available to **decision-makers** (e.g. national and state/region parliamentarians) could quickly help raise awareness in a group with a major influence on the future of Myanmar's environment. Many parliamentarians and government staff may not be familiar with the value of biodiversity or appropriate ways to maintain and enhance this as Myanmar develops. Increasing the awareness of decision-makers would be an effective way to build support for enhanced biodiversity conservation at the highest levels. To this end, a series of short **briefing documents** will be prepared for parliamentarians and senior government staff on the importance and value of biodiversity and the potential to use nature-based solutions to address challenges related to food security, disaster risk reduction, and climate change. Studies that demonstrate the true economic value of a select number of high-profile ecosystems, such as mangrove forests, should also be undertaken and shared.

The staff of **line agencies** may already possess significant knowledge, but could benefit from inter-departmental communication to share their expertise in a specific sector, as well as enhance awareness of new fields. As the focal point for the CBD, the FD could serve as a coordinating agency, helping to actively develop and expand extension services, materials, and host meetings to bring together various line agencies to discuss and learn about biodiversity in Myanmar.

Local communities in and around KBAs and PAs are a key group to involve in outreach and knowledge sharing activities. These communities often have the best understanding of the value of biodiversity in these areas and are well-placed to share this knowledge, as well as work with government and NGOs to implement appropriate management regimes. Improved co-operation and knowledge sharing between FD and NWCD staff and local communities would facilitate and improve biodiversity conservation programmes. In particular, the current rule requiring government staff to have at least a secondary-level education complicates recruiting local community members to participate in activities that would benefit from local knowledge and help raise awareness of activities that affect biodiversity, such as PA management, within

communities. Relaxation of this rule, perhaps by establishing a 'community ranger' job class, would increase community participation and knowledge exchange.

Where possible **participatory monitoring and management (PMM)** techniques should be considered an important way to raise awareness, and will also assist in improving community involvement and participation. NWCD is currently exploring co-management and knowledge sharing opportunities through community-based participatory biodiversity monitoring systems. This gives communities a platform through which they can share knowledge of biodiversity with PA authorities, and monitor and manage resource use and trends. Mechanisms such as PMM also provide space for important communication channels between communities and PA authorities. This is currently being piloted in Natmataung National Park, but is soon to be expanded to other PAs. Greater cooperation between FD and local NGOs with experience in community engagement would further facilitate these activities. Opportunities to link biodiversity conservation goals with the **cultural norms and belief systems** of local communities should also be identified.

Incorporation of the value of biodiversity and the environment into the **educational system** at all levels is fundamental to building support for conservation. Biodiversity is covered in curricula at select universities, but this could be expanded. Curricula addressing biodiversity values should also be expanded at the primary and secondary levels, as well as through non-traditional education. Public education is a key management activity at many PAs. Between 2009 and 2013, the FD conducted about 300 educational activities for local communities. One way to expand similar opportunities to other areas, including urban areas, would be to form nature clubs. These clubs could increase understanding and appreciation of nature and provide a supplement to official school curricula. They could also be used to help promote civic engagement around local environmental stewardship by promoting campaigns to plant trees, collect waste, and raise awareness about biodiversity. A similar role is also played by religious groups that have environmental outreach and education as part of their community outreach activities.

The **private sector** is poised to become an increasingly important audience to involve in biodiversity conservation. Making the connection between business operations and biodiversity represents a massive opportunity. By working with business leaders and investors to understand their incentives and communicate the value of biodiversity and ecosystem services to their operations, a strong business case can be made for conservation. This could build on tools such as a national biodiversity information repository and natural capital accounting systems (see Target 2). Government can work with the private sector to set and raise environmental standards, and scale-up action and investment.

The **media** can help raise awareness of biodiversity across all sectors. As of 2014, Myanmar Radio and Television (MRTV) has played an educational series about forests and broadcast 39 radio segments on the value of the environment. Organising targeted training for journalists and media representatives would increase quality media coverage, and raise awareness, of threats and opportunities for biodiversity conservation in a cost-effective manner. Visual and auditory aids, produced by the media or other groups, are an important tool for raising awareness among those who cannot read or write. Radio, including programmes in local languages, will be important in some areas.

There are many potential benefits of an effective communication strategy to raise awareness in Myanmar about biodiversity conservation issues, such as national pride, community action, political support and improved funding. Public awareness programmes in neighbouring countries have mobilized a broad spectrum of society, including politicians, journalists, lawyers, PA managers, the private sector, media, and the general public, to implement the sometimes substantial measures needed to conserve their most threatened wildlife. Increasing awareness of biodiversity is an effective way to build similar broad-based support for conservation in Myanmar and is critical to achieving all of the remaining national targets.

Table 11: National targets and priority actions for Aichi Target 1.

Target and Action		Lead
Target 1.1:	**By 2018, awareness of biodiversity values in key decision makers and line agencies has been improved**	
Action 1.1.1	Draft and disseminate briefing documents to national and state/region parliaments	MOECAF
Action 1.1.2	Establish national working group chaired by FD and state/region working groups to share information and communicate activities related to biodiversity and the natural environment	FD
Action 1.1.3	Strengthen capacity of MOECAF's outreach unit to communicate biodiversity values	MOECAF
Target 1.2:	**By 2018, the private sector has an enhanced understanding of the value of biodiversity and relation to business practices**	
Action 1.2.1	Work with business associations in relevant sectors, business education providers, and international and local networks such as the UN Global Compact Local Network and Green Economy Green Growth to raise awareness of biodiversity through Business Ecosystem Training (BET)	UN GCLN, GEGG
Target 1.3:	**By 2017, the media have an improved understanding of and capacity to communicate topics related to biodiversity**	
Action 1.3.1	Hold media training events focused on environmental issues and reporting	FD, MOAI, Media
Target 1.4:	**By 2020, local communities in and around PAs have enhanced opportunities to share knowledge and participate in management activities**	
Action 1.4.1	Increase number of annual discussions, outreach, and extension activities with local communities living in and around PAs	FD
Action 1.4.2	Appoint well-known Myanmar artists as 'biodiversity ambassadors' to raise awareness of biodiversity values and share information with communities through art and entertainment	FD, Ministry of Culture

Target 1.5:	By 2020, primary and secondary curricula have incorporated biodiversity values	
Action 1.5.1	Improve curricula covering biodiversity-related topics and integrate into educational activities	Ministry of Education (MOEd)
Action 1.5.2	Translate and make available key existing biodiversity references in Myanmar language	FD

Bar-headed Goose (*Anser indicus*)

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

Myanmar is undergoing a rapid political and economic transition that presents both opportunities and threats to biodiversity. The ADB (2012) concluded that "Myanmar's current growth pattern is placing huge pressure on its environment and, if continued, will certainly be unsustainable given the country's continued population increase, expected rapid industrialization, increased consumption of and demand for natural resources for food production and trade, and increased energy consumption."

