



Food and Agriculture  
Organization of the  
United Nations

# Global Forest Resources Assessment 2020

Report

**Myanmar**

Rome, 2020



FAO has been monitoring the world's forests at 5 to 10 year intervals since 1946. The Global Forest Resources Assessments (FRA) are now produced every five years in an attempt to provide a consistent approach to describing the world's forests and how they are changing. The FRA is a country-driven process and the assessments are based on reports prepared by officially nominated National Correspondents. If a report is not available, the FRA Secretariat prepares a desk study using earlier reports, existing information and/or remote sensing based analysis.

This document was generated automatically using the report made available as a contribution to the FAO Global Forest Resources Assessment 2020, and submitted to FAO as an official government document. The content and the views expressed in this report are the responsibility of the entity submitting the report to FAO. FAO cannot be held responsible for any use made of the information contained in this document.

## TABLE OF CONTENTS

### Introduction

1. Forest extent, characteristics and changes
2. Forest growing stock, biomass and carbon
3. Forest designation and management
4. Forest ownership and management rights
5. Forest disturbances
6. Forest policy and legislation
7. Employment, education and NWFP
8. Sustainable Development Goal 15

# Introduction

## Report preparation and contact persons

The present report was prepared by the following person(s)

Name	Role	Email	Tables
Khine Zaw Wynn	Alternate national correspondent	khinezawwynn2007@gmail.com	All
Myat Su Mon	National correspondent	sumonforest@gmail.com	All

## Introductory text

The Republic of the Union of Myanmar is geographically located in Southeast Asia between latitudes 9°32'N and 28°31'N and longitudes 92°10'E and 101°11'E. Myanmar is bordered by China on the north and northeast, by Laos and Thailand on the east and southeast, and by Bangladesh and India on the west. To its south, there are the Andaman Sea and the Bay of Bengal.

The total area of Myanmar is 676,577km<sup>2</sup>. It stretched for 936 km from east to west and 2051 km from north to south.

The topography of Myanmar can roughly be divided into three parts- the western hill region, the central valley region and the eastern hills region. The central valley region of the Ayeyawady River consists of Sittaung Valley and Chindwin Valley. The eastern hills region is the Shan Plateau. Thanlwin River flows through the Shan Plateau to the northern Tanintharyi Coastal Strip.

Myanmar has three seasons-summer, rainy and cold seasons. The Central Myanmar has an annual rainfall of less than 1,000 mm while the Rakhine coast receives more than 5,000 mm. The average highest temperature in the Central Myanmar during the summer months of March and April 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.

Myanmar forests are diverse and varied in composition and structure and constitute a valuable ecosystem due to their wide extent, varied topography and different climatic conditions. According to the estimation of forest cover assessment 2015 which was conducted under the support of FAO Technical Cooperation Project, about 44% of the country's total land area is still covered with natural forests.

In Myanmar, forest resources play a critical role in supporting the livelihood of the people and the national economy. Reliable information on extent, composition and density of forests is very important for its sustainable development.

In order to inform forest resource information to multistakeholders; decision makers, related departments and stakeholders who are concering with both forestry sector and non-forestry sector, Forest Department prepared the FRA2020 country report with the technical support of FAO and respective technical institutions such as Servir Mekong and ADPC.

1 Forest extent, characteristics and changes

1a Extent of forest and other wooded land

National data

Data sources

1989	References	GOM. 1991. Forest Cover of Myanmar, the 1989 Appraisal. Kyaw Tint and TunHla, Yangon January 1991.
	Methods used	National Forest Inventory, Sample-based remote sensing assessment, Full-cover forest/vegetation maps
	Additional comments	

1998	References	GOM. 1998. Anti-narcotic sampling frame mapping, Landuse Map of Shan States using 2001 Landsat 7 ETM data.
	Methods used	Full-cover forest/vegetation maps, Sample-based remote sensing assessment
	Additional comments	

2006	References	Remote sensing interpretation-National Map developed by Remote Sensing and GIS section, Planning and Statistics Division of Forest Department
	Methods used	Full-cover forest/vegetation maps
	Additional comments	

2010	References	National Map developed by Remote Sensing and GIS section, Planning and Statistics Division of Forest Department
	Methods used	Full-cover forest/vegetation maps
	Additional comments	Around 2010, it was impossible to apply Landsat images due to the sensors’ technical problem. Forest Department applied IRS Liss3 satellite images (77 images in total for whole country) which were acquired during 2010 to produce source forest cover map for FRA 2015. Our expectation was in order to do the forest change detection and spatial resolution (24 m x 24 m) of the IRS Liss3 satellite images is comparable to the previous assessment. In addition, there were two visual bands, NIR band in IRS image and this is supportive to forest cover assessment.

