# FORESTRY IN MYANMAR

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# FOREWORD

Naturally, forests provide a wide range of ecosystem services. Conservation of forests is not only a cost-effective way to mitigate climate change, but also means that many other benefits including biodiversity, soil and water resources, pollination are provided to local communities and a wider society. Myanmar is blessed with high forest cover of 42.92 % of the country's total area. The forestry sector of Myanmar is playing a pivotal role in the sustainable development of the nation. The Forest Policy (1995) was formulated with a holistic content and formalized the commitment and intent of the state to ensure sustainable development of forest resources. Besides environmental priorities being accorded, sustainable management of forest resources has always been the prime mandate to manage and utilize forests and their resources rationally and sustainably to meet the needs of the growing population.

Nowadays, forests are increasingly threatened by a wide range of pressures, including deforestation, land-use change, agricultural expansion, invasive alien species, severe droughts and wildfires. The challenge to effectively manage forests on a truly sound and sustainable basis has been particularly urgent in Myanmar as other developing countries which are encountering high population and development pressures.

The Government of Myanmar is fully committed to climate change mitigation, biodiversity conservation, combating desertification, sustainable forest management, restoration of degraded forest ecosystems and so on. In adherence to the Myanmar Forest Policy, the natural forests will be managed to provide timber, especially premium teak wood, and other forest products sustainably while rendering protective functions to ensure ecological and biodiversity stability with supportive services for agriculture, recreation and ecotourism. At the same time, degraded forests are being restored to its original forest ecosystem through ecosystem restoration approach which reflects the fulfillment of

international commitments including nationally determined contributions (NDCs), Sustainable Development Goals (SDGs), Aichi Targets, etc.

Recognizing the importance of creating harmony and balance between economic development and environmental sustainability, Myanmar is integrating environmental considerations into the economic development planning process. Within this context, awareness raising about the role of forests and institutional coordination mechanisms needs to be strengthened at national, sub-national and local levels to achieve sustainable development. At the same time, it is of crucial importance to bring different policy areas and stakeholders together to demonstrate the integrated approach of sustainable forest management, which will require good scientific evidence, reliable information, data and better monitoring of the value of the services that forests provide.

Myanmar will continue to provide its best efforts in achieving sustainable forest management through the endeavor of dedicated foresters who will have to remain competent, cooperative, vigilant, far-sighted and motivated to fulfill their tasks, as well as through the full and effective participation, cooperation and coordination of stakeholders.

**H.E. U Ohn Winn**
**Union Minister**
**Ministry of Natural Resources and Environmental Conservation**

# PREFACE

The forestry sector of Myanmar plays a vital role in sustainable development of the nation. Particularly, it significantly contributes not only to the national economy through the export of timber and non-timber forest products but also to the livelihood improvement of the rural communities. Myanmar's forests, covering 42.92 percent of the country's area, stabilize the ecosystems, sustain a rich variety of biodiversity, maintain the environment, preserve soil and water resources and ameliorate climate which are the key attributes to ensure viable agriculture on which the economy of the country is based.

In order to respond to the changing world of global digital networking and fourth industrial revolution, we have been shifting our priorities in forestry from sustained yield to sustainable development with ecosystem management approach, from selective use of wood to use of multiple woods, non-woods and ecosystem services, from regulatory to participatory and from centralized to devolutionary and shared management.

Keeping this concept, Myanmar has made many positive changes and initiatives including promulgation of National Land Use Policy (2016), National Environmental Policy (2019), Myanmar Climate Change Policy (2019), enactment of new Forest Law (2018), Conservation of Biodiversity and Protected Areas Law (2018) and issuing Community Forestry Instructions (2019). Furthermore, moratorium of logging for one year in the entire country in 2016-17 and 10 years in Bago Yoma Range, reduction of logging of teak down to 55 percent and hardwood to 33 percent of the Annual Allowable Cut (AAC), etc. At the same time, Myanmar Reforestation and Rehabilitation Programme (2017-18 to 2026-27), Re-establishing Natural Habitats Programme (2019-20 to 2028-29), National REDD+ Strategies, MTLAS, FLEG T Programme were also launched to address the needs of goods and services of the national as well as to fulfill the international commitments including Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), Aichi Targets, Bonn Challenges, New York Declaration on Forests, etc. All these efforts reflect the prevailing situations and

interests of the country as well as the rapidly changing world.

I am very delighted to present this "Forestry in Myanmar" booklet which depicts the current significant events concerning forestry in Myanmar. Preceding issues focused on Myanmar's endeavours on legal and institutional frameworks, long and short-term programmes, partnership approaches and international and regional commitments among other things. This booklet highlights Myanmar's effort in the follow-up activities on our commitments in the current issues and new programmes in which we are making progress. This booklet not only provides information on the current status of forestry in Myanmar but also explains recent policy and institutional developments, initiatives towards sustainable forest management, commitments to sustainable development of natural resources, biodiversity and the environment, people's participation in forest management, future directions in forestry and external influences on the sector.

I sincerely believe that this booklet would be able to provide reliable and up-to-date information to decision makers, natural resources managers, practitioners, academics, the forest industry and the general public. It is our hope that this publication will help facilitate well-informed discussions for decision makers and professionals, and will also assist professionals in forestry practices and the general public to gain insights into Myanmar forestry and appreciate the importance of sustainable forest management.

**Nyi Nyi Kyaw, Ph.D**
**Director General**
**Forest Department**

# CONTENT

## 1. INTRODUCTION

The Republic of the Union of Myanmar is located in Southeast Asia between latitudes 9°32' and 28°31'N and longitudes 92°10'E and 101°11'E. Myanmar is bordered by China, Laos, Thailand, Bangladesh and India. The total area of Myanmar is 676,577 $km^2$, stretching for 936 km from east to west and 2,051 km from north to south. The topography of Myanmar can roughly be divided into four parts: namely the Western Hills Region, the Central Valley Region,the Eastern Hills Region and Tanintharyi Coastal Strip.

Myanmar has three distinct seasons; hot season, rainy season and cold season. The Central Myanmar has an annual rainfall of less than 1,000 mm while the Rakhine coast receives more than 5,000 mm. Besides, the average highest temperature in the Central Myanmar is about 43.3° C while in Northern Myanmar, it is about 36.1° C and on the Shan Plateau, between 29.4° C and 35° C. Due to these ecological diversity, Myanmar is endowed with a rich diversity of habitat types. Myanmar has been protecting and conserving its diverse biological resources on a sustainable basis.

According to FAO FRA 2015, about 42.92% of the country's total land area is still covered with forests. Myanmar's forests are socially and economically significant to the country. Over 70% of the country's total population are rural and dependent on forest resources for basic needs such as food, fodder, fuel, and shelter. Despite high dependency on forests, considerable extent of natural forests in the country is an indication of the consistent exercise of sound forest management practices for years.

## 2. INSTITUTIONAL STRUCTURE

Ministry of Natural Resources and Environmental Conservation (MONREC) is mainly responsible for the two sectors, namely, 'Forestry/Environmental Affairs' and 'Mining Affairs'. There are fourteen institutions under MONREC, seven in each sector to perform their specific duties and responsibilities(Figure.1). Table-1 shows the manpower in the institutions for Forestry/ Environmental Affairs under MONREC.


*Figure-1: Organizational chart of Ministry of Natural Resources and Environmental Conservation (MONREC)*

| No. | Institutions | Officer | Staff | Total |
|---|---|---|---|---|
| 1. | Union Minister office (Forestry/Environmental) | 40 | 79 | 119 |
| 2. | Forest Department | 497 | 7416 | 7913 |
| 3. | Dry Zone Greening Department | 108 | 1193 | 1301 |
| 4. | Myanma Timber Enterprise | 792 | 13788 | 14580 |
| 5. | Environmental Conservation Department | 316 | 415 | 731 |
| 6. | Survey Department | 74 | 422 | 496 |
| 7. | University of Forestry and Environmental Science | 36 | 67 | 103 |

***Table-1: Manpower in Ministry of Natural Resources and Environmental Conservation***

**Uninon Minister's office (Forestry/Environmental Affairs)** takes a leading role in coordination of Forest Department (FD), Dry Zone Greening Department (DZGD), Myanma Timber Enterprise (MTE), Environmental Conservation Department (ECD), Survey Department (SD) and University of Forestry and Environmental Science (UFES) and deals mainly with policy matters and issues related to forestry and environmental conservation.

***Picture-1: Union Minister's Office of the Ministry of Natural Resources and Environmental Conservation***

**Forest Department (FD)** is responsible for protection and conservation of biodiversity and sustainable management of forest resources of the country. It performs the protection and production functions in harmony, based on the Forest Policy (1995). While endeavoring to mitigate climate change through sustainable forest management, FD has been making its best efforts to meet the basic needs of local people. The Headquarters facilitates and manages the tasks of forest department to be in line with the directives of FD and to catch the target plans. The Headquarters is structured with 11 divisions, namely, the Administration Division, Planning and Statistics Division, Natural Forests and Plantation Division, Training and Research Development Division, Inspection Division, Finance Division, Nature and Wildlife Conservation Division, Zoological Gardens Division, Extension Division, Watershed Management Division, and Forest Research Institute. There are 15 regional offices, 68 district offices and 321 township offices for the implementation of reforestation, rehabilitation and conservation activities of FD.

*Picture-2: Head Office of the Forest Department*

**Dry Zone Greening Department (DZGD)** is responsible for reforestation of degraded forest lands, protection and conservation of remaining natural forests, and restoration of the environment in the dry zone of central Myanmar. The specific aim is to implement greening of the Central Dry Zone of Myanmar.

*Picture-3: Dry Zone Greening Department*

**Myanma Timber Enterprise (MTE)** is a state-owned enterprise which has legal right of commercial harvest of timber. MTE is also responsible for milling, marketing and export of timber and its products. MTE is comprised of 8 Departments, namely; (i) Extraction Department, (ii) Export Milling &

*Picture-4: Myanma Timber Enterprise*

Marketing Department, (iii) Domestic Milling & Marketing Department, (iv) Wood- based Industries Department, (v) Planning & Statistic Department, (vi) Engineering Department, (vii) Budget & Accounting Department and (viii) Administration Department.

**Environmental Conservation Department (ECD)** is a new department founded in 2012, which is responsible for implementing National Environmental Policy, strategy, framework, planning and action plan for the integration of environmental consideration into the national sustainable development process. It is also responsible for environmental management and pollution control on water, air and land for the sustainable environment.

*Picture-5: Environmental Conservation Department*

**Survey Department (SD)** is responsible for topographic mapping throughout the whole country and carries out boundary demarcation works in cooperation with neighbouring countries. Its vision is to establish and maintain the geospatial data for the whole country aiming to introduce the online mapping system by the year 2030.

**University of Forestry and Environmental Science (UFES)** is mainly responsible for providing educational services and conducting researches relating to forestry and environmental sciences. The main aims are to contribute to human resource development, produce qualified professionals, improve and disseminate scientific knowledge.

*Picture-6: Survey Department*


*Picture-7: University of Forestry and Environmental Science*

# 3. FOREST RESOURCES BASE

## 3.1 Land Use/ Land Cover

Myanmar's forests vary in species composition and stand structure, and constitute a valuable ecosystem due to their wide extent, varied topography and different climatic conditions. The Forest Resource Assessment (FRA, 2015) has indicated that Myanmar is endowed with a forest covered area of 42.92% of the country's total land area. This positions Myanmar as one of the highest in the Asia-Pacific Region.

Possessing a great variation of forest ecoregions, there are six major forest types in Myanmar. Areas of respective forest types are shown in Table 2. The majority of the forest area is covered by mixed deciduous forest, and hill and temperate evergreen forests, accounting for 38.20 and 26.92 percent, respectively.

| No. | Major Forest Types | ha | % of Forested Area |
|---|---|---|---|
| 1. | Mangrove Forest | 325,259.20 | 1.12 |
| 2. | Tropical Evergreen Forest | 5024,093.00 | 17.30 |
| 3. | Mixed Deciduous Forest | 11,093,662.00 | 38.20 |
| 4. | Dry Forest | 2,904,100.00 | 10.00 |
| 5. | Deciduous Dipterocarp | 1,237,146.60 | 4.26 |
| 6. | Hill and Temperate Evergreen | 7817,837.20 | 26.92 |
| 7. | Scrub and Grass Land | 638,902.00 | 2.20 |
| | **Total Forest Area** | **29,041,000.00** | **100.00** |

**Table-2: Forest Types of Myanmar**

## 3.2 Reserved Forest, Protected Public Forest and Protected Area

Forest areas under the management of forest department can be classified into two categories, namely Reserved Forest (RF) and Protected Public Forest (PPF) that collectively constitute the Permanent Forest Estate (PFE), and that have been gazetted through a legal process. Reserved Forest is the best quality and higher commercial value forest, where the public have no harvesting rights.