Myanmar can benefit from the many lessons of its neighbours' development experiences, especially to avoid the social instability and environmental degradation they have experienced. Despite the region's spectacular economic performance, poverty persists along with harmful environmental impacts. Thus, Myanmar's long-term development agenda would benefit from placing environmental sustainability at its core. The country can capitalize on its 'late mover advantage' by incorporating international experience and best practice into new legislation. From an environmental perspective, the Equator Principles, environmental impact assessments (EIA), biodiversity valuation, and natural capital accounting are among the array of policy tools and international standards that can support more efficient, effective, and equitable use of natural resources.Following the adoption of the 2012 Environmental Conservation Law (ECL), and 2014 Environmental Conservation Rules, Myanmar is establishing a system for EIAs. EIA Procedures, to be adopted shortly, will require certain types and sizes of projects to undertake an Initial Environmental Examination or EIA (incorporating social impacts), and to submit an Environmental Management Plan (EMP) to the ECD for clearance. ECD's capacity to assess EIAs and to enforce EMPs remains limited, and significant capacity-building is required in ECD and other government departments at the national and local level.

Environmental values should be incorporated into the cost-benefit analyses that the Myanmar Investment Commission (MIC), MOECAF and other relevant national and sub-national institutions should conduct when reviewing proposed investments. The EIA procedures, capacity building, and implementing rules should be monitored for effectiveness and revised based on early experiences. This review can help to ensure the quality, transparency, and independence of EIAs and of the EIA review process. The current procedure requires MOECAF to form an EIA Report Review Body, which comprises experts from relevant government departments, technical organisations, and civil society to review and provide comments and recommendations on EIA. The inclusion of civil society and technical organisations could help improve transparency of the review process. Additional resources are necessary to ensure that EIAs are effectively reviewed and to avoid unacceptable environmental or social impacts.

The Equator Principles (EPs) are a risk management framework for determining, assessing, and managing environmental and social risk in projects and are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. To date, 80 financial institutions in 35 countries, including the Industrial Bank of China, have officially adopted the EPs. In total, these institutions account for over 70% of international project finance debt in emerging markets. As foreign direct investment (FDI) grows in Myanmar, the EPs could help improve social and environmental performance of these funds by requiring higher standards than would otherwise be followed.

The Business and Biodiversity Offset Programme (BBOP) is another tool to assess and avoid or minimize impacts from development. BBOP advocates strict adherence to a mitigation hierarchy, i.e. avoid, minimize, mitigate and, as a last resort, compensate, in development planning and assessment. This process ensures that biodiversity values are appropriately considered at all stages of development project planning. A regularly updated national database for biodiversity assessment could be used for reference and to screen targets against. This would help companies investing in Myanmar assess what biodiversity values are potentially present in an

area, permitting avoidance and minimization measures to be applied at lower costs during the early stages of development planning and through the EIA process. This would in turn avoid expensive and controversial offsetting processes. Compensatory measures such as biodiversity offsets should be viewed as a last resort, after all other reasonable measures have been taken, first to avoid and minimize the impact of a development project, then to restore biodiversity on-site. The goal of biodiversity offsets is to achieve no net loss, and preferably a net gain, of biodiversity with respect to species composition, habitat structure, ecosystem function and people's use of and cultural values associated with biodiversity in a specific area. When no other reasonable options are available this no net loss requirement should be strictly followed and not seen as an option to pay for the loss of biodiversity.

The **Extractive Industries Transparency Initiative** (EITI) provides a framework for improving resource governance and the accountability of extractive industries through increased transparency and multi-stakeholder dialogue. Established in 2003 to strengthen the transparency of government and company accounting and reporting systems, inform public debate, and enhance trust between stakeholders, EITI is a global standard to promote open and accountable management of natural resources. While EITI compliance applies to only oil and gas and mining, its principles can be applied to other extractive sectors such as timber and marine fisheries. EITI is being implemented by a multi-stakeholder group of government, private sector, and civil society representatives. Current implementation goals include improving EITI awareness at the state/region level. Myanmar is an EITI Candidate Country, and has a national target to be certified as EITI compliant by 2017.

Improved integration of environmental considerations in planning processes by individuals, the private sector, and government decision-makers can be supported through biodiversity valuation. Biodiversity valuation estimates the economic value of biodiversity, including species, ecosystems and landscapes—facilitating interpretation of biodiversity values by decision makers more familiar with economic planning than the environment—and allowing incorporation of biodiversity values into cost-benefit analysis processes for assessment of development actions or conservation projects. Biodiversity valuation may also be used as a tool to raise awareness of the importance of natural ecosystems in communities and decision makers. Without biodiversity valuation, environmental values and ecosystem services are often undervalued or ignored in planning processes, leading to high environmental costs. In order to assist in the incorporation of biodiversity values into development planning, a **systematic valuation approach** should be applied to ecosystems. As many ecosystem values are not quantifiable, valuation approaches must also include non-monetary values in their assessments.

GDP looks at only one part of economic performance-income-but says nothing about the underlying wealth and assets. For example, when a country exploits its minerals, it generates income, but depletes its wealth. The same holds true for over-exploiting fisheries or degrading water resources. These declining assets are not included in estimations of GDP. Wealth accounting, including **natural capital accounting** (stock of natural assets such as water, minerals, and living organisms), is needed to sustain growth based on the accumulation and sound management of a portfolio of assets. These assets include manufactured capital, natural capital, and human and social capital. A major limitation of GDP is the poor representation of natural capital. For-

estry is an example: timber resources are counted in national accounts but the other services provided by forests, such as carbon sequestration and air filtration, are ignored. As such, GDP can give misleading signals about the economic performance and well-being of a country. As a result, ecosystems are deteriorating worldwide, and with them, the capacity to support human wellbeing and sustainable economic growth. In order to more fully assess sustainability and economic performance Myanmar should consider natural capital as a critical asset to be included in long-term development planning.

The government has expressed support for more accurate valuation of natural capital. At the fourth GMS Environment Ministers' Meeting in Nay Pyi Taw in January 2015, the six GMS governments pledged to intensify efforts to protect and enhance natural assets, including forests, wetlands, and water bodies. The Joint Ministerial Statement noted: "natural capital/resources lie at the heart of economic development, underpins inclusive and sustainable development and sustains the livelihoods and well-being of all people in the GMS, especially the rural poor... future prosperity of the GMS will depend on timely and effective investments [in natural capital/resources]." There are currently substantial opportunities for Myanmar to build on the experiences of other countries in the region to institutionalize natural resource accounting natural capital accounting procedures into national accounts.