2015	References	This source data was one outcomes of FAO Technical Cooperation Programme(TCP) project “Strengthening Myanmar’s National Forest Monitoring System - Land Use Assessment and Capacity Building” (TCP/MYA/3501).
	Methods used	Full-cover forest/vegetation maps
	Additional comments	Land use and land cover (LULC) map of Myanmar for 2015 was produced through supervised classification of Landsat 8 images.

Classifications and definitions

--	--	--

1989	National class	Definition
	Closed Forest	
	Open forest	
	Other wooded land	

1998	National class	Definition
	Closed Forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover of more than 40 percent, or trees able to reach these threshold in situ.
	Open forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover between 10 and 40 percent, or trees able to reach these thresholds in situ.
	Other wooded land	Areas mostly covered by grassland and stunted trees, shrub forests, lower that 10% crown density.

2006	National class	Definition
	Closed Forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover of more than 40 percent, or trees able to reach these threshold in situ.
	Open forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover between 10 and 40 percent, or trees able to reach these thresholds in situ.
	Other wooded land	Areas mostly covered by grassland and stunted trees, shrub forests, lower that 10% crown density.

2010	National class	Definition
	Closed Forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover of more than 40 percent, or trees able to reach these threshold in situ.
	Open Forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover between 10 and 40 percent, or trees able to reach these thresholds in situ.
	Mangrove	Area covered by Mangrove tree species as interpreted from satellite imagery and aerial photographs
	Other Wooded Land	Areas mostly covered by grassland and stunted trees, shrub forests, lower that 10% crown density.
	Others	All land that is not classified as "Forest" or "Other wooded land"
	Water	Inland water bodies, lakes, reservoirs, large streams and rivers

2015	National class	Definition
	Closed Forest	

		Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover of more than 40 percent, or trees able to reach these threshold in situ.
	Open Forest	Under forestry or no land use, spanning more than 0.5hectares; with trees higher than 5 meters and a canopy cover between 10 and 40 percent, or trees able to reach these thresholds in situ.
	Mangrove	Area covered by Mangrove tree species as interpreted from satellite imagery and aerial photographs
	Other Wooded lands	Land not classified as “Forest” spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of 5-10 percent or trees able to reach these thresholds; or with a combined cover of shrubs bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
	Others	All land that is not classified as “Forest” or “Other wooded land”; consisting of permanent agriculture areas mostly from plains and valleys; in some cases it is mixed with shifting cultivation, settlement areas, snow, rock, bareland, sandbanks etc.....
	Water	Inland water bodies, lakes, reservoirs, large streams and rivers

Original data and reclassification

1989	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Closed Forest	31 553.80	100.00 %	0.00 %	0.00 %
	Open forest	8 131.10	100.00 %	0.00 %	0.00 %
	Other wooded land	15 080.00	0.00 %	100.00 %	0.00 %
	Total	54 764.90	39 684.90	15 080.00	0.00

1998	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Closed Forest	25 516.60	100.00 %	0.00 %	0.00 %
	Open forest	9 970.50	100.00 %	0.00 %	0.00 %
	Other wooded land	15 080.00	0.00 %	100.00 %	0.00 %
	Total	50 567.10	35 487.10	15 080.00	0.00