Protected Public Forest is of lower commercial value, more accessible, where the public have some harvesting rights. Forest Department also designates Protected Areas (PA) to preserve diverse ecosystems and species richness of Myanmar. The extent of PFE and PAs (as of Dec 2019) is shown in the Table 3.

| Legal classification | Area (Acre) | % of land area |
|---|---|---|
| Reserved Forest (RF) | 29,702,095.99 | 17.77% |
| Protected Public Forest (PPF) | 12,909,460.99 | 7.72% |
| Total RF & PPF | 42,611,556.98 | 25.49% |
| Protected Area (PA) | 9,783,684.42 | 5.85% |

*Table-3: Current Status of Reserved Forests, Protected Public Forests and Protected Area System in Myanmar*

In 2015, a historical record was made by 196 countries under the Paris Agreement to transform their development trajectories to reduce global emissions. According to the agreement, member countries have to prepare, communicate, and maintain increasingly ambitious Nationally Determined Contributions (NDCs). Myanmar also developed its NDC and submitted to United Nations Framework Convention on Climate Change (UNFCCC). In Myanmar's NDC, forestry is a main sector to contribute to climate change mitigation and adaptation. Myanmar's NDC targeted to extend RF and PPF up to 30 percent and PA up to 10 percent of the total country's area.

### 3.3 Forest cover changes over time

The status of forest cover changes in Myanmar is shown in the Table-4 and Figure-2 below. Due to the various factors, forest cover is gradually decreasing and other land cover areas are gradually increasing between 1990 and 2015 according to FRA (2015).

| | Area (000 hectares) | | | | |
|---|---|---|---|---|---|
| Categories | 1990 | 2000 | 2005 | 2010 | 2015 |
| Forest | 39,218 | 34,868 | 33,321 | 31,773 | 29,041 |
| Other wooded land | 19,498 | 19,703 | 19,908 | 20,113 | 15,080 |
| Other land | 7,039 | 11,184 | 12,526 | 13,869 | 21,634 |
| Inland water bodies | 1,903 | 1,903 | 1,903 | 1,903 | 1,903 |
| TOTAL | 67,658 | 67,658 | 67,658 | 67,658 | 67,658 |

*Table-4: Status of Land Cover Changes in Myanmar (1990 to 2015)*

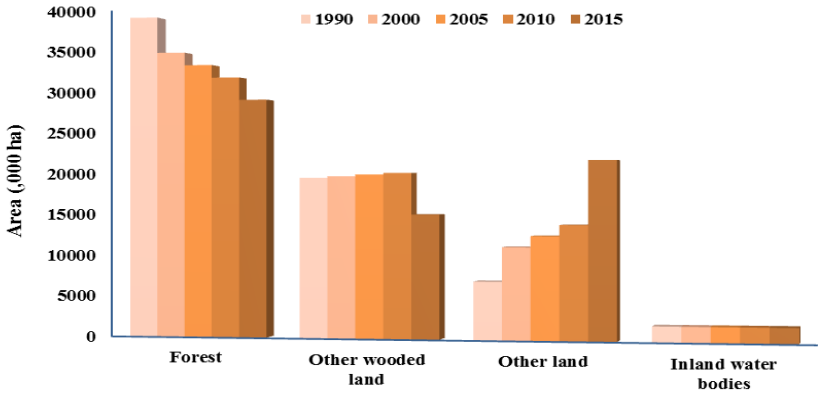



*Figure-2: Categorical Changes of Land Cover Over Time (1990 to 2015)*

| Forest type | Annual change 2000 – 2015, ha | Annual change 2005 – 2015, ha | Annualized change rate 2000 - 2015 (15 years) | Annualized change rate 2005 – 2015 (10 years) |
|---|---|---|---|---|
| Closed forest | -889,104 | -738,842 | - 4.81% | - 4.63% |
| Open forest | +461,103 | +95,707 | + 3.57% | + 0.59% |
| Mangroves | N.A | -4,328 | N.A | - 0.9% |
| Total forest | -397,766 | -647,463 | - 1.22% | - 1.96% |

***Table-5: Change Rates of Forest Cover***

Deforestation was at an alarming rate in the past three decades due to various reasons. The forest cover changes between 1990 and 2015 indicate accelerating rates of deforestation–0.9 to nearly 2% annually. The extent of forest area is changing by different rate on a different period. The annual forest change rate during 1990-2000 is -435 thousand hectare (,000 ha) or –1.2% per year. During the year 2010 -2015, forests are changing from very highest rate of annual change at –1.8% per year in the last period of 5 years. The overall forest loss calculated for the 25-year period of 1990-2015 is -407.1 thousand hectare (,000 ha) per year and the annual change rate is –1.2% annually. Therefore, Myanmar was among the tropical countries with the highest rates of deforestation, after Brazil and Indonesia (FRA, 2015).

# 4. POLICIES, LEGISLATIONS AND INSTRUCTIONS

## 4.1 National Environmental Policy (2019)

National Environmental Policy was adopted in 2019. This Policy builds on Myanmar's 1994 National Environmental Policy and reaffirms its core values:

(1) The wealth of the nation is its people, its cultural heritage, its environment and its natural resources;

(2) It is the responsibility of the State and every citizen to preserve our natural resources in the interests of present and future generations; and

(3) Environmental protection should always be the primary objective in seeking development.

It also builds on the Myanmar Agenda 21 (1997) and the National Sustainable Development Strategy (2009). It is grounded in the environmental responsibilities in the Constitutional Law of the Republic of the Union of Myanmar (2008), and the obligations contained in the Environmental Conservation Law (2012). It also aligns with, and expands upon, the environmental considerations in the National Comprehensive Development Plan (2015) and the Myanmar Sustainable Development Plan (2018). The Policy recognises and integrates Myanmar's commitments to Multilateral Environmental Agreements, including the Paris Agreement.

## 4.2 Myanmar Forest Policy

Myanmar Forest Policy (1995) has been formulated in a holistic and balanced manner with the overall context of the environment and sustainable development taking full cognizance of the forestry principles. It formalizes the commitment and intent of the Government to ensure the sustainable development of forest resources for social, environmental and economic purposes. The policy paves the way for prudent use and enhanced benefit from the forest while maintaining ecosystem integrity and environmental balance. Six imperatives identified in the policy are:

(1) Protection of soil, water, wildlife, biodiversity and the entire environment;

(2) Sustainability of forest resources to ensure perpetual supply of both tangible and intangible benefits accrued from the forests for the present and future generations;

(3) Basic needs of the people for fuel, shelter, food and recreation;

(4) Efficiency to harness, in the socio-environmentally friendly manner, the full economic potential of the forest resources;

(5) Participation of the people in the conservation and utilization of forests; and

(6) Public awareness about the vital role of forests in the well-being and socioeconomic development of the nation.

### 4.3 National Wetland Policy and Strategic Actions

On 30th August 2016, the Myanmar National Wetland Committee was formed by Notification No. 94/2016 of the Ministry of Natural Resources and Environmental Conservation to enhance coordination of wetland conservation and management. This committee is composed of fourteen senior officials from nine governmental departments related to wetland management. Under the guidance of the National Wetland Committee, National Wetland Policy and Strategic Actions was developed by the Government of Myanmar. This policy is Myanmar's first policy directed towards wetlands, and it will assist and facilitate coordination among the relevant departments and organizations for the conservation and wise use of wetlands and their resources for the benefit of humans and wildlife. The National Wetland Policy and Strategic Actions include six policy imperatives mentioned as below:

(1) Protection of the country's wetlands by conservation measures;

(2) Wise use of resources and services obtained from wetlands;

(3) Mainstreaming wetlands values in development plans;

(4) Participation of government departments, non-governmental organizations, local communities and private sector;

(5) Raising awareness and understanding of the importance of wetlands and wetland resources for sustainable development; and

(6) Collaborating in international and regional programmes.

### 4.4 National Land Use Policy

National Land Use Policy was launched in 2016 and it aims at implementing, managing and carrying out land use and tenure rights in the country systematically and successfully, including both

urban and rural areas, in accordance with the objectives of the Policy. It shall be the guide for the development and enactment of a National Land Law, including harmonization and implementation of the existing laws related to land, and issues to be decided by all relevant departments and organizations relating to land use and tenure rights.

National Land Use Council is formed for the implementation of the National Land Use Policy and determines its roles and responsibilities. It consists of the Vice-President-2 as the Chairman, the relevant Union Ministers and Chief Ministers of the Regions or States as members, and a person elected and assigned by the members as the Secretary.

### 4.5 Myanmar Climate Change Policy

Myanmar Climate Change Policy was adopted in 2019 with a vision of "to be a climate-resilient, low-carbon society that is sustainable, prosperous and inclusive, for the well-being of present and future generations". The purpose of this Policy is to provide long-term direction and guidance to:

(a) Take and promote climate change action on adaptation and mitigation in Myanmar;

(b) Integrate climate change adaptation and mitigation considerations into Myanmar's national priorities and across all levels and sectors in an iterative and progressive manner

In actions to achieve the purpose of this Policy, Myanmar will be guided by the guiding principles of 1) Sustainable Development, 2) Precaution, 3) Prevention, 4) Environmental Integrity, 5) Shared responsibility and cooperation 6) Inclusiveness 7) Good Governance, 8) Climate Justice and Equity 9) Gender Equality and Women's Empowerment.

### 4.6 Forest Law

The old Forest Law (1992) was repealed by the new Forest Law enacted in 2018. The basic principle, management of forest land, conservation and protection, administrative actions, and offences and penalties were revised and updated in the new Forest Law (2018). The new Forest Law comprises nine basic principles and 58 sections under 13 Chapters, highlighting the constitution of reserved forest and declaration of protected public forest, management of forest land, establishment of forest plantation, extraction and removal of forest produce, disposal of drift, stranded and waif timber, establishment of wood-based industry, administrative action (search, arrest and administrative action) in respect of offences and penalties. The new Law recognizes local and indigenous peoples' rights,

encourages people's participation in forest management, private sector involvement in forestry sector development, human resource development and extension to local people.

### 4.7 Conservation of Biodiversity and Protected Areas Law

In May 2018, the Union parliament enacted the "Conservation of Biodiversity and Protected Areas Law" which replaced the old "Protection of Wildlife and Protected Areas Law" (1994). There are three major changes found in the new law, which enable a much greater role for local communities while promoting co-management, support international obligations such as Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and increase penalties for legal infringements. Most significantly, "Community Protected Areas" are recognized as a category of protected area. So the new Law provides opportunities for more effective conservation while recognizing the rights and the potential roles of local communities.

### 4.8 Environmental Conservation Law

Environmental Conservation Law was enacted in 2012 and it aims at implementing the Myanmar National Environmental Policy, laying down the basic principles and giving guidance for systematic integration of the matters of environmental conservation in the sustainable development process and enabling to emerge a healthy and clean environment and enabling to conserve natural and cultural heritage for the benefit of present and future generations etc. It mandates to form Environmental Conservation Committee to conserve the environment of the country.

### 4.9 Community Forestry Instructions

The new Community Forestry Instructions (CFI) was issued by Forest Department in 2019 replacing the former CFI 1995. The new CFI comprises of 26 sections although the old one has 21 sections. In the new CFI, the specific objectives and definitions for community forestry were clearly defined, the types of land that can establish CF were increased (for example, CF is allowable in the buffer zone of the protected area), and the production from CF was considered not only for the subsistence needs of local people but also for the small scale to commercial scale enterprises. The new CFI focuses a significant development in the aspects of partnership, participation and decentralization. The local communities are granted trees and forest land tenure rights for an initial 30-year period, which is extendable. The Forest Department provides the technical assistance and plays the leadership role in the exercise of community forestry and the development of CF based enterprises.

## 5. PLANS AND STRATEGIES

Planning is an integral component of forest management and is for determining and expressing the goals and objectives and for deciding the targets and steps that should be taken in order to achieve those objectives. Forest Department developed 30-year National Forestry Master Plan (2001-02 to 2030-31) to manage the forests on a sustainable basis.