Table 12: National targets and priority actions for Aichi Target 2.

Target and Action		Lead
Target 2.1:	**By 2018, Myanmar has made a formal commitment to natural capital accounting and has taken significant steps to integrate the value of biodiversity and ecosystem services into its national accounts**	
Action 2.1.1	Take steps to formalize natural capital accounting and conduct national capital assessment	MOECAF, MNPED, INGOs
Action 2.1.2	Implement necessary steps to become an EITI Compliant Country	EITI Multi-Stake-holder Group
Action 2.1.3	Incorporation of biodiversity and ecosystem services assessment in the development plan	MOECAF, MIC
Target 2.2:	**By 2018, significant steps have been taken to incorporate biodiversity and ecosystem services into state/region planning**	
Action 2.2.1	Identify and start to work with at least two states/regions on incorporating biodiversity into integrated land use plans	MOECAF, MNPED
Action 2.2.2	Prepare non-binding guidelines for incorporating biodiversity into land use plans and key sectors in at least two states/regions and provide capacity training to increase their use	MOECAF, MNPED

Target 2.3:	By 2018, the government has significantly enhanced its capacity to review and assess EIAs and monitor and enforce EMPs	
Action2.3.1	Review the implementation of the EIA Procedures with a focus on improving effective regulation, enforcement, transparency and community participation, particularly in environmental monitoring, and the assessment of cumulative impacts	ECD
Action2.3.2	Establish and hold annual or more frequent EIA training course for staff responsible for EIA review, monitoring, and enforcement	ECD
Action2.3.3	Design and establish a national biodiversity database using the latest land cover, habitat, and species data	MOECAF, ML-FRD, MOAI
Target 2.4:	By 2017, Myanmar has been assessed as an EITI compliant country	
Action 2.4.1	Implement necessary steps to become an EITI Compliant Country	EITI Multi-Stakeholder Group, MOM

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

Globally, governments use positive and negative incentives such as subsidies and taxes to influence outcomes such as the level of investment in certain sectors for public policy purposes. Subsidies create a positive incentive resulting in an increase in production and supply relative to demand while taxes create a negative incentive decreasing production and supply relative to demand. Depending on the incentive structures chosen, incentives can be used to undermine or promote environmentally sustainable practices. Incentive structures in resource management can also be heavily impacted by property rights, which are intrinsically linked to decisions on management for sustainability or short term gain, and explicit recognition of the non-market economic value of ecosystems through valuation of ecosystem services and implementation of payments for economic services schemes.

Positive environmental outcomes can also be achieved through incentives structures such as taxation or subsidies. Taxes designed to allow for market failures such as unincorporated external environmental and social costs, such as carbon emissions, pollution or loss of ecosystem services, e.g. pollution taxes, can be a cost-effective solution to avoid overproduction and reduce environmental impacts which also generates revenue. Subsidies may be effectively used to enable emerging sustainable industries, such as renewable energy, to become established

on a scale at which they can compete with established, non-sustainable industries or to stimulate investment in technologies which reduce environmental impact.

Subsidies in the agricultural, energy or transport sectors may be applied in order to stimulate investment in those sectors or as poverty reduction policies. While popular, poorly designed or blanket subsidies can be an inefficient and ineffective strategy for stimulating investment or reducing poverty. Such subsidies can result in **overconsumption and waste**, and may reduce incentives to invest in energy efficiency or renewable energy. While targeted subsidies for fertilizer mixes and other agricultural inputs can contribute to the public good, subsidies in many countries have encouraged excessive application of urea and agrochemicals, with serious repercussions for ecosystems, agricultural production, and human health.

Energy consumption for the poor is relatively inelastic, and while targeted subsidies may provide a public purpose, blanket fossil fuel subsidies risk **depleting government budgets** to subsidize wealthier businesses while doing little to reduce poverty.

Policies such as improving land tenure for local communities, establishing Payments for Ecosystem Services (PES) programmes and developing community conservation agreements can also provide direct incentives to promote conservation. **Tenure systems,** including customary rights and access rights to natural resources, play a fundamental role in shaping incentives and disincentives for sustainable resource management. Tenure systems determine who has the right to manage resources, including terrestrial, marine/freshwater, and sub-surface resources, and who can benefit from their use. Securing tenure for local communities creates strong incentives for sustainable management, while insecure and open access tenure promotes rapid extraction for short-term gain.

The objectives of Myanmar's draft **NLUP** are to promote sustainable land use management, protect cultural areas, the environment, and natural resources for the public good, strengthen land tenure security for the livelihood security of people in rural and urban areas, recognize and protect customary land tenure rights and procedures, develop a transparent, fair, and independent dispute resolution mechanism, and to promote responsible investment to support equitable environmental development. The policy includes participatory mapping of land use and land use planning at the district level, to be integrated with state, region, and national level planning. It includes guidelines on changes in land use for government and private purposes, dispute resolution mechanisms, and research and monitoring priorities. The policy also recognizes customary tenure, including rotational and shifting *taungya.*

Recognizing customary tenure protects practices that support conservation, such as community-based management and protection of sacred areas, help to preserve traditional knowledge, and contribute to food security. The establishment of PAs and PFE on customary land can create an open access resource out of what had previously been a managed commons, incentivizing short term resource extraction. In lands currently classified as vacant, fallow, and virgin, customary tenure recognition would help secure tenure of local users and protect forests against outside concessions.

Plans and targets in other sectors, particularly agriculture and energy, can have **unintended environmental consequences.** For example, while the 2011 NBSAP and the National Sustainable

Development Strategy (NSDS) prioritize increasing yields on existing agricultural land to meet production targets instead of expanding agricultural land, the current legal framework on land and agriculture provides stronger incentives for expanding land than for increasing yields, efficiency, quality, or profitability of existing agricultural land.

Strengthening the legal framework for **communities to benefit from sustainable forest management** would better incentivize forest conservation and restoration when done with clearly defined and secure tenure. The 1995 Community Forestry Instruction (CFI) is being revised to allow for the commercial use of community forests. It is also the first step to a legal pathway for community-managed sustainable timber harvesting. The revision of the Forest Law to allow communities to harvest and sell high-value commercial trees on the reserved species list, especially teak, which currently can only be legally harvested and sold by the state, would further strengthen this incentive by making forest management more profitable for communities.