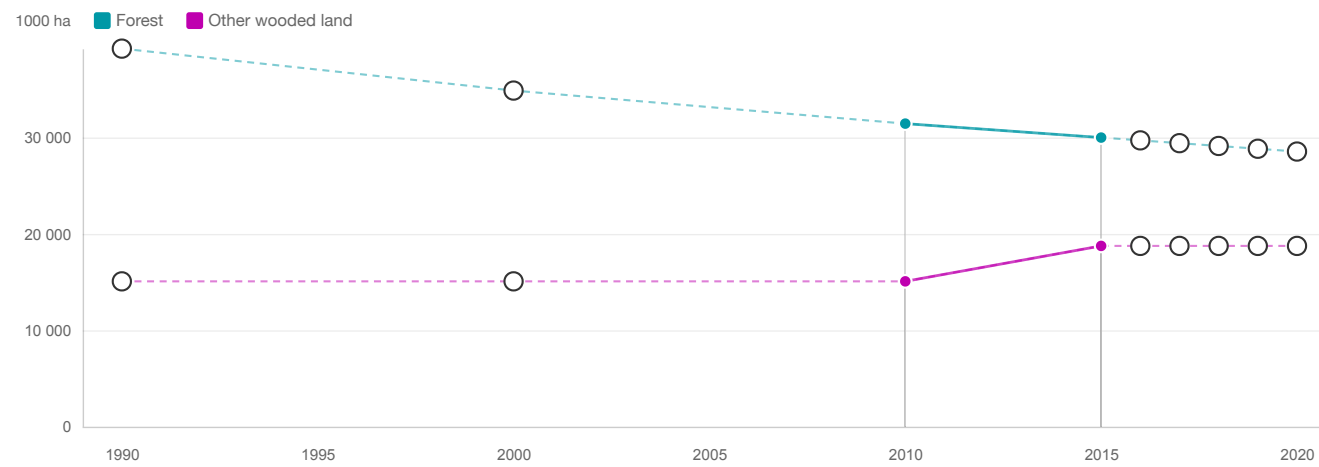
2006	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land

	Closed Forest	17 468.58	100.00 %	0.00 %	0.00 %
	Open forest	15 542.56	100.00 %	0.00 %	0.00 %
	Other wooded land	15 080.00	0.00 %	100.00 %	0.00 %
	<b>Total</b>	<b>48 091.14</b>	<b>33 011.14</b>	<b>15 080.00</b>	<b>0.00</b>

2010	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Closed Forest	14 753.00	100.00 %	0.00 %	0.00 %
	Open Forest	16 148.00	100.00 %	0.00 %	0.00 %
	Mangrove	540.00	100.00 %	0.00 %	0.00 %
	Other Wooded Land	15 080.00	0.00 %	100.00 %	0.00 %
	Others	18 836.00	0.00 %	0.00 %	100.00 %
	Water	2 301.00	0.00 %	0.00 %	100.00 %
	<b>Total</b>	<b>67 658.00</b>	<b>31 441.00</b>	<b>15 080.00</b>	<b>21 137.00</b>

2015	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Closed Forest	12 411.23	100.00 %	0.00 %	0.00 %
	Open Forest	17 109.97	100.00 %	0.00 %	0.00 %
	Mangrove	471.24	100.00 %	0.00 %	0.00 %
	Other Wooded lands	18 756.05	0.00 %	100.00 %	0.00 %
	Others	16 938.25	0.00 %	0.00 %	100.00 %
	Water	1 971.14	0.00 %	0.00 %	100.00 %
	<b>Total</b>	<b>67 657.88</b>	<b>29 992.44</b>	<b>18 756.05</b>	<b>18 909.39</b>





FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest (a)	39 218.48	34 868.11	31 441.00	29 992.44	29 702.73	29 413.02	29 123.31	28 833.60	28 543.89
Other wooded land (a)	15 080.00	15 080.00	15 080.00	18 756.05	18 756.05	18 756.05	18 756.05	18 756.05	18 756.05
<b>Other land (c-a-b)</b>	<b>11 009.52</b>	<b>15 359.89</b>	<b>18 787.00</b>	<b>16 559.51</b>	<b>16 849.22</b>	<b>17 138.93</b>	<b>17 428.64</b>	<b>17 718.35</b>	<b>18 008.06</b>
<b>Total land area (c)</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>	<b>65 308.00</b>

The FAOSTAT land area figure for the year 2015 is used for all reference years

Climatic domain	% of forest area 2015	Override value
Boreal	0.00	0.00
Temperate	0.00	0.00
Sub-tropical	0.00	0.00
Tropical	100.00	100.00

## Comments

Planning and Statistics Division, Forest Department-FD, under Ministry of Natural Resources and Environmental Conservation-MONREC is the organization responsible for collection, analysis and reporting on forest resource status.