National Forestry Master Plan outlines the strategic direction for the sector and covers a range of issues, including conservation, restoration, protection, production, watershed management, law enforcement, and the promotion of fuelwood substitutes. The National Forestry Master Plan provides a guiding framework for ten-year forest management plans developed by the Forest Department for each forest district.

Myanmar's forests have been managed through the formulation and implementation of short-term and long-term plans. The forest management plans covering the whole country have been formulated in line with the modern forestry concepts. The plans focus attention on sustainable production of timber and NTFPs, conservation of wildlife and wild plants, and social well-beings of local communities. The present plans for 10-year period (2015-16 to 2024-25) were formulated for 68 Districts throughout the country, and being implemented within the framework of Forestry Master Plan.

Furthermore, the following plans and programmes have been developed to achieve the sustainable forest management as well as biodiversity conservation in Myanmar:

- National Biodiversity Strategy and Action Plan (2015-2020)
- National REDD+ Strategy
- Myanmar Reforestation and Rehabilitation Programme (2017-18 to 2026-27)
- Re-establishing Natural Habitats Programme (2019-20 to 2028-29)
- Inlay Lake Sustainable Development and Environmental Conservation Action Plan (2015-20)
- National Wetland Policy and Strategic Actions

# 6. SUSTAINABLE FOREST MANAGEMENT

## 6.1 Natural Forest Management

The Myanmar Selection System (MSS), originally known as the Brandis System, was developed during the period 1880-1920 as a combination of yield regulation by the Brandis method and periodical improvement fellings to favour teak. Dr. Dietrich Brandis, a German botanist, became Superintendent of Bago Yoma Forests in January 1856. MSS has been the principal forest management system applied in managing the natural forests of Myanmar since 1856. It involves formation of felling series, each of which is divided into 30 annual coupes based on equal productivity and more or less the same size and worked over a period of 30- year felling cycle. On the other hand, MSS is practiced within the bound of area limit (Felling series-30 Blocks), size/girth limit (63 cm or 73 cm DBH) and time limit (a felling cycle of 30 years). Fixing of Annual Allowable Cut for teak and hardwood, conducting pre- and post-harvest inventory and cultural treatments such as improvement felling, enrichment planting, climber cutting etc, are the characteristics of MSS. MSS has been being applied in Myanmar practically to all types of natural forests with virtually blanket silvicultural prescriptions, although it is well aware that silvicultural techniques are sometimes highly site-specific.

Furthermore, Forest Management Units (FMUs) are formed for each District (totaling 68 Districts across the country). Each and every FMU also has 10 years forest management plan which is also called District Forest Management Plan. District Forest Management Plan includes seven working circles namely Production Working Circle (PWC), Planted Forests Working Circle, Local Supply / Community Forestry Working Circle (LS/CFWC), Watershed Forests Working Circle (WFWC), Non-wood Forest Products Working Circle (NFPWC), Protected Areas Working Circle and Special Working Circle (such as mangrove working circle, pine working circle, resin production working circle, bamboo working circle etc). Among these WCs, PWC covers an area of 30 million acres in which sustainable timber production is conducted in accordance with the AAC of the District Forest Management Plan. Forest Management Plans are revised every 10 years to cope with the changing situation of forest resource status of the Districts.

Development of Myanmar's criteria and indicators (C&I) for SFM at both national and FMU levels was completed in October 1999, and formally approved by the MONREC (formerly Ministry of Forestry). Myanmar's C&I, which is based on ITTO's C&I of 1998, contains 7 criteria each at both

national and FMU levels. There are 78 indicators and 257 required activities at the national level, and 73 indicators and 217 activities at the FMU level.

### 6.2 Annual Allowable Cut (AAC)

Under MSS, only mature trees are selected and harvested. Harvesting of trees is regulated based on annual growth and controlled by girth limits prescribed by species or species groups. Felling of exploitable trees is within the bounds of Annual Allowable Cut (AAC). Fixing AACs, therefore, accords the increment of individual tree species, which has taken place over the course of 30-year felling cycle. AAC is thus a tool that ensures the harvest of timber yield on a sustained basis. AACs for teak and for non-teak other hardwoods are periodically revised and fixed based on the forest inventory data. Current AACs are given in Table 6.

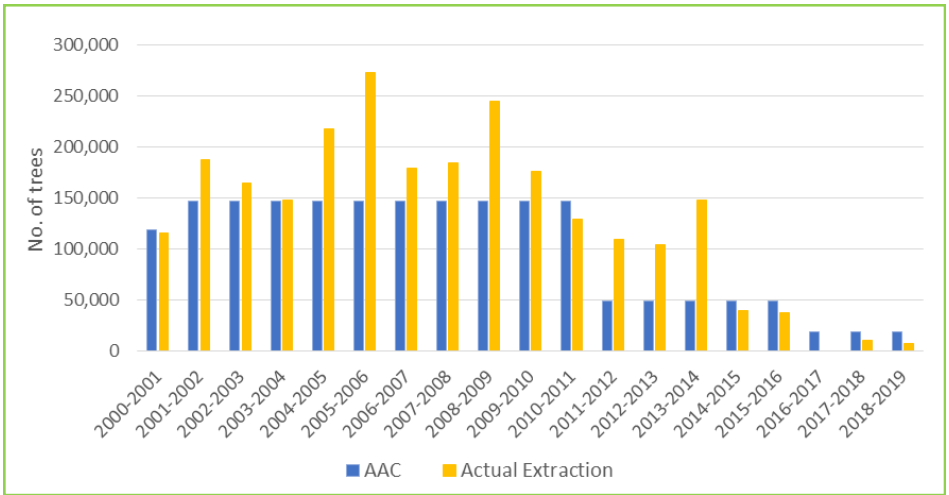



*Figure-3: Annual Allowable Cut (AAC) and Extracted Number of Teak*

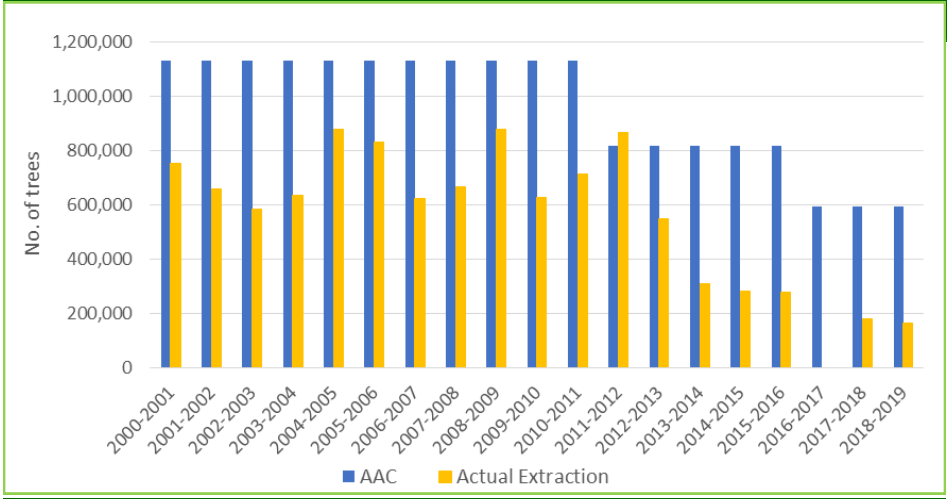



*Figure-4: Annual Allowable Cut (AAC) and Extracted Number of Hardwood*

| Year | Teak (no of trees) | | Hardwood (no of trees) | |
|---|---|---|---|---|
| | AAC | Extracted | AAC | Extracted |
| 2000-2001 | | 115,897 | 1,131,461 | 753,812 |
| 2001-2002 | | 187,829 | 1,131,461 | 658,701 |
| 2002-2003 | | 165,046 | 1,131,461 | 582,097 |
| 2003-2004 | | 148,077 | 1,131,461 | 633,504 |
| 2004-2005 | | 217,869 | 1,131,461 | 877,173 |
| 2005-2006 | | 272,547 | 1,131,461 | 831,614 |
| 2006-2007 | | 178,847 | 1,131,461 | 623,174 |
| 2007-2008 | | 184,473 | 1,131,461 | 667,696 |
| 2008-2009 | | 245,421 | 1,131,461 | 880,215 |
| 2009-2010 | | 176,618 | 1,131,461 | 625,812 |
| 2010-2011 | 48,897 | 129,518 | 1,131,461 | 714,814 |
| 2011-2012 | | 109,128 | 817,343 | 867,923 |
| 2012-2013 | | 104,233 | 817,343 | 548,053 |
| 2013-2014 | | 147,935 | 817,343 | 310,245 |
| 2014-2015 | | 40,221 | 817,343 | 281,781 |
| 2015-2016 | | 38,295 | 817,343 | 275,773 |
| 2016-2017 | | - | 592,330 | - |
| 2017-2018 | | 10,620 | 592,330 | 179,494 |
| 2018-2019 | | 7,424 | 592,330 | 161,500 |

*Table-6: Annual Allowable Cut (AAC) and Extracted Number of Teak and Hardwood*

## 6.3 Plantation Forestry

### 6.3.1 Government-owned plantations

Myanmar initiated the establishment of Teak plantation as early as 1856 on a small scale using Taungya method. In 1941, the extent of forest plantations reached 47,167 ha. Large scale plantation forestry began in 1980 and about 30,000 ha of forest plantations have annually been established since 1984. In 1998, the Government initiated special teak plantation program to increase timber production. At present, annual planting rate amounts to 6,000 ha as well as annual distributions of about 17 millions of seedlings to the public for tree planting campaign. The Forest Policy (1995) stipulated that plantation forestry has always been the supplementary and the existing natural forests will not be substituted with forest plantations. Table -7 and Table - 8 show forest plantations by types and by species, respectively.

| No | plantation type | Area (ha) | Percent of total area (%) |
|---|---|---|---|
| 1 | Commercial | 491,403 | 54.11 |
| 2 | Village supply | 187,022 | 20.59 |
| 3 | Industrial | 72,519 | 7.98 |
| 4 | Others | 14,269 | 1.57 |
| 5 | Watershed | 139,160 | 15.32 |
| 6 | Mangrove | 3,828 | 0.42 |
| | **Total** | **908,200** | **100** |

***Table-7: Forest plantations by types (from 1981-1982 to 2018)***

| No | Species | Area (ha) | Percent of total area(%) |
|---|---|---|---|
| 1 | Kyun (Teak) | 395,492 | 43.55 |
| 2 | Pyinkado | 56,896 | 6.26 |
| 3 | Padauk | 16,883 | 1.86 |
| 4 | Pine | 22,131 | 2.44 |
| 5 | Eucalyptus | 72,519 | 7.98 |
| 6 | Other | 340,450 | 37.49 |
| 7 | Mangrove | 3,828 | 0.42 |
| | **Total** | **908,200** | **100** |

***Table-8: Forest plantations by species (from 1981-1982 to 2018)***

### 6.3.2 Myanmar Reforestation and Rehabilitation Programme (2017-18 to 2026-27)

The forest cover in Myanmar is about 42.92%, whereas closed forest and opened forest account for 21.56% and 21.36% of the country's total area respectively (FAO 2015). Average annual deforestation rate is about 1.72% (1,348,620 acres) of the country's total area between 2010 and 2015. As a result, degraded forests amounted to 22.29% (3,725,0000 acres) of the country's total area.