Persistent debt and other social conditions can serve as disincentives for sustainable use. Agricultural development programmes that increase reliance on high input cash crops can increase the vulnerability of farmers to fall into debt, which can in turn drive land use conversion for short term gain. Increased landlessness can push farmers onto increasingly marginal land and drive forest degradation. Safeguards for contract farming and fishing, and programmes to reduce vulnerability and increase the resilience of these groups, can help to reduce rural debt and create an enabling environment for positive conservation incentives. Examples of these programmes include addressing land tenure systems, support for low-input agricultural commodities, formation of cooperatives and associations to increase bargaining power, and provision of microcredit for rural farmers. The National Sustainable Development Goals may be an appropriate forum to develop a national target on rural debt, which would complement the national biodiversity targets.

MIC, MOECAF, and relevant line ministries at national and regional levels will consider how **direct incentives for investment** will impact biodiversity, as well as create a national investment framework that minimizes unnecessary environmental impacts. This includes mainstreaming natural capital accounting into cost-benefit analyses for approving investments, creating a transparent process by which investors are encouraged and obligated to follow national environmental standards, and encouraging corporate social responsibility. Incentives to encourage **technology transfer** can help to minimize the environmental impacts of industrialization.

PES and direct payments for conservation are emerging tools to **provide incentives for conservation**. These tools are typically mediated through NGOs and are intended to directly compensate local communities for protecting biodiversity and ecosystem function and compensate for direct losses and opportunity costs of restricted use of resources. PES schemes are most effective when the beneficiaries (users) can be clearly identified and made to pay for ecosystem services, for example, a hydroelectric company would be the beneficiary (user) of, and pay for, ecosystem services provided by a forested watershed area that reduces reservoir siltation and therefore increases the lifespan of the hydropower plant. Less direct incentives include coupling conservation activities with projects to improve livelihoods, including improved access to healthcare and education. Livelihood support can compensate for reduced access to resources.

Mechanisms to recognize and reward government staff who make a strong positive contribution to national biodiversity targets would create institutional incentives for staff to work toward these targets. Time spent working with communities in participatory processes and consultations should be recognized in performance evaluations and considered an important part of relevant job descriptions.

Table 13: National targets and priority actions for Aichi Target 3.

Target and Action		Lead
Target 3.1:	**By 2020, the national legal framework on tenure encourages conservation and sustainable management**	
Action 3.1.1	Finalize a National Land Use Policy and Land Law that strengthen smallholder and customary tenure rights	MOECAF
Action 3.1.2	Develop implementing rules and regulations that recognize customary tenure of land, freshwater, and marine resources, including communal tenure and rotational and shifting *taungya*	MOECAF, MNPED, MOAI, MOHA, MLFRD
Action 3.1.3	Mainstream conservation into national and district level land use planning, improve inter-ministerial coordination, and provide technical support to districts	Central Committee for Land Resource Mgt., MOECAF
Target 3.2:	**By 2020, positive incentives are established for the sustainable use of nature**	
Action 3.2.1	Commission a comprehensive review of laws, rules and other relevant incentives affecting biodiversity in Myanmar	MOECAF
Action 3.2.2	Amend the Forest Law and Community Forestry Instructions to enable sustainable, market-led community forestry and enable joint forest management	FD

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

The CBD defines sustainable use as the "use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations". The sustainability of primary production and subsistence activities (such as fisheries, agriculture,

and forest products) are addressed elsewhere in the Myanmar NBSAP. This target focuses on sustainable production and consumption relating to the mining and energy industries.

Development inevitably involves liquidating natural capital to build the homes, factories, schools, roads, airports, and other infrastructure and services that support a healthy, well educated, and productive workforce. However, as regional experience shows, the unregulated exploitation of natural resources for short term gains results in large inefficiencies and unnecessarily large environmental impacts. To deliver long term economic development, the sustainable use of natural resources must be a fundamental principle of development planning. For Myanmar, the challenge is to increase resource use efficiency to minimize biodiversity loss.

In 2009, with UNEP support, the government prepared a NSDS, which outlined eleven goals and associated actions to be implemented within 5- and 10-year timeframes for the sustainable management of natural resources. A number of critical actions identified in this plan, such as enacting an Environmental Conservation Law (ECL), and developing an EIA procedure have been completed or are near completion. A review of progress toward implementing the actions identified in the NSDS would serve to assess progress the government has made toward sustainable development.

There are many opportunities for Myanmar to integrate sustainability principles into development projects by strengthening internal government processes, learning from international experience, and engaging the private sector. The ECL has established special task forces for the following sectors to provide advice on environmental sustainability and the green economy: land use; rivers, streams and wetlands; industrial projects, large industries and urban and rural areas; and environmental policy, law, and procedures. Further engagement of local and international business is key and can be encouraged through training programmes such as BET, an initiative to increase understanding of linkages between business and ecosystems, and development of business plans for biodiversity.

The unregulated expansion of the mining sector in Myanmar, especially small- and medium-sized operations are a significant threat to biodiversity. Mining projects have a range of impacts such as reduced agricultural productivity, soil and water contamination, and fragmentation and destruction of natural habitat. Unregulated gold mining in Sagaing Region is a major cause of forest loss and pollution of the Chindwin River. Unregulated mining is also polluting many other lakes and rivers throughout the country with serious repercussions on environmental and human health.

Box 1: Hydropower in Myanmar

Currently, 74% of power in Myanmar is supplied by hydropower. Surging demand for electricity mean that Myanmar will have to greatly increase its power production in the coming years. Although coal and natural gas power plants have been proposed, additional hydropower dams will also make up part of this increase in generation capacity. In 2011, one of the largest dams proposed for Myanmar, the Myitsone, was temporarily suspended, citing environmental and community concerns. However, 19 other dams have already been constructed, and the ADB counts another 59 hydropower schemes as being under consideration (although the exact status of these is unknown). As of 2013, Myanmar had 2,780 MW of hydropower capacity, or roughly 2.7% of the total potential hydropower generation capacity estimated for the four largest rivers in Myanmar. This same year, six dams were proposed for the Thanlwin River alone, which would add 15,000 MW of capacity to Myanmar's power grid. Such dams can offer relatively clean power, but also impact riverine ecosystem services and the communities that depend on them. Dams can alter hydrological flow regimes, block fish migration, and disrupt upstream and downstream food chains, potentially disrupting extensive fisheries and agricultural systems. The benefits of these hydropower projects must be balanced against external costs, such as loss of agricultural productivity, fisheries, forest resources and biodiversity values, which may not be explicitly quantified, along with the need to maintain critical ecosystem services and the rights of local residents to make use of natural resources

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Energy reform is one of the big challenges relating to sustainability in Myanmar. Domestic electricity use in Myanmar is low with less than 30% of the population having access to electricity. With ADB support, the government is preparing a long term energy policy that will guide development of the energy sector. This is an opportunity to maximize the sustainability of both energy supply and demand by adopting an appropriate mix of energy production strategies, including renewables, off-grid systems and, improving incentives for technology transfer. The development of Myanmar's hydropower potential is likely to be an important component of the Energy Policy. Regional experience shows clearly that if undertaken without appropriately planning, hydropower development can severely harm fish production, food security, and fish diversity.