Under Planning and Statistics Division, there are three specific sub-divisions; i.e. Remote Sensing and GIS Section, Computer Section(i.e. responsible for Data Analysis on forest inventory data) and Inventory Section, are mainly responsible for forest resource assessment using Remote Sensing base and national forest inventory, district management inventory and other forest inventory for various objectives concerning with sustainable forest management.

The data used in this FRA 2020 country report are generated and analysis by the above three main sections through the coordination with other related divisions under FD.

In previous FRA 2015, estimation of forest area for 1990, 2000, 2005, 2010 and 2015 were done by using change forecast function using 1989, 1998, 2006 and 2010 source datasets. Estimation for other wooded land has been done using 2006 figures and applying the change rate from the 1989 and 1998 figures to the 2006 to calculate 1990, 2000, 2005 and 2010 figures.

In addition to this, source data of forest cover (1975 and 1989) were still being used as national data points. That figure was applied to estimate forest cover of 1990 which is the same figure of FRA2015. 2000 figure was then calculated as interpolation of 1990.

There are also national forest cover maps (digital and GIS format) for three different periods, i.e. 2005,2010 and 2015 which are represented as national data sets.

In January 2018, Myanmar submitted its initial Forest Reference Emission Level (FREL) to UNFCCC. During the time of FREL preparation, country team tried to estimate its forest cover and forest lost areas (deforested areas) to be more accurate. Through a series of consultation meetings for Myanmar FREL submission, the proposed reference period was identified as the period from the years 2005 to 2015, due to the availability of the most reliable national existing Activity Data (AD) and Emission Factors (EF) for this period.

The last land use and land cover (LULC) map of Myanmar for 2015 was produced through supervised classification of Landsat 8 images with the technical support under FAO Technical Cooperation Programme (TCP) project “Strengthening Myanmar’s National Forest Monitoring System - Land Use Assessment and Capacity Building” (TCP/MYA/3501). Country team also checked back the 2005 and 2010 forest cover datasets to be more consistent of mapping , consistencies in classification procedures, etc... However, after the detailed evaluation, there are some errors due to inconsistencies in geo-locations within temporal maps, especially with 2005 datasets. In addition, the mapping datasets of year 2005 were not from the same reference year and the map had been produced using Landsat imagery collected during 2004-2007. That might affecting on the estimation of forest cover data.

Therefore, the amount of deforestation (forest loss) has been estimated using a sample-based approach as an independent and consistent method to derive estimates on areas of forest, non-forest and deforestation between 2005 and 2015. Among various types of probability-based sampling design, stratified random sample (STRS) design has been used. Given the limitations of the wall-to-wall maps, as described above, Global Forest Change maps (Hansen et al., 2013) were used to generate the strata map for the years 2005-2015. The freely available GFC maps, year 2000 tree canopy cover map and annualized loss map, have been produced following a transparent and consistent methodology and, therefore, offer a complete application of the independent sample-based approach. The GFC maps were adjusted to the forest definition; a minimum of 5 m canopy height and a minimum tree canopy cover of 10% within a 0.5 ha area. Through the *Stratified Area Estimator – Design* tool within FAO's **System for Earth Observation Data Access, Processing and Analysis for Land Monitoring** (SEPAL), a total of 1,884 stratified random samples were generated using the GFC-based strata map of 2005-2015. The validation process followed recognized design considerations in which three distinctive and integral phases are identified: **sampling design**, **response design**, and **analysis and estimation** (Stehman and Czaplewski, 1998). Detail methodology of FREL/FRL activity data estimation in Myanmar report at UNFCCC webpage. After Technical Assessment process of UNFCCC, Myanmar changed FREL to FRL and the deforestation loss from the Myanmar FRL report was gross forest cover loss for the reference period 2005 and 2015.