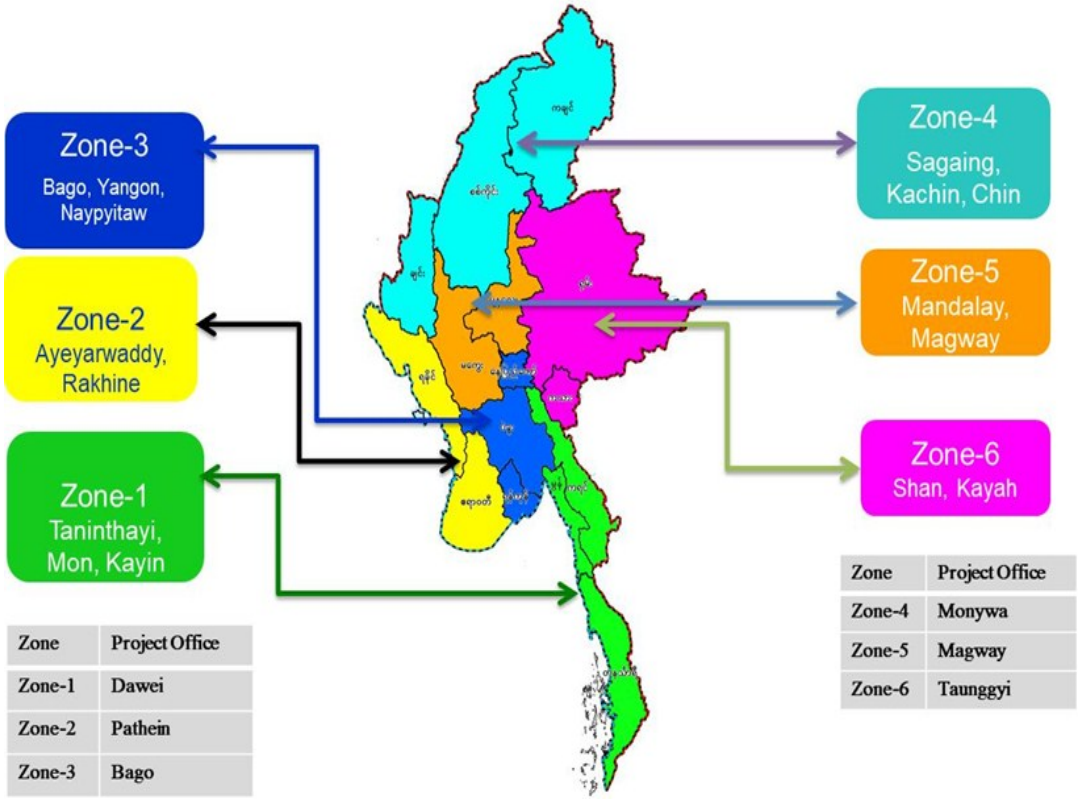
In order to restore the degraded forests, Forest Department launched Myanmar Reforestation and Rehabilitation Programme (MRRP) (2017-18 to 2026-27) in 2017. MRRP is being implemented in all 15 States and Regions (i.e., 68 Districts) of the country. Dry Zone Greening Department is also cooperating with Forest Department in implementing MRRP. It is a milestone and significant initiative of the Government with various objectives as follows:

- To restore and rehabilitate the degraded forests for climate change mitigation and adaptation as well as to enhance ecosystem services
- To fulfill the demands on teak and other commercial timber species
- To strengthen the investment of private sector in forest plantations
- To improve the livelihood and socioeconomic conditions of the rural people through increasing job opportunities and the community forestry

- Formulation of Forest Plantation Policy

In order to achieve the objectives, the following targets are set, and being implemented with great efforts:

- establishment of 148,627 ha (352,438 Acres) of state-owned forest plantations
- establishment of 115,427 ha (285,104 Acres) of private plantations
- encouraging and improving Assisted Natural Regeneration covering 331,392 ha (818,538 Acres) in the Production Forests
- conservation of 202,429 ha (500,000 Acres) of remaining natural forests in Central Dry Zone
- establishment of 311,875 ha (770,332 Acres) of Community Forests
- reservation of 1,610 square miles (6.195% of country area) to fulfill the national target of 30% of PFE in accordance with Myanmar Forest Policy 1995.
- formulation of forest plantation policies and strategies




| Zone | Project Office |
|---|---|
| Zone-1 | Dawei |
| Zone-2 | Pathein |
| Zone-3 | Bago |

| Zone | Project Office |
|---|---|
| Zone-4 | Monywa |
| Zone-5 | Magway |
| Zone-6 | Taunggyi |

*Figure-5: Zoning of MRRP*

### 6.3.3 Private Forest Plantations

With the decreasing availability of logs from natural forests, plantations become the important source of timber. Historically, forest plantations were established and managed by the Government for various purposes. With the changes of political and socioeconomic conditions, the Government allowed private sector to invest in establishment of teak plantations and hardwood plantations in 2006 in order to accelerate plantation forestry, meet the timber demands, increase forest cover and enhance job opportunities.

Up to date, 13,127 ha of private teak plantations and 16,220 ha of non-teak forest plantations have been established. Table - 9 shows the area of private teak plantations and non-teak forest plantations.

| No. | Plantation type | Area (acres) |
|---|---|---|
| 1 | Teak | 148,551 |
| 2 | Hardwood (non-teak)* | 112,086 |
| 3 | Industrial | 410055 |
| | **Total** | **670,692** |

***Table-9: Private teak and non-teak forest plantations***

**Note:** **Xylia xylocarpa, Pterocarpus macrocarpus, Acacia mangium*

## 7. REHABILITATION OF DRY ZONE

The dry zone of Myanmar lies in the central portion of the country and covers about 12% of the total land area. It has very harsh climatic conditions with extreme temperature, prolonged drought period and erratic rainfall. Thus, the "Agricultural and Rural Development Corporation" (ARDC) implemented afforestation projects in Dry Zone since 1953-54 and ended on 30th September 1963. In 1994, the Government launched a project entitled "Nine District Special Greening Project" in the Dry Zone of Central Myanmar for rehabilitation as well as greening of the Dry Zone. Based on the experiences and success of the Project, Dry Zone Greening Department (DZGD) was constituted under Ministry of Forestry in July 1997. The working area of Dry Zone Greening Department consists of 53 Townships from 13 Districts of 3 Regions, covering 19.54 million acres of the central dry zone of Myanmar.

Dry Zone Greening Department has formulated a comprehensive master plan for a 30-year period from 2001-2002 to 2030-2031 with a view to implement the following four main tasks;

(i) Establishment of Forest Plantations

(ii) Protection and Conservation of Remaining Natural Forests

(iii) Promotion on Utilization of Fuelwood Substitutes

(iv) Water Resources Development

### 7.1 Establishment of Forest Plantations

In order to reduce the impacts of climate change, to enhance environmental stability of the area and to fulfil the basic needs of local community, DZGD has established a total 236545 acres of forest plantations during a period of 1997-1998 to 2018 (April-September) fiscal years as shown in the following table.

| Type of plantations | Village Supply | Watershed | Mountain Greening | Research | Others | Total |
|---|---|---|---|---|---|---|
| Area (acres) | 181,990 | 102,927 | 32,573 | 38,375 | 44,480 | 236545 |

*Table-10: Types of Plantations and Areas Established by the DZGD*

### 7.2 Protection of Remaining Natural Forests

The conservation of natural forests has been implemented by the DZGD thereby providing ecosystem services which make life possible and mitigating the impacts of climate change. Up to the end of 2018(April-September) fiscal year, a total of 2,157,931 acres of remaining natural forests have been effectively protected in the central dry zone as mentioned in the following table-11.

| No. | Region | Protection of Remaining Natural Forest (Acre) |
|---|---|---|
| 1 | Sagaing | 515,000 |
| 2 | Magway | 1,222,431 |
| 3 | Mandalay | 420,500 |
| | **Total** | **2,157,931** |

***Table-11: Areas of Natural Forests Protected by DZGD***

### 7.3 Promotion on Utilization of Fuelwood Substitutes

DZGD had launched fuelwood saving and substitution program to reduce the pressure on remaining natural forests due to household fuelwood consumption. The table-12 below mentions the activities for promotion on utilization of fuelwood substitutes carried out by each region up to 2018 (April-September) fiscal year.

| No. | Item | Unit | Accomplishment |
|---|---|---|---|
| 1 | Utilization of Improved Cooking Stove | No. | 594,190 |
| 2 | Utilization of Briquette | No. | 116,889,422 |
| 3 | Utilization of Agriculture Residues | Ton | 942,079 |
| 4 | Model Village on Utilization of Fuelwood Substitutes | Villages | 588 |
| 5 | Environmental Education | Times | 18,503 |
| 6 | Establishment of Extension Centre | Times | 649 |

***Table-12: Activities and Accomplishment for Promoting Fuelwood Substitutes***

### 7.4 Water Resources Development

DZGD has been carrying out the following water resources development activities in order to assist greening activities and fulfilling the local needs.

(i) Construction of Ponds

(ii) Construction of Check dams

(iii) Drilling of Tube wells

(iv) Rain Water Collection Tanks

(v) Construction of Small Dams

Table -13 mentions the accomplishments of water resources development activities by DZGD in the central dry zone of Myanmar up to 2018 (April-September) fiscal year.

| No | Activities | Total |
|---|---|---|
| 1 | Construction of Village Ponds | 1,789 |
| 2 | Construction of Loose stone Check dams | 2,771 |
| 3 | Construction of Tube wells | 124 |
| 4 | Construction of Rain-fed Tanks | 31 |
| 5 | Small Check Dams | 10 |
| 6 | Renovation of Old Village Ponds | 26 |
| 7 | Construction of Small Ponds in the plantation sites | 7 |

***Table-13: Water Resources Development Activities of DZGD***

## 8. TREE IMPROVEMENT PROGRAMME

Tree improvement provides the means for greatly increasing the benefits flowing from intensive management programmes. The need to increase forest productivity to meet rising world-wide demands for forest products is driving forestry toward major technological change. Tree improvement technology is a versatile tool that can be used in various management settings, but it is particularly appropriate and potent when applied within the context of intensive forestry. Impressive results can be expected from the integration of advanced breeding and intensive silvicultural technologies.

### 8.1. Seed Production Areas (SPAs)

Seed production areas have increasingly been established since 1996 as seed sources for teak and other commercial forest plantations. Up to 2018-2019, 255 SPAs, having a total area of about 3834 ha, have been set up and details are shown in Table -14.

| No | State/Region | Species | No. of SPA | Area (ha) of SPA |
|---|---|---|---|---|
| 1 | Kachin | Teak, Pyinkado | 13 | 328 |
| 2 | Kayah | Teak | 4 | 40 |
| 3 | Kayin | Teak, Pyinkado | 16 | 95 |
| 4 | Chin | Teak, Pinus | 12 | 63 |
| 5 | Sagaing | Teak, Padauk, Pyinkado | 37 | 606 |
| 6 | Tanintharyi | Teak, Pyinkado | 15 | 417 |
| 7 | Bago | Teak, Padauk, Pyinkado | 79 | 858 |
| 8 | Magway | Teak, Padauk | 28 | 445 |
| 9 | Mandalay | Teak | 12 | 104 |
| 10 | Naypyitaw | Teak | 10 | 210 |
| 11 | Mon | Teak, Pyinkado | 4 | 12 |
| 12 | Rakhine | Teak, Pyinkado | 7 | 59 |
| 13 | Yangon | - | - | - |
| 14 | Shan | Teak, Pinus | 12 | 506 |
| 15 | Ayarwaddy | Pyinkado, Yemane, Teak, Thiho | 6 | 91 |
| **Total** | | | **255** | **3834** |

***Table-14: Establishment of SPAs in states and regions***

Source: Natural Forest and Plantation Division, FD

## 8.2 Tissue culture

Tissue culture has become one of the key elements in the successful promotion of plantation forestry. Planting materials need to be not only of adequate supply but also of high quality. In this regards, tissue culture technique is becoming very important for mass production of quality planting materials. Originally, teak tissue culture research were carried out in CFDTC with dedicated researchers from FRI. In July 2002, the first batch of teak plants has been planted and these plants are being observed to be growing with good health and performance. In 2009, tissue culture lab was established in FRI and tissue culture research for teak and rare and endangered orchid species are conducted to supply good quality teak seedlings and plantlets of rare and endangered orchids which are reintroduced in their habitats (e.g, Nat Ma Taung National Park). In 2017, a new tissue culture lab was established in FRI and hybrid eucalypt species were produced by using tissue culture technique.

*Picture-8: Tissue Culture*

## 8.3 Clonal Seed Orchards (CSOs)

In Myanmar, teak clonal seed orchards were established in Bago and Mandalay regions since 1981. The first teak clonal seed orchard (34 ha) was established in Letpankhon Research Station No.7, Pauktaw PPF, Oaktwin Township, Taungoo District, Bago Region. In 1988, teak clonal seed orchard (6 hectares) was established in Moeswe area, Ngalaik RF 72, Pyinmana Township, Mandalay Region. In

1995, another teak clonal seed orchard with the area of 10 ha was established in Lewin area, Ngalaik RF, Pyinmana Township, Mandalay Region.

Under the Project (2007-2010) of "*Ex situ* and *in situ* conservation of teak to support sustainable forest management", two Teak CSOs were established in Ngalaik RF 18, Pyinmana Township, Mandalay Region (2.5 ha) and in Pyay Township, Bago Region (1.5 ha). These orchards are still lacking the progeny test and genetic information of clones.