Strategic Environmental Assessments (SEAs) are recommended by the World Bank to assess cumulative impacts of sectors with large scale cumulative environmental impacts. SEAs can identify critical areas in which development is not appropriate, and identify thresholds of impacts on biodiversity and natural resources required to ensure that cumulative development impacts occur within safe ecological limits. This information would support the development of industry guidelines, and form the basis for subsequent assessment of the impacts of individual projects.

A sectoral SEA of existing and potential mining operations, and of all planned hydropower development to assess cumulative impacts would permit the development of guidelines to ensure that biodiversity impacts are avoided and mitigated in the development of this industry. The IFC and Ministry of Electric Power are planning to conduct a SEA of hydropower in Myan-

mar. The World Bank is funding the Ayeyawady Integrated River Basin Management Project, which includes preparation of a river basin management plan for the Ayeyawady River, which covers 60% of the country's area and 70% of the population. These projects could be used to develop a hydropower development plan that optimizes the trade-offs between power, biodiversity, and food security.
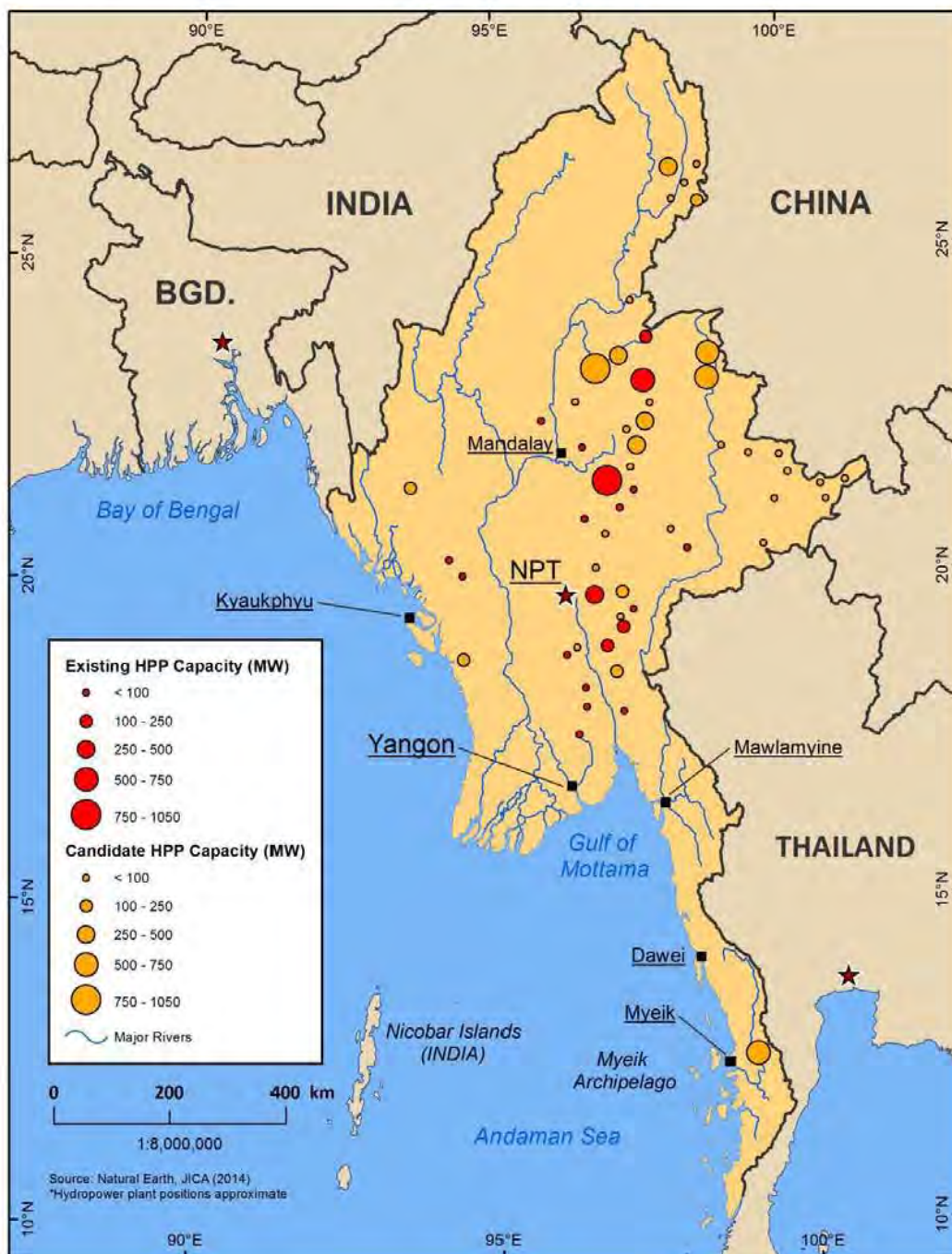

Figure 9: Existing and candidate hydropower plants.

Reducing wastage and improving efficiency of distribution networks will reduce the energy sector's environmental impacts. Methods to achieve this include upgrading transmission technology and designing efficient distribution networks through adoption of diverse strategies including off-grid solutions for remote communities. Similarly, requiring the consideration of energy consumption in urban planning, and reducing dependence on charcoal would reduce energy consumption and the impact on biodiversity. Increasing domestic supply and distribution of energy sources such as natural gas could would reduce pressure on natural forests and provide a cleaner alternative to coal. The removal of perverse incentives such as energy subsidies that encourage resource over-use would also make a significant contribution to reducing energy consumption and wastage.

Sustainability planning in urban development can deliver significant dividends in the form of improved energy efficiency for individuals, the private sector and the government, and also significantly reduce waste production. In Myanmar, priorities for urban development planning include providing access to efficient cooking fuel sources, ensuring climate appropriate building design, treating sewage, and developing appropriate waste and construction material recycling systems.

Table 14: National targets and priority actions for Aichi Target 4.