Although consistency among FRL, GHGs Inventory reporting and FRA reporting was highly considered by Myanmar, the difference in areas of annual deforestation are mainly due to the different reference periods and also different estimation methods. The reference period does not overlap with the INC, which used data from the year 2000 as well as FRL reference period. Data used in INC were generated by expert assumption and judgement. The INC used EF which is based on IPCC global default factors and AD which is based on the projected data of FRA 2000.

Due to the different reference periods, the forest area loss used in FRA2020 is different from the Myanmar FRL report in which reference period was 2005 to 2015. Myanmar used forest area lost (ha) that is mainly based on 2010 and 2015 national datasets after validation process.

Due to the technical challenges and limitation of field data, Myanmar would like to update other wooded land area estimation in coming FRA; i.e. FRA2025. Myanmar assumed that other wooded land estimation of current national data sets were not reliable for 2010. Current report, Myanmar used other wooded land areas estimated in 2015 National Data set. Myanmar assumed that stability of other wooded land and would like to continuously estimate the same value of 2015 up to 2020. Again, we assumed that 2010 figure for other wooded land was not reliable and therefore it has been adjusted. In coming future, Myanmar would like to revise other wooded land figure with more clear methodology.

Forest: forest area 1990 calculated by interpolation of 1989 and 1998. Forest area 2000 calculated by interpolation of 1998 and 2006. 2016 onward calculated using 2010-2015 trend.

Other wooded land: 2010 area used to estimate also 1990 and 2000. Area 2000 calculated by interpolation of 1998 and 2006. Area considered constant from 2015 onward because the linear estimation would lead to a not realistic trend.

Forest area figures for 2010 and 2015 differ slightly from what previously reported to FRA 2015 because of availability of updated information used to generate estimates.

# 1b Forest characteristics

## National Data

### Data sources + type of data source eg NFI, etc

According to the definition of the FRA2020, Myanmar developed the areas for naturally regenerating forest and plantation forest based on the areas of establishment of forest plantations annually.

As provision of forest resources, especially timber and fuelwood from natural forests alone is insufficient to fulfill demands for forest products, establishment of forest plantation by various objectives and scales was conducted since 1970s. The data used in FRA2020 were departmental figures developed by Natural Forest and Plantation Division of Forest Department.

### National classification and definitions

Government Plantation: Under different reforestation and rehabilitation programs, FD has been establishing different types of forest plantations such as commercial plantation, watershed plantation, local supply plantation, industrial plantation by government budgets. Government Plantation covers the all types of plantaion established by government budgets.

Private Plantation: Private Plantation covers all plantation developed under private plantation program that was launched in 2006 with the objective of promoting private investment in plantation forestry.

### Original data

Year	Total Government Plantation Area (ha)	Private Plantation Area (ha)	total area (ha)	Cumulative areas (ha)
1989-1990	30,698		30,698	30,698
up to 2000	30,715 (we assumed based on FRA2015 Data)		30,715	30,715
2000-2001	30,718		30,718	30,718
2001-2002	30,756		30,756	61,474
2002-2003	31,396		31,396	92,870
2003-2004	30,441		30,441	123,310
2004-2005	31,974		31,974	155,285
2005-2006	33,201		33,201	188,486
2006-2007	28,328	113	28,441	216,927
2007-2008	25,670	2,765	26,666	243,593
2008-2009	26,504	5,087	29,373	272,966
2009-2010	25,349	9,933	32,271	305,237
2010-2011	17,729	11,189	26,189	331,426
2011-2012	14,253	13,110	24,846	356,273
2012-2013	9,248	11,032	17,264	373,536
2013-2014	11,281	12,283	18,354	391,890
2014-2015	8,806	10,895	14,133	406,023
2015-2016	7,805	10,371	12,354	418,377
2016-2017	3076	5637	8,713	427,090