Recently, under the MRRP, FD has planned to establish the clonal seed orchards for not only teak but also Padauk (*Pterocarpus macrocarpus*), Pyinkado (*Xylia xylocarpa*), Yemane (*Gmelina arborea*) and other valuable timber species. In 2018, a teak clonal seed orchard (4 ha) was established in Moeswe area, Ngalaik RF 74, Pyinmana Township, Mandalay Region. More hectares of teak clonal seed orchards were planned to be established in Hlaing Yoma RF 5, Taikgyi Township, Yangon Region.

***Picture-9: Teak Clonal Seed Orchard at Let Pan Khone Forest Research Station***

### 8.4 Selection of Mother Trees (or) Plus Trees

Mother trees or plus trees are of crucial importance for seed source for tree improvement programme. With the support of MRRP, about 2000 mother trees of teak, pyinkado, padauk, yemane and other species were selected and conserved. Seeds and cyons are collected from mother trees or plus trees.

## 8.5 Hedge Gardens (HGs) and Shoot-cutting

Conventional vegetative propagation methods, such as grafting, budding, layering and cutting could easily be applied for clonal propagation and establishment of Teak Hedge Gardens (THGs), germplasm. Research on shoot cutting was successfully conducted by FRI in 1995-96. Short-term training courses on THGs and planting stock production by shoot-cutting were regularly provided at the Central Forestry Development Training Center (CFDTC). Both clonal and seedlings THGs have been introduced so as to ensure the sustained production of planting stock for plantations. Field planting of rooted cuttings from THGs has been introduced to some forest districts during the rainy season of 2002. At present, as a component of MRRP, hedge gardens of some commercial species were established in FRI's Research Stations as shown in the table -15.


*Picture-10: Hedge Garden*

| No. | Species | Established Year | Locaton | Area (acres) |
|---|---|---|---|---|
| 1. | Teak (*Tectona grandis* L. f.) | 2007 | Forest Research Institute, Yezin | 0.25 |
| 2. | Teak (*Tectona grandis* L. f.) | 2008 | Let-pan-khone research station | 1.8 |
| 3. | Teak (*Tectona grandis* L. f.) | 2014 | Let-pan-khone research station | 0.5 |
| 4. | Teak (*Tectona grandis* L. f.)<br>Padauk (*Pterocarpus macrocarpus* Kurz)<br>Yemane (*Gmelina arborea* Roxb.)<br>Thinwin (*Millettia pendula* Benth.)<br>Pyinkado (Xylia xylocarpa (Roxb.Taub.) | 2018 | Forest Research Station No. 1, Phetswet, Katha Township, Sagaing Region | 2 |
| 5. | Teak (*Tectona grandis* L. f.)<br>Padauk (Pterocarpus macrocarpus Kurz)<br>Yemane (Gmelina arborea Roxb.)<br>Thinwin (*Millettia pendula* Benth.)<br>Pyinkado (Xylia xylocarpa (Roxb.) Taub.) | 2018 | Forest Research Station No. 5, Moeswe, Oaktayathiri Township, Nay Pyi Taw | 2 |
| 6. | Teak (*Tectona grandis* L. f.)<br>Padauk (*Pterocarpus macrocarpus* Kurz)<br>Yemane (*Gmelina arborea* Roxb.)<br>Thinwin (*Millettia pendula* Benth.)<br>Pyinkado (*Xylia xylocarpa* (Roxb.) Taub.) | 2018 | Forest Research Station No. 6, Amatgyi-kon, Yetashae Township, Bago Region | 2 |
| 7. | Teak (*Tectona grandis* L. f.)<br>Padauk (*Pterocarpus macrocarpus* Kurz)<br>Yemane (*Gmelina arborea* Roxb.)<br>Thinwin (*Millettia pendula* Benth.)<br>Pyinkado (*Xylia xylocarpa* (Roxb.) Taub.) | 2018 | Forest Research Station No. 7, Let-pan-khone, Oaktwin Township, Ba-go Region | 2 |
| 8. | Teak (*Tectona grandis* L. f.)<br>Padauk (*Pterocarpus macrocarpus* Kurz)<br>Yemane (*Gmelina arborea* Roxb.)<br>Thinwin (*Millettia pendula* Benth.)<br>Pyinkado (*Xylia xylocarpa* (Roxb.) Taub.) | 2018 | Forest Research Station No. 9, Hmawbi Township, Yangon Region | 2 |
| **Total** | | | | **12.55** |

***Table-15: Commerical Species Planted in Hedge Gardens***

# 9. WATERSHED AND COASTAL MANAGEMENT

## 9.1 Watershed management

Watershed of Myanmar covers over 80 percent of total country area. Major watershed areas include:

1) Ayeyawady-Chindwin Watershed
2) Rakhine Coastal Region
3) Sittaung Basin
4) Thanlwin Basin
5) Taninthari Coastal Region
6) Mekong Basin

| Sr. | River basin name | Catchment area ($km^2$) |
|---|---|---|
| 1. | Chindwin | 115,300 |
| 2. | Ayeyarwady (Upper) | 193,300 |
| 3. | Ayeyarwady (Lower) | 95,600 |
| 4. | Sittaung | 34,400 |
| 5. | Rivers in Rakhine State | 58,300 |
| 6. | Rivers in Tanintharyi division | 40,600 |
| 7. | Thanlwin (in Myanmar) | 158,000 |
| 8. | Mekong (in Myanmar ) | 286,00 |
| 9. | Bilin river and other rivulets | 8,400 |
| 10. | Bago river | 5,300 |
| | **Total** | **737,800** |

**Table-16: Major Watershed Areas of Myanmar**

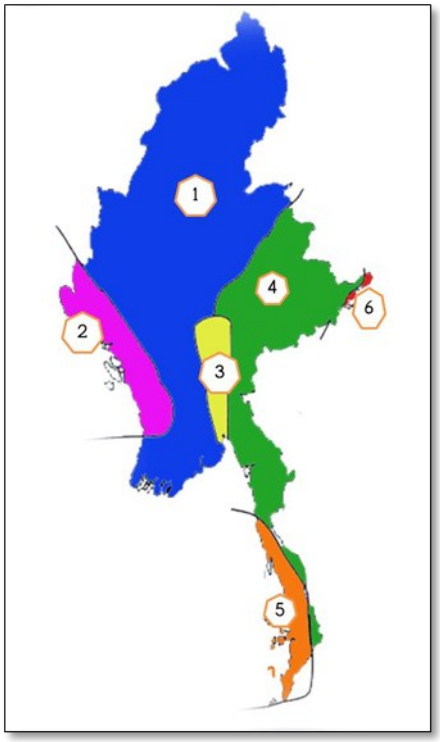



**Figure-6: Map of Watershed Areas**

In collaboration with Norway Bilateral Environment Programme, Integrated Water Resource Management (IWRM) Project Phase (I) was implemented from 2015-2019. During the Phase I, the Project focused on capacity building for water quality monitoring in multiple rivers and lakes in

Myanmar. Important project results include water sample determination of different physical parameters, ions and nutrients at the Forest Research Institute (FRI) water quality laboratory, and an establishment of a water quality database, including installation of a server at FD. Additionally, a river basin management approach for development of a river basin management plan, based on coordination of authorities and involvement of civilians, was carried out in the Bago Sub-basin. At present, Institutional Building and Training project is being implemented as Phase II (2019-2023).

Nowadays, watershed areas are increasingly threatened by a wide range of pressures. Causes for the deterioration of watershed areas are;

1) Agricultural practices on slope/hill side including shifting cultivation,
2) Deforestation in watershed areas,
3) Settlement on slope/hill side,
4) Improper road construction and poor maintenance,
5) Forest fire, and
6) Mining.

### 9.2 Coastal and mangrove management

Mangroves are very important both economically and ecologically in terms of the different services they provide. Mangrove ecosystems provide many goods and ecological services not only to the coastal communities but also to the entire country. Moreover, mangrove helps to stabilize shorelines in coastal streams and estuaries by protecting them against tidal surge and soil erosion. Mangrove is also a habitat of aquatic animals. Mangrove forests are the fundamental natural resources found in coastlines throughout tropical and subtropical regions of the world.

The area of mangrove of Myanmar stands seventh/eighth largest extent of mangroves worldwide and third in the ASEAN Region (World mangrove atlas, 2010: Toe, 2017). Mangroves in Myanmar cover an area of 502,911 hectares (1,242,190 acres) along 2832 km coastline. There are about 34 true mangrove species and 148 true plus associate mangrove species (Toe, 2017).

Of the total Myanmar primary mangroves, the majority is located on Ayeyarwady flood plains, with the remainder in Tanintharyi and a lesser portion in the Rakhine area. Species distributions and compositions of mangroves differ amongst the three coastal regions. Along the 14,708 km-long coastline of the country, these mangrove forests serve as the link between inland and marine ecosystems.

Forest Department has been attempting to rehabilitate and conserve mangrove ecosystem and also jointly implementing mangrove conservation projects in cooperation with international organizations such as UNDP/FAO, JICA and local NGOs. In cooperation with JICA, Forest Department implemented a project namely "Integrated Mangrove Rehabilitation and Management Project through Community Participation in the Ayeyarwady Delta" from 2007 to 2013. The major activities of the project were establishment of community forestry, implementation of action research plantations and construction of Community Forestry Extension and Nursery Centers in the Ayeyarwady Delta. Currently, mangrove conservation projects are being implemented in collaboration with international organizations such as World View International Foundation (WIF), the University of Queensland, and Danish International Development Agency (DANIDA).

*Picture-11: Mangrove Forest in Tanintharyi*

### 9.3 National Coastal Resources Management Central Committee (NCRMCC)

To address the coastal issues and to sustain coastal resources, NCRMCC was formed on 30th November, 2016 with a total of 19 members including Union Ministers, Permanent Secretaries, Director Generals from relevant Ministries, Navy Chief and Chief Ministers from Coastal Regions and States, led by Vice President of the country. NCRMCC was reformed on 24th May, 2018 with a total of 20 members by adding a new member, Deputy Attorney General from Union Attorney General's Office. The responsibilities of NCRMCC are;

(i) Formulation of Policy, Strategy, Laws, Rules and Regulations,

(ii) Knowledge Management,

(iii) Developing Integrated Coastal Management (ICM),

(iv) Extension of Protected Areas System,

(v) Biodiversity Conservation, Research and Knowledge Exchange,

(vi) Implementation of International Commitments,

(vii) Coastal Resources Research Center,

(viii) Controlling Illegal Fishing,

(ix) Coastal Management Institutions, and

(x) Technical and Financial Support from International Communities.

In order to implement coastal resource issues more efficiently, two specialized committees were formed as follows according to the decision of NCRMCC;

(a) National Coastal Resources Management Taskforce Committee (NCRMTC)

(b) National Coastal Resources Management Advisory Committee (NCRMAC)

## 10. BIODIVERSITY CONSERVATION

In Myanmar, biodiversity conservation, primarily wildlife, wild plants and pristine forests, has traditionally been prioritized at the national level. The earliest Wildlife Sanctuary in Myanmar was established by King Mindon in the vicinity of the kingdom, Mandalay in 1860. Since then, biological resources has systematically been protected and conserved in Myanmar. A policy target was set by the Forest Policy (1995) that protected area coverage must be at least 5% of the total land area of the country. In 2000, the 30-year Forestry Master Plan adjusted this target up to 10% of total land area. At present, 45 Protected Areas covering 5.85 percent (9,783,684 acres) of total land area of the country have been constituted.