Target and Action		Lead
Target 4.1:	**By 2020, SEA conducted and guidelines prepared for mining and energy sectors**	
Action 4.1.1	Conduct SEAs, in line with international best practice, of the mining and hydropower sectors	ECD, MOEP, MOM
Action 4.1.2	Develop guidelines for the mining and hydropower sectors based on SEA recommendations	ECD, MOM, MOEP
Action 4.1.3	Assess the national energy master plan for opportunities to minimize environmental impacts and revise it accordingly	MOEP, ECD
Target 4.2:	**By 2020, sustainable production and consumption of natural resources is mainstreamed in development planning**	
Action 4.2.1	Legislate that Biodiversity Action Plans be prepared for any new large scale resource extraction or power generation project	ECD
Action 4.2.2	Develop the authority and capacity of taskforces established by the ECL to advise on the sustainability of developments and development plans, particularly through consideration of impacts on biodiversity	ECD
Action 4.2.3	Establish an energy production technology transfer programme with a focus on enhancing efficiency and increasing the proportion of renewable energy	MOEP
Action 4.2.4	Establish government green procurement programme and targets	MOECAF, I/NGOs

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

Stretching from sea level to 5,881 meters and from 9 to 28 degrees north, Myanmar encompasses a **wide range of habitats** encompassing alpine and sub-alpine in the far north, low to moderate elevation forest and mountain ranges running along the eastern and western borders, a central dry zone, several large freshwater lakes and river systems, and extensive deltaic, coastal, and offshore marine areas. These diverse habitats and ecosystems form the basis of Myanmar's economy, culture, and biodiversity. Forests make up an important part of many of these ecosystems, but have been severely impacted in recent decades.

Forest cover figures are available from a variety of sources, including recent unofficial figures from research institutions and NGOs. The Smithsonian Institution reports a loss of 12,000 km2 of forest of all types between 1990 and 2000. Global Forest Watch (GFW) reports a loss of 15,000 km2 of forest between 2001 and 2012, indicating an **acceleration of forest loss**, peaking at 2,162 km2 in 2009. Over half the loss occurred in Kachin and Shan States and Sagaing and Taninthayi Regions. Two of the most threatened, economically valuable, and biologically important forest types are dry mixed deciduous and mangrove forests.

Myanmar holds 125,000 km2 of **dry mixed deciduous forest** (DMDF), half of the total in Southeast Asia (Wohlfart et al. 2014). Restricted to lowland areas with strongly seasonal rainfall and found in isolated patches or as modified fragments within a human-dominated landscape, DMDF is one of the least protected forest types in the tropics. Within Myanmar, relatively large areas remain in Sagaing Region, Shan and Rakhine States. At present, only 2% of Myanmar's DMDF is legally protected (compared to about 40% in Thailand and Cambodia). DMDF is characterized by exceptionally high diversity and endemism, and historically by an abundance of elephants, tigers, rhinos, and other large, wide-ranging mammals.

Because of large human population in DMDF, there are few opportunities for establishing large, strictly PAs. Community-based conservation, including community forestry, community conservation agreements, and other forms of sustainable management are more appropriate for remaining forest patches. Demonstrated interest by communities, local leaders, and parliamentary representatives for preserving forest patches indicate opportunities to establish sustainable management given appropriate support from government and NGOs.

Myanmar has the third largest area of **mangroves** in Southeast Asia (after Indonesia and Malaysia). However, a 2014 NASA study showed a significant decline in mangrove cover between 2000 and 2013, particularly in Rakhine State and Ayeyawady Region (Table 15).

Table 15: Mangrove cover changes between 2000 and 2013.

Area	Mangrove cover (km2)		Mangrove loss (2000–2013) (km2)	Annual loss (km2)	Rate
	2000	2013			
Rakhine State	1,734	1,470	-264	-20.31	-1.17%
Ayeyawady Region	818	462	-356	-27.38	-3.35%
Taninthayi Region	2,075	2,040	-35	-2.69	-0.13%
Total	6,627	5,985	-655	-50.38	-0.76%

The extensive mangrove clearing was a major factor behind the loss of life caused by cyclones Nargis (2008) and Giri (2011) and the collapse of the shrimp sector in northern Rakhine State. Cyclone Nargis led to a large number of NGO-led mangrove reforestation efforts in the Ayeyawady Delta, but mangroves continue to decline in both extent and quality. Despite their demonstrated economic and environmental values, less than 5% of mangroves are legally protected and there is growing pressure on the 137 km2 Meinmahla Kyun Wildlife Sanctuary, the largest area of intact mangroves in the delta, for fuelwood and charcoal production. In areas of Malaysia and the Philippines, **sustainable harvesting regimes** have been in place for decades that allow for mangrove cutting in ways that do not threaten the integrity of the forest. Myanmar needs to practise this sustainable use approach. Myanmar recently became a member country of Mangroves for the Future (MFF), a project that has been successful in protecting coastal regions, providing alternative livelihoods, and conserving mangroves throughout the region. As this project expands in Myanmar it could be a key tool in protecting the remaining mangroves along Myanmar's coast, and in helping reduce vulnerability to future natural disasters.

According to a 2015 Forest Trends report (Woods 2015), forest clearing for the **expansion of commercial agriculture** is now the leading cause of deforestation. While this process has been occurring for many decades, the current rate of forest conversion for agriculture is unprecedented. Concessions were issued for 16 km2 of oil palm and rubber plantations within the PFE in 2013–2014. However, this excludes all other types of agricultural concessions, as well as concessions for energy infrastructure, mining, and other uses and concessions granted by military, regional government, and non-state actors. The laws, regulations, and procedures by which these concessions are allocated, especially those involving degazetting of forest reserves or those located within forest reserves, are spread across numerous uncoordinated jurisdictions and the use of legal loopholes, special permits, and exemptions is common.

In the forestry sector itself, promising new reforms are underway, but so far have focused only on FD-managed timber estates. The remaining natural forests in the country's resource-rich, ethnic minority areas remain outside of any effective forest management and are vulnerable to extensive logging and forest conversion (Woods 2013). The dramatic increase in agribusiness concessions under the authority of multiple ministries and actors presents significant institutional and policy challenges for the FD.

After 100 years of intensive logging, Myanmar's forests are heavily degraded and commercially exhausted. The risk is further large-scale deforestation. To avoid this outcome, the FD will consider putting in place measures that break the deforestation sequence that starts with the removal of larger trees by commercial operators, then less valuable species for domestic construction and fuelwood, and ends with the conversion of degraded forest to plantations and/or small-scale cultivation.