## Analysis and processing of national data

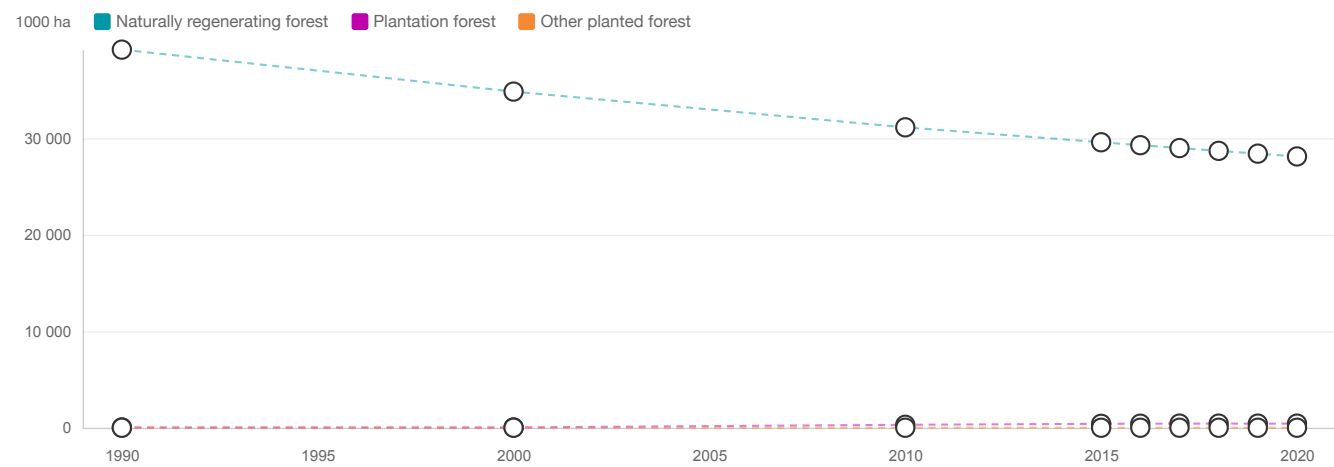
### **Estimation and forecasting**

Planted forest area of 1990 data source was from FRA2015 report where as data sources From 2000 to 2017 are mentioned in the original data section.

Estimation is only conducted for 2018, 2019 and 2020 by using the already established plantation areas up to 2017.

### **Reclassification into FRA 2020 categories**

Reclassification into FRA2020 categories is done by following to the instructions of FRA2020 report and national definition.



FRA categories	Forest area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest (a)	39 187.30	34 837.28	31 134.92	29 586.42	29 284.52	28 986.26	28 696.72	28 407.17	28 117.63
<b>Planted forest (b)</b>	<b>30.70</b>	<b>30.72</b>	<b>305.24</b>	<b>406.02</b>	<b>418.38</b>	<b>427.09</b>	<b>427.09</b>	<b>427.09</b>	<b>427.09</b>
Plantation forest	30.70	30.72	305.24	406.02	418.38	427.09	427.09	427.09	427.09
...of which introduced species									
Other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total (a+b)</b>	<b>39 218.00</b>	<b>34 868.00</b>	<b>31 440.16</b>	<b>29 992.44</b>	<b>29 702.90</b>	<b>29 413.35</b>	<b>29 123.81</b>	<b>28 834.26</b>	<b>28 544.72</b>
<b>Total forest area</b>	<b>39 218.48</b>	<b>34 868.11</b>	<b>31 441.00</b>	<b>29 992.44</b>	<b>29 702.73</b>	<b>29 413.02</b>	<b>29 123.31</b>	<b>28 833.60</b>	<b>28 543.89</b>

## Comments

Myanmar assumed that planted forest and plantation forest are the same.

Myanmar recognizes the potential importance of plantation and forest restoration measures to climate change mitigation efforts.

As provision of forest resources, especially timber and fuelwood from natural forests alone is insufficient to fulfill demands for forest products, establishment of forest plantation by various objectives and scales was conducted since 1970s. Under different reforestation and rehabilitation programs, FD has been establishing different types of forest plantations such as commercial plantation, watershed plantation, local supply plantation, industrial plantation within its limited manpower and budget. With the objective of promoting private investment in plantation forestry, private plantation program was launched in 2006.