### 10.1 International and Regional Agreements, Conventions and Protocols

With regards to biodiversity conservation, Myanmar has made commitments to the following international Agreements, Conventions and Protocols:

| No. | Agreements/ Conventions/ Protocols | Status |
|---|---|---|
| 1 | Plant Protection Agreement for the Southeast Asia and the Pacific Region | 1959(R) |
| 2 | United Nations Framework Convention on Climate Change (UNFCCC) | 1994 (R) |
| 3 | Convention on Biological Diversity (CBD) | 1994 (R) |
| 4 | Convention for the Protection of the World Culture and Heritage | 1994 (R) |
| 5 | International Tropical Timber Agreement (ITTA) | 1996 (R) |
| 6 | Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) | 1997 (R) |
| 7 | United Nations Convention to Combat Desertification (UNCCD) | 1997 (R) |
| 8 | ASEAN Agreement on the Conservation of Nature and Natural Resources | 1997 (S) |
| 9 | Cartegena Protocol on Bio-safety | 2001 (S) |
| 10 | ASEAN Agreement on Trans-boundary Haze Pollution | 2003 (R) |
| 11 | Declaration on ASEAN Heritage Parks (AHP) | 2003 (S) |
| 12 | Convention on Wetlands of International Importance Especially as Water-fowl Habitat, 1971 | 2004 (A) |
| 13 | International Treaty on Plant Genetic Resources for Food and Agriculture | 2004 (R) |
| 14 | Global Tiger Forum | 2004 (R) |
| 15 | ASEAN Centre for Biodiversity (ACB) | 2009 (R) |

***Table –17: Myanmar's Commitments to International Agreements, Conventions and Protocols on Biodiversity Conservation***

*A: Accession/Acceptance; R: Ratification; S: Signature*

The Forest Department is serving as the focal institute for the following multilateral environmental agreements, already ratified by the Government of Myanmar:

- Convention on Biological Diversity (CBD)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora-CITES
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)

In collaboration with concerned line departments and organizations, the Forest Department is implementing these Conventions, particularly developing and implementing policy and strategies as mentioned below:

- National Biodiversity Strategy and Action Plan (NBSAP) 2015-2020
- National Wetland Policy and Strategic Actions

CITES regulations have been integrated into national legislation as appropriate, particularly in the Conservation of Biodiversity and Protected Area (CBPA) Law, 2018 and the drafted Conservation of Biodiversity and Protected Area Rule.

Being the focal institute for the Conventions, the Forest Department has submitted the following reports to the respective Conventions:

- Sixth National Report to CBD (2018);
- COP13 National Report to Ramsar Convention (2018)
- Annual Report to CITES (2018);

Protected Areas (PA) are established across the country in order to conserve biological diversity as well as maintain a representative sample of unaltered species and ecosystems for the future, and to limit the potential for environmental degradation through human mismanagement of resources.

Among the 45 PAs, those, seven PAs namely; Alaungdaw Kathapa National Park, Hkakabo Razi National Park, Indawgyi Wildlife Sanctuary, Inlay Lake Wildlife Sanctuary, Meinmahla Kyun Wildlife Sanctuary, Lampi Marine National Park and Natmataung National Park, have been recognized as ASEAN Heritage Parks (AHPs).

Moreover, Inlay Lake region and Indawgyi Lake region were designated as Men and Biosphere Reserve (MAB) in 2015 and 2017 respectively. During the period of fourteen years (2004-2018), the following five Ramsar Sites were designated:

1) Moeyungyi Ramsar Site (10,359 ha; 17-11-2004)
2) Indawgyi Ramsar Site (47,884.4 ha; 02-02-2016)
3) Meinmahla Ramsar Site (50,000 ha; 02-02-2017)
4) Gulf of Mottama Ramsar Site (42,500 ha; 10-05-2017)
5) Inlay Ramsar Site (5,797.6 ha; 10-08-2018)

Forest Department has collaborated with UNESCO for the designation of Natural World Heritage Site (NWHS) in Myanmar since 2013. Based on consultation with multi-stakeholders, the following seven potential sites were identified to be included in the tentative list. The Tentative Natural World Heritage List was submitted to UNESCO Headquarters on 20th January, 2014, and was recognized by the UNESCO World Heritage Committee. These seven potential sites are:

1) Hkakabo Razi Landscape, formally called Northern Mountain Forest Complex
2) Hukaung Valley Wildlife Sanctuary,
3) Indawgyi Wildlife Sanctuary,
4) Natmataung National Park,
5) Myeik Archipelago,
6) Ayeyawady River Corridor and
7) Tanintharyi Forest Corridor.

As the results of the field observation, the Hkakabo Razi Landscape has been prioritized for nomination as a World Natural Heritage Site. Nomination Dossier for the Hkakabo Razi Landscape (draft) signed by the Union Minister was submitted to UNESCO Headquarters in September 2017 and the feedback and evaluations were received from World Heritage Center. However, local stakeholders raised serious concern about World Heritage Site Nomination and Protected Areas Management during the period of conducting Free, Prior and Informed Consent (FPIC) by Forest Department. Hence the nomination process has been temporarily halted.

## 10.2 Key Biodiversity Areas

According to Myanmar Biodiversity Conservation Investment Vision (2013) prepared by Wildlife Conservation Society (WCS), 132 Key Biodiversity Areas (KBAs) have been identified in Myanmar. Preserving these areas from degradation is a priority for ensuring the viability of habitat and species conservation.

These sites are of global significance for biodiversity and are identified using standardized criteria. They represent the most important sites for biodiversity conservation worldwide. In Myanmar, KBAs fall in different land management categories such as protected areas, reserved forests, protected public forests, community-conserved forests, community forests and other resources and land use area. Therefore, KBAs accommodate different management systems including government, private, community-led and joint management. Of these 132 KBAs, thirty-five are existing protected areas and a further six are proposed protected areas. They assist countries to identify priority areas for future conservation efforts and protection; to support development planning by highlighting the value of areas so that impacts on biodiversity can be avoided.

## 11. FORESTRY RESEARCH

Forests and forest products related research activities are carried out mainly by the Forest Research Institute (FRI) which is under the supervision of Forest Department.

The FRI has been established in Yezin, (Pyinmana), Zayathiri Township, Nay Pyi Taw since 1978. But forestry research started as early as in 1914 in Myanmar and a research division was formed in 1922 as part of the Forest Department. In 1952, a Forest Research and Training Circle was set up, which is the forerunner to the present FRI. The main objective of FRI is to provide technical information on all aspects of forestry and forest–based activities to increase the contributions of the forest and forest lands to the well-being of the nation.

The FRI has prioritized the research programmes on sustainable forest management in natural teak forests, development of forest plantations, biodiversity conservation (mainly focus on flora of Myanmar), analysis of water quality and soil properties, tissue culture and biotechnology, reforestation/ afforestation in the central Dry Zone, efficient utilization of timber, development of the non-timber forest products and fuelwood resources development, wood energy conservation measures, development of social forestry and agroforestry research activities.

There are three divisions under the FRI, namely; the Forest Development Divisions, the Wood Utilization Division, and the Administration and Finance Division. There are 67 researchers in the three divisions under FRI. Each division has its own structure and major research functions. The Forest Development Division takes responsibility for technological development in sustainable forest management including soil and water conservation, in-situ and ex-situ genetic conservation and forest protection. The Wood Utilization Division mainly concentrates on investigation of physical and mechanical properties of Myanmar timber species and the utilization potential of these species. In addition, properties and sustainable utilization prospects of non-timber forest products (NTFPs), with special emphasis on bamboo, rattan and medicinal plants, are examined as priority to enhance household economy and national economy, as well as providing technical information. Administration and Finance Division conducts community forestry, agroforestry research and rural development research in addition to financial and administrative work. There are ten research stations established in different agro-ecological zones of the country. Up to date, about 268 research papers have been presented at annual research congress, published and disseminated.

FRI is a member of the following international research organizations and working closely with these organizations:

- International Network for Bamboo and Rattan (INBAR)
- Asia Pacific Forestry Network (APFNet)
- Asia-Pacific Association of Forestry Research Institutions (APAFRI)
- International Union of Forest Research Organization (IUFRO)
- International Tropical Timber Organization (ITTO)
- International Centre for Integrated Mountain Development (ICIMOD)
- Member of Asia and Pacific Forest Invasive Species Network (APFISN- FAO)

## 12. HUMAN RESOURCE DEVELOPMENT

### 12.1 University of Forestry and Environmental Science (UFES)

University of Forestry and Environmental Science (UFES) is located in Yezin, Zayathiri Township, Nay Pyi Taw, and it covers an area of 142.95 acres. In 1923, Forestry education leading to B.Sc. (Forestry) degree was started at Yangon University. In 1964, a new forestry education system was started and forestry course was extended to 6 years after matriculation. In 1985, Department of Forestry was transferred to the Institute of Agriculture at Yezin. In 1992, Department of Forestry was upgraded to the status of a professional institute and its administration was transferred to Ministry of Forestry. In 1996, Postgraduate courses were offered in Institute of Forestry. Institute of Forestry was renamed as University of Forestry on 27$^{th}$ December, 2003, and on 10$^{th}$ October 2017, it was reorganized again as the University of Forestry and Environmental Science.

**Main Objectives**

- To contribute to human resource development in Forestry and Environmental sector,
- To produce qualified forestry and environmental professionals for the forest sector,
- To disseminate forestry and environmental knowledge through teaching and training,
- To increase scientific knowledge of forestry and Environmental through research and development, and
- To provide educational services in forestry and environmental affairs.

**Academic Program for Undergraduate Course**

Study period - 5 years

Degree conferred - B.Sc. (Forestry)

Present annual intake- 100 (Male 80%, Female 20%)

**Academic Program for Postgraduate Course**

Study period - 4 Semesters (extendable up to 6 semesters)

Degree conferred - M.Sc. (Forestry)

Qualifying Course - Lecture & exams-2 Semesters (not extendable)

Thesis -Study proposal, Data collection, Analysis & Thesis preparation -2 Semesters (extendable up to 4 semesters)

### 12.2 Myanmar Forest School (MFS)

The Myanmar Forest School (MFS), located in Pyin Oo Lwin, has a long history of more than a century as a forestry training centre. The history of the MFS can be traced back to the 19th century. The school was started since 1898 in Tharawaddy, a town in Bago Region. In the years between the two World Wars, the school was moved to Pyinmana and accepted additional 32 students from Thailand. The school was moved further three times before the Japanese occupation of 1942-45, but after the war it was reopened in Pyinmana. In 1953, the school was moved to its current location in Pyin Oo Lwin (Maymyo). The MFS is established aiming:

- To have skill at forest operations both in theory and in practice,
- To improve moral, discipline and character, and
- To produce good staff who have accountability and willingness to serve people.

Up to date, the MFS has produced about 6,294 graduates who have been recruited as junior officers in the Ministry.

Depending upon the focus and priorities, the curriculum of the School has been evolved over time and, recently, two new subjects namely Environmental Conservation and Management were included. As these graduates are the practitioners of forestry development activities at the basic operational level, they play a significant role in the implementation of the sustainable management of forest resources in the country.

### 12.3 Central Forestry Development Training Centre (CFDTC)

Central Forestry Development Training Centre (CFDTC) was established in Ye Twin Gone Village, Hmawbi Township,Yangon Region in 1990, jointly by FD and the Japan International Cooperation Agency (JICA). It was established to provide trainings on forest conservation, silviculture and community forestry for systematic management and sustainable forest resources production for forest staff, local peoples and private organizations. The main objectives of the CFDTC are;

- To strengthen the capacity of Forest Staff,
- To raise public awareness in Forestry Sector,
- To share Forestry Techniques for Private Sector, and
- To support National Forestry Sector and Rural Development.

Moreover, CFDTC sub-center was also established in Patheingyi township, Mandalay Region in 2003 with the support of JICA to offer trainings on community forestry for local people and forest

staff. Various types of trainings have been organized and conducted since its establishment. About 13 types of training have been conducted since 1990.

| No. | Location | Types of Training | No. of Training Courses | No. of Trainees |
|---|---|---|---|---|
| 1. | Hmawbi | 31 | 576 | 15819 |
| 2. | Patheingyi | 8 | 135 | 2593 |
| | Total | 39 | 711 | 18412 |

*Table-18: Number of training courses completed and trainees participated*

### 12.4. The Asian Forest Cooperation Organization Regional Education and Training Center (AFoCO RETC)

The Asian Forest Cooperation Organization Regional Education and Training Center (AFoCO RETC) is situated in Hmawbi Township, Yangon Region, Myanmar. Under the Asian Forest Cooperation Project **(AFoCO)**, the Forest Department and Korea Forest Service have signed a Memorandum of Understanding (MoU) on the Establishment of Asian Forest Cooperation Regional Education and Training Center **(AFoCO RETC)** in Myanmar on the 1st day of August 2014. After entry into force of Asian Forest Cooperation Organization **(AFoCO)** on April 2018, the center is called as the Asian Forest Cooperation Organization Regional Education and Training Center (AFoCO RETC).

It aims at strengthening the capacity of the forestry sector in member countries through advanced training and education programs. The AFoCO RETC was built on a total area of 28,419 $m^2$ with a total floor area of 5014 $m^2$. It is equipped with modern training facilities including lecture rooms, laboratories, multimedia rooms, an auditorium, a dormitory and other support facilities for the convenience of the trainees. It will function as the regional base for international cooperation in the forestry sector by providing capacity building programs and activities specialized in the development of professionals who will be responsible for improving livelihoods through sustainable forest management in the member countries of AFoCO. It will be a leading global institute in the international forestry sector for capacity building by improving research capabilities and management practices through scientific approaches to address forestry issues in each member country.