Reversing this sequence requires restoring hundreds of thousands of hectares of degraded forest while meeting the large and growing domestic demand for timber. This requires profound changes in how local communities are incentivized to cooperate with government to protect and manage the forest estate. It also requires moving away from the country's traditional focus on timber extraction for export toward the domestic market (see Target 15).

Community forestry has had some success in Myanmar but the model has focused on small areas and is cumbersome to negotiate. Progress has been slow: approximately 80,000 hectares of forest have been brought under formal community management since the CFI were issued in 1995. The National Forestry Master Plan sets a target of 980,000 hectares of CF established by 2030. To contribute to a national PFE restoration programme, the process needs to be simplified and scaled up and, crucially, communities need to be assured a fair share of the benefits. For example, communities could be responsible for designing forest management plans, establishing nurseries, planting native species, and protecting the forest in cooperation with FD. In exchange they would have the right to collect fuelwood and construction timber within agreed sustainable levels, and if consent to harvesting, would receive an equitable proportion of the timber revenue. This approach could be accelerated by working with NGOs, such as the Center for People and Forests (RECOFTC), which are well-placed to support and scale-up community forestry projects.
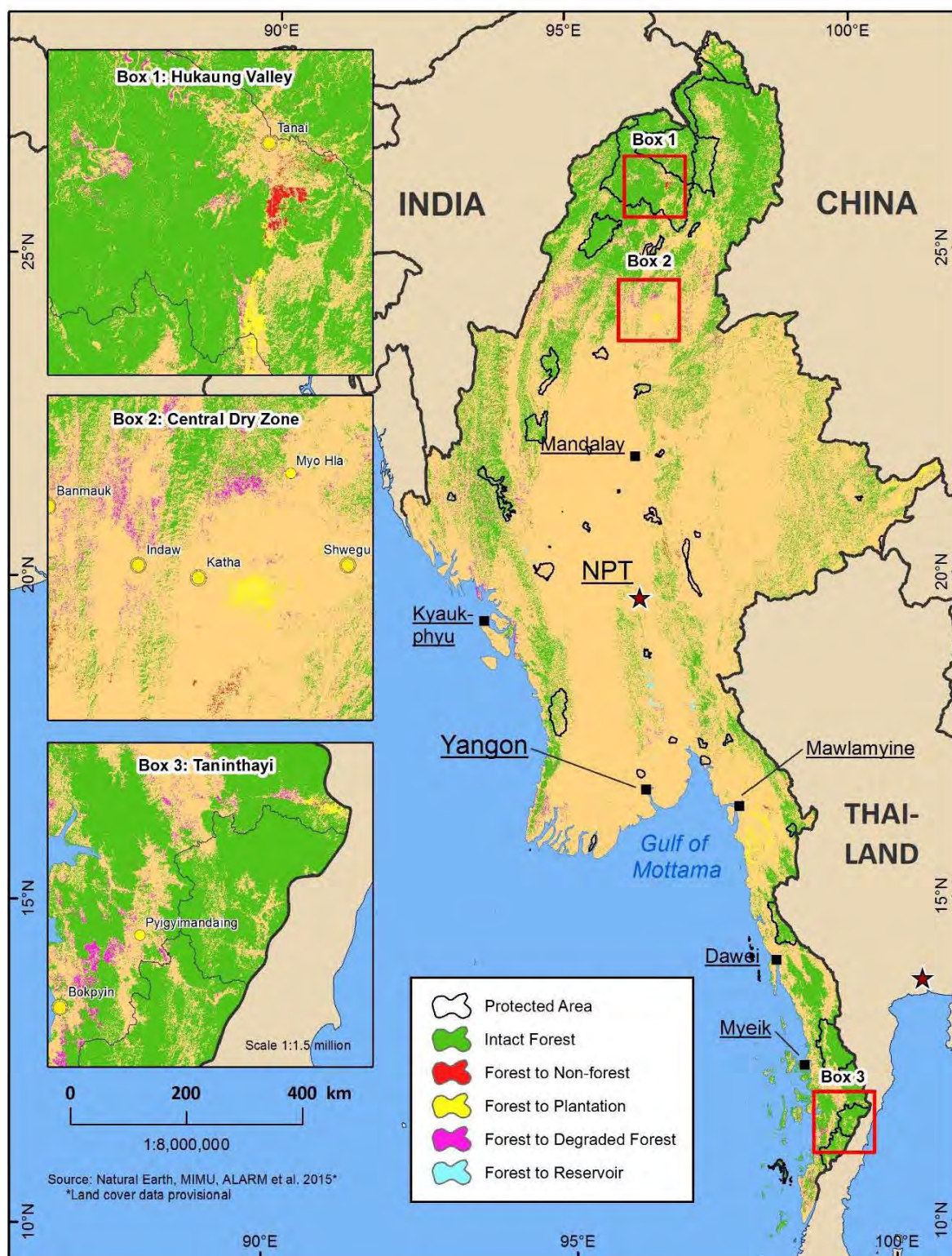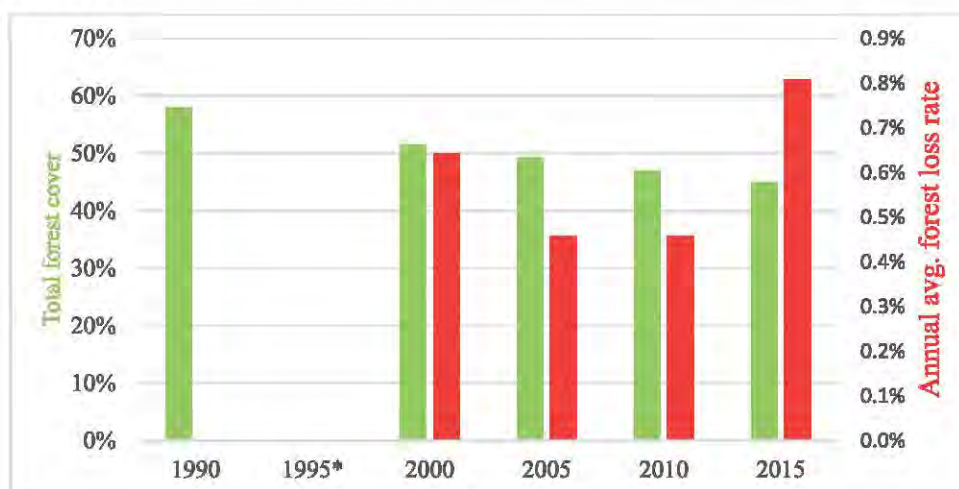
Figure 10: Forest cover change between 2002 and 2014 (provisional).

Box 2: Forest Cover

Every five years the Food and Agriculture Organization (FAO) and Forest Department conduct a Forest Resource Assessment (FRA) to quantify the state of Myanmar's forests. The FRA provides the official forest cover figures. However, changing methodologies and differences in forest definitions mean that it is difficult to compare forest covers and forest change rates.

Between 1948 and 1963, the FRA was based on questionnaires sent to participating countries, including Myanmar. In the first year it was conducted, Myanmar estimated that it had roughly 25,000 km2 of "productive forests" (37% of terrestrial area). However, changes in methodology mean that this figure cannot be compared to more recent measurements. Starting in 1980, statistical modeling and remote sensing were integrated into the FRA. These show that total forest cover has fallen from just under 58% in 1990 to 45% in 2015.

Source: FAO 2015. *No FRA data

Figure 11: FRA forest cover between 1990 and 2015.

The Smithsonian Institution and Conservation International carried out an assessment of forest cover change between 1990 and 2000 using two sets of 30-m resolution Landsat images covering the whole country. The results, which were published in 2005, showed that nation-wide, net deforestation was low: less than 0.2%/year, which was significantly lower than the FRA estimate. But where deforestation was happening, it was happening very fast, especially in the mangroves in the Ayeyarwady Delta (>2.2%/year) and the dry deciduous forest in the northern edge of the Central Dry Zone (0.7%/year).

A follow up assessment, carried out by EcoDev and GMAP with technical assistance from the Smithsonian Institution and the Aerican Museum of Natural History, mapped forest cover change between 2002 and 2014. Like the 1990–2000 study, it used complete Landsat coverage. But the classification scheme split forest into additional categories: intact, closed-canopy forest (>80% canopy cover) versus degraded and open-canopy forest (10%–80% canopy cover).

Initial results show that although Myanmar still has large areas with forests (>60% of the country), only relatively little intact, closed-canopy forest remains, covering roughly 24% of the country's land area. Moreover, most of the recent declines come from intact forest, which the study estimated to cover nearly 50% less area than FRA. Large areas of intact forest have been converted to tree and agricultural plantations and lost to mining, particularly in Sagaing Region. The largest remaining areas of intact forest are in northern Sagaing Region, Kachin State, and Taninthayi Region.

Myanmar is very well endowed with coastal and freshwater **wetlands**. In 2001–2003, Birdlife International surveyed wetlands in the Central Dry Zone, along the Ayeyawady River, in Shan State, and in Kachin State. Ninety-nine wetland sites were surveyed, including 19 that were assessed as globally significant. The results were published in 2004. In 2005, Myanmar joined the Ramsar Convention and its first and only Ramsar site: Moeyungyi Wetland Sanctuary, a 100 km2 man-made wetland near Yangon was designated in the same year. Indawgyi Lake Wildlife Sanctuary has been submitted as Myanmar's second Ramsar site and there is strong interest in nominating parts of the Gulf of Mottama, which is home to Southeast Asia's largest intertidal mudflats and is essential for the survival of the Critically Endangered spoon-billed sandpiper (*Calidris pygmaea*).

Despite their importance for both biodiversity and livelihoods, Myanmar has still not established a national wetlands management committee and has no wetlands management policy. As the basis of such a policy, the 2004 wetlands inventory should be updated and expanded to include more information on fish diversity and to fill geographic gaps, notably Shan State, Rakhine State, Taninthayi Region, and the upper Chindwin River.

Table 16: National targets and priority actions for Aichi Target 5.

Target and Action		Lead
Target 5.1:	**By 2020, at least 10% of DMDF and mangrove forest has been put under some form of protection, including sustainable use and management**	
Action 5.1.1	Establish ICCAs, CF, and/or PAs in priority DMDF and mangrove forest areas to improve sustainable management	FD
Action 5.1.2	Draft and begin to implement a national mangrove action plan, including CF and LMMAs	FD
Target 5.2:	**By 2018, the PFE will have been re-assessed**	
Action 5.2.1	Assess the status of forest cover in the PFE, unclassified forest areas for potential inclusion in PFE, and areas of PFE overlapping with agricultural concessions	FD
Action 5.2.2	Update GIS database showing PFE	FD,GAD
Target 5.3:	**By 2020, all wetland areas surveyed and prioritized for conservation value**	
Action 5.3.1	Establish NWC and update wetlands inventory	FD, NGOs
Action 5.3.2	Nominate three additional Ramsar sites to Ramsar Secretariat	FD
Action 5.3.3	Establish community-based participatory monitoring and management programme in Ramsar sites and potential Ramsar wetlands	FD, NGOs

Target 5.4:	By 2020, all wetland areas surveyed and prioritized for conservation value	
Action 5.4.1	Establish national-level mechanism for combating illegal logging	FD
Action 5.4.2	Increase budget allocation for combating illegal logging	FD
Target 5.5:	By 2020, negotiation phase to sign Forest Law Enforcement Governance and Trade (FLEGT) and Voluntary Partnership Agreement (VPA)a FLEGT VPA has been conducted	
Action 5.5.1	Develop a FLEGT process	FD
Action 5.5.2	Form a FLEGT Task Force with relevant organization, private sector and civil society organisations	FD
Action 5.5.3	Integrate the tasks of FLEGT in the annual work plans of concerned organizations	FD, private sector, and CSOs
Action 5.5.4	Amend laws, procedures and rules to support the implementation of FLEGT	FD

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

The fisheries sector is the second largest food producing sector after agriculture and is a very important source of food security and employment. The seafood sector alone employs 3–4 million people directly and focuses primarily on the export market. The majority of data relating to fisheries relate primarily to marine fisheries. Estimating the yield and sustainability of freshwater fisheries in Myanmar is difficult, as fish catch is consumed domestically and the fisheries are highly dispersed. Between 1995 and 2010, the value of Myanmar's fisheries increased rapidly, to about US$500 million, primarily due to increased effort, as measured by the number of both subsistence and commercial boats and fishers. However, since 2010 there has been a sharp decline in total catch and quality of fish harvested. Anecdotal reports suggest that fish and shrimp harvests have fallen by as much as 90% over the past 10 years, a decline that has affected both capture fisheries and aquaculture.

Myanmar has impressive freshwater capture fisheries, utilized primarily for domestic consumption, associated with the Ayeyawady, Chindwin, Sittaung and Thalwin Rivers, encompassing a total aquatic resource area of approximately eight million hectares of permanent and seasonal water bodies. In addition, the Department of Fisheries (DOF) estimates that there is an additional six million hectares of floodplains.