The AFoCO RETC offers education and training programs to share knowledge and to train and foster exemplary leaders who are capable of carrying out good governance for a Greener Asia. The

problem - oriented education and training programs of RETC will enable participants to contribute towards integration of Asia by narrowing the development gap while promoting sustainable forest management. RETC programs will also cover methods to improve local livelihoods.

The AFoCO RETC provides regular programs on forestry topics within the scope of AFoCO's mission and strategies. Three core training topics provided by the RETC are:

- Forest Rehabilitation and Reforestation
- Forest Fire Management
- Community-based Forest Management

The AFoCO RETC cooperates with international organizations, governments, universities to organize and implement various forestry-related education programs. The training and education programs are categorized into 1) short-term training, 2) long-term training, 3) community development training, and 4) customized training.

Starting from 2018, the AFoCO RETC has been organizing training and education programs for the trainees. A total of six times including four times of short-term trainings and two times of customized training were organized in 2018. In 2019, 6 times of short-term trainings, 4 times of long-term trainings, 4 times of local development trainings and 22 times of education programs for local students and teachers will be organized.

***Picture-12: Asian Forest Cooperation Regional Education and Training Center (AFoCO RETC) in Hmawbi, Yangon***

## 13. FORESETRY EXTENSION SERVICES

Forestry Extension is one of the most important tasks of Forest Department. With the shift in concept of forest management from top-down to bottom-up approach, people's participation is becoming an essential in forest management. In this context, forestry extension plays a vital role to pursue the participation of stakeholders in sustainable forest management, biodiversity conservation, watershed management, climate change mitigation and adaptation etc. Through forestry extension, win-win conditions of socioeconomic development and forest conservation can be achieved. Major forestry extension services provided by the Forest Department are as follows:

- Making documentary videos and films for international relations, community forestry, biodiversity conservation, coastal area management, public tree planting campaign, and so on;
- Broadcasting of forest conservation in the Government and Private Channels;
- Publication of forest related articles published in newspapers;
- Publication of Forest Bulletins and Forestry Journal;
- Publication of Forestry magazine, namely "Forestry Mirror";
- Exhibition shows at the national events;
- Public talk shows;
- Teaching extension subjects in training centers of the Forest Department; and
- Exhibition of Elephant Museum in Yangon and Forest Department Museum in Nay Pyi Taw.

### 13.1 Development of Community Forestry

FD had issued Community Forestry Instructions (CFI) since 1995 in order to protect forest resources and support the basic needs of local people in Myanmar. Nowadays, community forestry had become a well-established and integral part of the framework for management and use of forest resources. Community forestry remains a potentially powerful driver of positive change within the forestry sector.

In order to reflect the current situations, revision of the Community Forestry Instructions in August 2016 provides communities commercial rights over timber and non-timber forest products. Furthermore, due to the needs of strengthening community participation and livelihood development, CFI was revised in 2019 and the Community Forestry Strategy (2018-2020) was also developed with the support of Community Forestry National Working Group (CFNWG). CFI allows local communities to involve in protection, conservation and restoration of forests, particularly in the vicinities of their

settlements. CFI provides a 30-year land use and the ownership rights and disposal of products from Community Forest under the guidance of FD.

The 30-year Forestry Master Plan of 2001-02 to 2030-31 established a target of 2.27 million acres (919,000 ha) of Community Forest by 2030. Up to December 2019, there are about 714,534acres established by 5,426 CF User Groups (138,179 members) of community Forests. The progress of Community Forest from 1996 to 2019 is shown in figure-8.

In Myanmar, about 1.5 to 2 million rural dwellers have been involved either directly or indirectly in shifting cultivation. Traditional shifting cultivation systems in the past appeared to be self-sustaining. However, the system is now considered as a land use practice, leading to unsustainability, increased marginalization and widespread deforestation in the tropics. To address this issue, Community Forestry has been promoted and implemented as a sustainable landuse practice as well as a win-win solution. Recognizing the traditional land use system, customary rights and cultural values, Forest Department, in cooperation with other sectors, has been implementing the following works:

- Community forestry based on agro-forestry systems;
- Provision of improved technologies, complementing traditional forest-related local knowledge;
- Recruiting shifting cultivators into routine forestry operations, such as plantation establishment;
- Enhancing income-generating opportunities; and
- Provision of awareness raising campaigns and extension services.

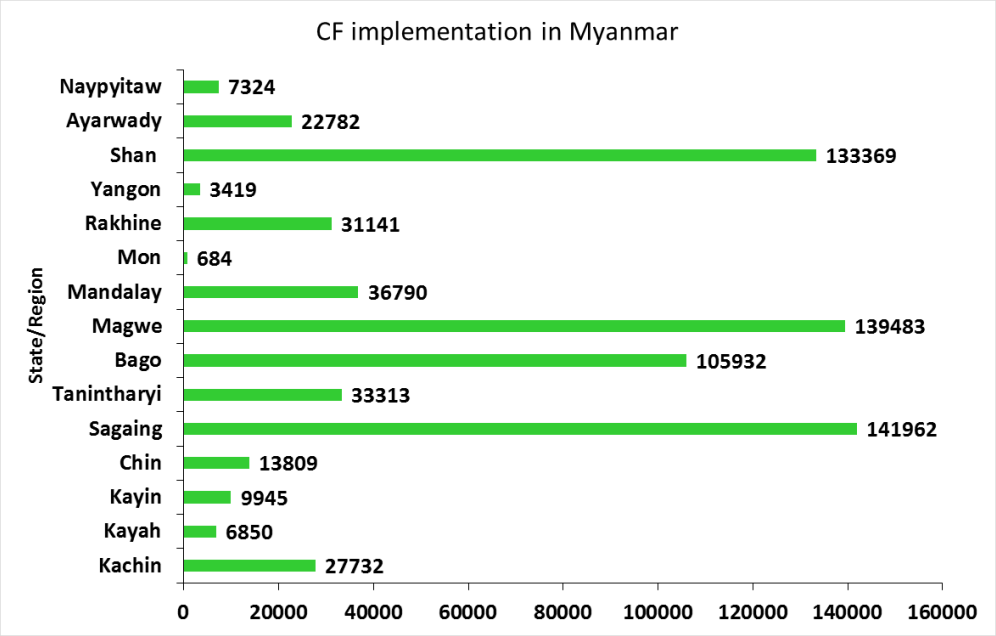



*Figure-7: Distribution of Community Forestry in States and Regions of Myanmar*

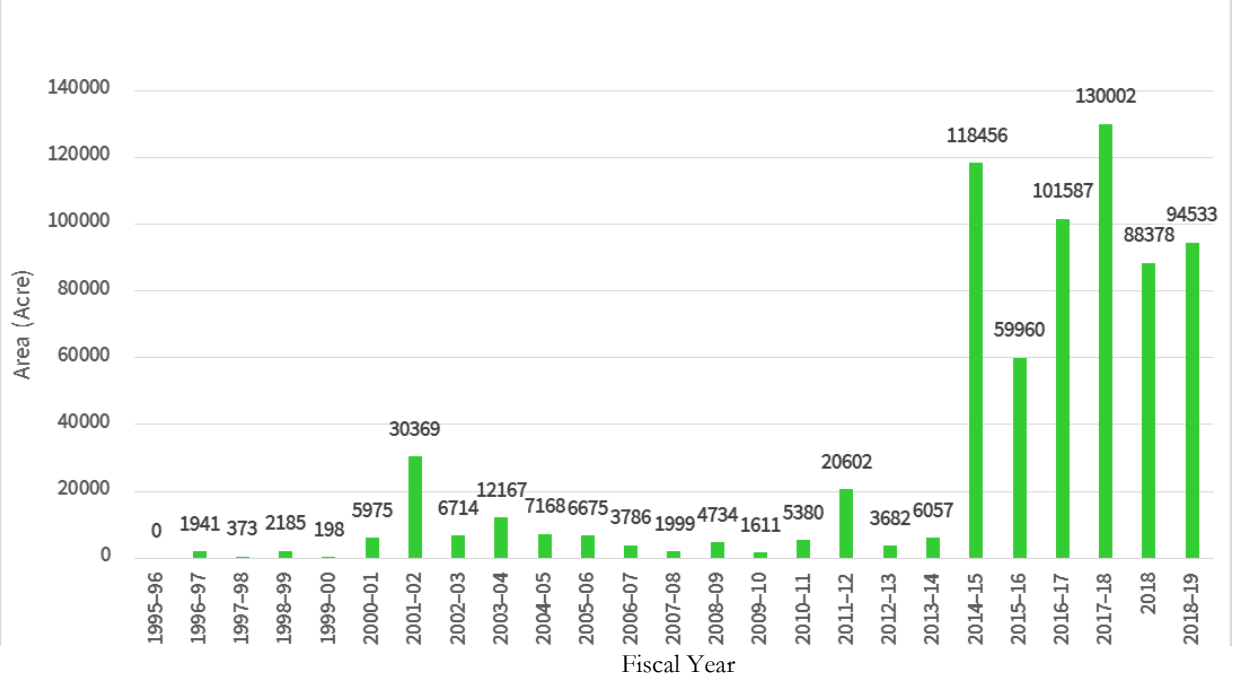



*Figure-8: Area of Community Forestry by year of establishment*

## 13.2 Nationwide tree planting programme

The nationwide tree planting programme has been launched in Myanmar since 1977-1978. The objective is to encourage and motivate people to plant trees in non-forested areas. The programme involves individuals, civil societies and governmental and non-governmental organizations. Forest Department annually supports about 10 millions to 17 millions seedlings to the public during the

*Picture-13: Tree Planting Campaign*

## 14. RECREATION AND ENVIRONMENTAL EDUCATION

### 14.1 Zoological Gardens

MONREC established four zoological gardens and one planetarium aiming at raising public awareness about the importance of natural environment and ecological values by exhibiting wild animals and also providing recreation. All the zoos and planetarium were operated by MONREC until 2011 and then were leased to the private company on an agreement of 10 years starting from 1st April 2011 to 31st March 2021.

Yangon zoological garden was established on 25th January 1906 and is located in Yangon . It is the first established zoological garden in Myanmar. It is an extensive leisure park which consists of a museum of natural history, an aquarium and an amusement park. In the zoo, a total of 137 species including 45 species of mammals, 73 species of birds and 19 species of reptiles and 1573 number of population were conserved. It was operated by the Forest Department until April 2011, and is now operated by a private company.


*Picture-14: Yangon Zoological Garden*

Yadanabon zoological garden located in Mandalay was established on 8th April 1989. The zoo has nearly 1213 population, 35 species of mammals, 52 species of birds, and 13 species of reptiles. The only potential captive breeding group of Burmese Roofed Turtles (*Batagur trivittata*) in the world is

*Picture-15: Yadanabon Zoological Garden*

also conserved in this garden. People can enjoy the animal shows on every Sunday, the entertainment, bicycling and boat riding inside the zoo.

An international level zoological garden had been established in Nay Pyi Taw under the arrangement of MONREC and it was opened to public on 26th March 2008. Being located beside

*Picture-16: Nay Pyi Taw Zoological Garden*

Yangon-Mandalay highway, it is easily accessible from various regions of the country. One can study 745 animals of 83 species including 38 species of mammals such as White tiger, Kangaroos, and Penguins, 36 species of birds and 9 species of reptiles. People can enjoy natural environment and gain botanical knowledge. Additionally, elephant and other animal shows are arranged for public.

There is also an international level aquarium inside the zoo and was opened on 23rd December 2017. Aquarium was arranged not only for providing knowledge on conservation of rare species but also for studying a variety of marine lives and imported marine species on a place.

Moreover, a planetarium was opened on 26th March 2009 inside the Nay Pyi Taw Zoological garden. It was a theatre established mainly for presenting educational and entertainment shows about astronomy and the night sky. In the educational room, it exhibits the plot explaining about the planets in the solar system, the Galaxy or the Milky Way, the Universe and constellation and the 15-kg weigh meteorites which had fallen onto Myothit Township, Magway division in 2015. Moreover, people can study about the natural scenery, constellation, coral reefs, etc. through the educational cartoons presented inside the planetarium.

The first Safari Park in Myanmar was opened in Nay Pyi taw on 12th February 2011 as a recreational site for public affair as well as a study site for research activities by conserving biological resources especially with wild animals from domestic and abroad. The Safari park is a National symbol not only for conserving biological resources but also for public recreation.

*Picture-17: Safari Park, Nay Pyi Taw*

The park has a total of 234 populations which includes 16 species of mammals and 3 species of birds. Among them, 8 species of the 54 wild animals were imported from South Africa and 6 kangaroos from Holland. Other animals were transferred from domestic zoological gardens. The Safari park is divided into three main zones namely Africa Safari zone, Australia Safari zone and Asia Safari zone.

### 14.2 National Kandawgyi Garden and National Landmark Garden

National Kandawgyi Garden, a national pride of the people of Myanmar, is situated in Pyin Oo Lwin, 3605 feet above sea level and 44 miles far from Mandalay. Because of its mild weather and fascinating sceneries of forests, flowers, grassland and lakes, National Kandawgyi Garden is very popular for recreation and relaxation, particularly in summer. It is also known as the flower city of Myanmar. The historical development of the Garden started in 1915 with an area of 30 acres. According to records of 1942, there were 178 collections of orchid species.

It was upgraded in the year 2000 to facilitate recreation and enjoyment as well as scientific studies and to place additional collection of indigenous and exotic plant species. Transportation for sightseeing is arranged and the natural vegetation within swamp forest can be seen by walking along jungle trail. The magnificent views of the garden and its adjacent areas can be enjoyed from the top of Nanmyint Tower which is 215 feet high. The Aviary (0.97 acre) was opened in 2005 and globally rare bird species, which are endemic to Myanmar, are also kept for public education.

Accordingly, the objectives of the garden were updated in order to meet the development conducted by the Ministry as follows:

- To provide visitors with recreation;
- To educate the public to understand the importance of environment and to realize the values of plants;
- To become a laboratory for the botanists, florists, researchers and students;
- To facilitate conservation of rare and endangered plant species;
- To enhance ecotourism by promoting garden activities and creating an Ecotourism Center; and
- To exhibit as a National Symbol of Myanmar.

The National Landmark Garden was completed on 15$^{th}$ December 2006 and it has an area of 56.67 acres adjacent to the National Kandawgyi Garden. National Landmarks representing States and Regions of Myanmar were constructed in the form of miniature models after thorough and careful

study of similar archeological designs overseas by the concerned officials and developers from the companies working with the Ministry. Furthermore, within the area of National Landmark Garden, a Modern Playground for children had been constructed and opened to public on 11th December 2008.

*Picture-18: National Kandawgyi Garden*

## 15. INTERNATIONAL COOPERATION

In recent years, Myanmar has welcomed a growing number of international Development Partners, including but not limited to bilateral, multilateral and United Nations (UN) agencies, funds and programs, regional partnerships, international non-government organizations (INGO) and other international organizations. In January 2018, Myanmar issued Development Assistance Policy (DAP), an overarching policy framework and guideline related to development assistance, in order to implement programs and projects that align with the priorities of the country as well as its international commitments, strengthen human and institutional capacity, and support achievement of Sustainable Development Goals.

Like other developing countries, human and institutional capacity, technical capability and sustainable financing are the major challenges to Forest Department in implementing Sustainable Forest Management (SFM) and international commitments related to forestry sector. In order to address these challenges, Forest Department has been cooperating and collaborating with a wide range of development partners in line with DAP in the field of reforestation and forest rehabilitation, forest resource assessment and development of national forest monitoring system, community forestry, climate change mitigation and adaptation through implementation of REDD+, biodiversity conservation, watershed management, mangrove conservation, etc.

As of July 2019, there are 33 on going collaborative projects being implemented with the support of international organizations including UN agencies, INGOs/ NGOs as well as other development partners. Table-19 and Figure-9 show the number of ongoing projects in different fields and annual budget contributed for international cooperation projects, respectively.

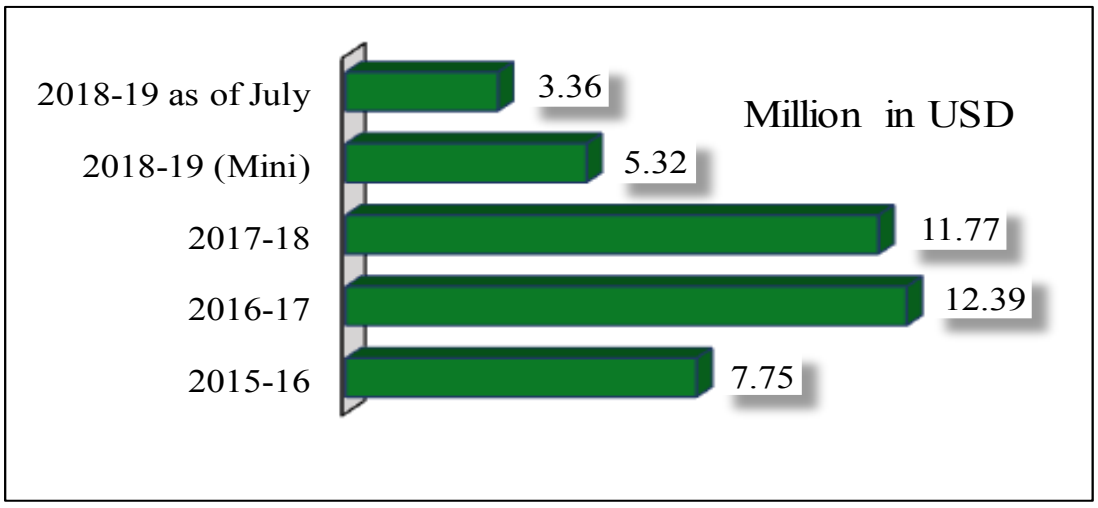



*Figure-9: Total Annual Budget of International Cooperation Projects*

| No. | Areas of Cooperation | No. of Projects |
|---|---|---|
| 1 | Biodiversity | 17 |
| 2 | REDD+ | 4 |
| 3 | Sustainable Forest Management (SFM) | 2 |
| 4 | Mangrove Conservation | 3 |
| 5 | Rural Energy | 1 |
| 6 | Human Resource Development and Research | 1 |
| 7 | Community Forestry | 4 |
| 8 | Watershed Management and Water Quality | 1 |
| 9 | Landuse | 1 |
| | **Total** | **34** |

***Table-19: Ongoing International Cooperation Projects (as of March 2019)***

## 16. CHALLENGES AND OPPORTUNITIES

Despite a substantial contributions and great efforts to achieve sustainable forest management, there are many challenges Forestry Sector is facing. The most significant challenges are:

- High rate of deforestation and forest degradation (i.e. annual deforestation rate of 1.7 percent during 2010-2015)
- Expanding area of reserved forest and protected public forest up to 30 percent of the total country's area as well as protected area coverage up to 10 percent of the total country's area.
- Conflict of interests; powerful (political and economic) interests may favor deforestation and forest degradation
- Conflict of sectoral policies and plans as well as legislation which may accelerate deforestation and forest degradation
- Some of the main drivers of deforestation and forest degradation often lying outside of forest sector (eg. related with agriculture, mining, infrastructure development etc.)
- Weak law enforcement and poor coordination mechanism among line ministries in fighting against illegal logging
- Integration of criteria and indicators into national forest programmes;

While many changings being faced, there are many opportunities to achieve the goals of Forest Policy and sustainable forest management. The major opportunities include:

- Political will and supports to the sustainable forest management and environmental conservation
- Moratorium of timber harvesting in Bago Yoma Region, Home of Teak *Tectona grandis* (**area of 1.5 million ha**) for 10 years starting from 2016-17 fiscal year
- Export ban for the confiscated timber
- Export ban for any log or timber extracted incompliant with sustainable manner, (e,g., conversion timber is no longer allowed to export)
- Export ban of round log since 1$^{st}$ April 2014 not only to promote exporting the value-added

products but also to fulfill the demand of raw materials for domestic wood-based industrial sector.

- Logging below Annual Allowable Cut (AAC) (for teak, under 55% of the AAC and for other hardwoods, under 33%) to reduce deforestation and forest degradation
- Increasing number of capable human resources in forestry sector
- Implementation of the Myanmar Restoration and Rehabilitation Programme (MRRP) for 10-year period (2017-2018 to 2025-2026) with government's budget.

## 17. THE WAY FORWARD

Forest Department under MONREC is committed to achieving the targets of not only Forest Policy (1995), Myanmar Sustainable Development Plan (MSDP) and sustainable forest management but also the international commitments including Nationally Determined Contributions (NDC), Sustainable Development Goals (SDGs) etc. Accordingly, Forest Department will continue to implement the following measures and activities in support of SFM in accordance with the criteria and indicators formulated in the context of Myanmar.

- To reduce/stop the rate of deforestation and forest degradation while increasing forest cover through all appropriate means and ways;
- To systematically conserve and manage existing natural forests and restore degraded ones in accordance with the principles of Myanmar Selection System (MSS) while carrying out reservation to achieve the forest policy target of reserved forest and protected public forest up to 30% of the country's total land area;
- To expand and enhance protected areas (PA) to fulfill the forest policy target of 5% and 10 % target of the 30-year Forestry Master Plan for biodiversity conservation and climate change mitigation benefits through increasing carbon stocks in addition to ecosystem services and social benefits;
- To pay more attention in achieving Myanmar Reforestation and Rehabilitation Programme
- To effectively promote community-based forest management and sustainable agricultural practices such as agroforestry, community forestry, nation-wide tree planting programme, etc.
- To efficiently harvest and utilize forest resources including non-timber forest products to ensure sustainability;
- To strengthen and effectively implement the forest law enforcement, governance and trade (FLEG-T) and Myanmar timber legality assurance system (MTLAS)
- To implement REDD+ to reduce deforestation and forest degradation and enhancement of forest carbon stock and non-carbon benefits

- To promote forestry research, education and extension leading to better understanding of the complex relationship between ecosystems and human well-being;
- To enhance capacity for the implementation of criteria and indicators for sustainable forest management and biodiversity conservation
- To actively cooperate with international communities, private sector, local communities, ethnic groups and relevant stakeholders in addressing issues such as sustainable forest management, climate change, loss of biodiversity and desertification and land degradation, etc.
- To strengthen organizational capacity and institutional framework of the forestry sector for dealing with the dynamic situations of the forestry-related issues and matters in the national as well as global perspectives.
- To strengthen synergies for sustainable forest management through cross-sectoral cooperation and national forest programmes, and
- To promote the incorporation of the economic viability of sustainable forest management in rural development policies and strategies.

## CONVERSION FACTORS

1. Length

| | | | | |
|---|---|---|---|---|
| 1 foot | = 0.3048 metre | ; | 1 m | = 3.28088 ft. |
| 1 mile | = 1.6093 kilometres | ; | 1 km | = 0.6214 mile |

2. Area

| | | | | |
|---|---|---|---|---|
| 1 acre | = 0.4047 hectare | ; | 1 ha | = 2.471 ac |
| 1 sq.mile | = 2.59 sq.km | ; | 1 $km^2$ | = 0.3861 sq.mile |

3. Volume

| | | | | |
|---|---|---|---|---|
| 1 cubic foot | = 0.028317 $m^3$ | ; | 1$m^3$ | = 35.3147 $ft^3$ |
| 1 ton (True) | = 1.4159 $m^3$ | ; | | = 0.7064 true ton |
| 1 ton (Hoppus) | = 1.8024 $m^3$ | ; | | = 0.5448 Hoppus ton |
| 1 ton (True)/ ac | = 3.4986 $m^3$/ ha | ; | 1$m^3$ / ha | = 14.2917 $ft^3$ ac |
| 1 ton (Hoppus)/ ac | = 4.4537 $m^3$/ ha | ; | | |

| | |
|---|---|
| 1 $ft^3$ (stacked) | = 0.66 $ft^3$ Hoppus (Solid) |
| | = 0.84 $ft^3$ True (Solid) |
| 1 bag charocal | = 90 lbs = 40.824 kg |
| | = 16 $ft^3$ Hoppus (Solid) |
| | = 20.372 $ft^3$ True (Solid) |
| 1 cartload firewood | = 45 $ft^3$ (Stacked) |
| | = 29.7 $ft^3$ Hoppus (Solid) |
| | = 37.815 $ft^3$ True (Solid) |
| 1 $ft^3$ (True) | = 0.78598 $ft^3$ Hoppus |