FD introduced very specific plan of 10-year Myanmar Reforestation and Rehabilitation Program (MRRP) from 2017-2018 to 2026-2027 in order to enhance economic and environmental conditions of the country through national reforestation and rehabilitation program. Therefore, the establishment of new forest plantations on heavily depleted forests (land cover is not fit with forest cover definition) and the restoration of heavily depleted forests through reforestation, enrichment planting and natural regeneration through silvicultural operations will play key role.

## 1c Primary forest and special forest categories

### National Data

#### Data sources + type of data source eg NFI, etc

Data sources are from the previous data and also from the FRA2015 Myanmar report.

#### National classification and definitions

-

#### Original data

There are no national figures on primary forest. WCMC reports a total protected areas of 3.192 million hectares and it is assumed that this area can be a quite reliable proxy to estimate primary forest.

### Analysis and processing of national data

#### Estimation and forecasting

Mangrove areas of 1990, 2000 were from FRA2015 report and that of 2010 and 2015 are from national datasets;i.e. 2015 was from the original data of Table 1a.

Mangroves area for 2020 was estimated forecasting 2010-2015 National Dataset figures.

#### Reclassification into FRA 2020 categories

-



FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Primary forest	3 192.00	3 192.00	3 192.00	3 192.00	3 192.00
Temporarily unstocked and/or recently regenerated					
Bamboos					
Mangroves	517.00	486.00	539.59	471.24	402.89
Rubber wood					

Comments

Although there is some bamboo break forests (and bamboo dominated forests) in Myanmar, there is still lack of data for bamboo. And Myanmar could not specify bamboo areas in this report.

Also there is lack of data sets for rubber wood.

# 1d Annual forest expansion, deforestation and net change

## National Data

### Data sources + type of data source eg NFI, etc

The Government of Myanmar recognizes the potential importance of plantation and forest restoration measures to climate change mitigation efforts. On the other hands, the provision of forest resources, especially timber and fuelwood from natural forests alone is insufficient to fulfill demands for forest products. Establishment of forest plantation by various objectives and scales was conducted since 1970s. Under different reforestation and rehabilitation programs, Forest Department (FD) has been establishing different types of forest plantations such as commercial plantation, watershed plantation, local supply plantation, industrial plantation. With the objective of promoting private investment in plantation forestry, private plantation program was launched in 2006. FD has been promoting community forestry program since 1995. FD introduced very specific plan of 10 year Myanmar Reforestation and Rehabilitation Program (MRRP) from 2017-2018 to 2026-2027 in order to enhance economic and environmental conditions of the country through national reforestation and rehabilitation program. Therefore, the establishment of new forest plantations on heavily depleted forests (land cover is not fit with forest cover definition) and the restoration of heavily depleted forests through reforestation.

### National classification and definitions

Forest plantations in Myanmar are established on land that was normally heavily degraded or on grass, savannah and bush/scrub land, often accompanied by bamboo with only occasional occurrence of trees, i.e. areas that fall outside of the definition of forests.

### Original data

Areas of annual forest expansion by means of the establishment of newly planted plantation was already presented in above section.

## Analysis and processing of national data

### Estimation and forecasting

FD has been made a cut and a zero baseline effectively been established for the year 2000 accordig to Myanmar initial FRL. The reasons for this were due to the difficulties to assume the level of reliability of area data for the years before 1990s and due to an unknown number of older plantations have likely been disappeared and transformed in other land uses according to expert judgements from FD. Therefore, it can be assumed to be on the safe side with forest expansion.

### Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Forest expansion (a)	0.00	27.45	20.16	4.21
...of which afforestation	0.00	27.45	20.16	4.21
...of which natural expansion				
Deforestation (b)	435.00	370.15	309.87	293.92
Forest area net change (a-b)	<b>-435.04</b>	<b>-342.71</b>	<b>-289.71</b>	<b>-289.71</b>

## Comments

Estimation was done by expert judgement in this report.

In absence of a reliable baseline map of forest gain, much uncertainty exists in identification of forest gain (enhancement) classes while using remote sensing technologies because of difficulties in distinguishing between afforestation and growing cycles of the forest plantations, and difficulties in identifying the ecological pattern of forest regrowth following deforestation. Therefore, forest expansion due to the newly planted area and naturally regenerated areas should be identified as one of the areas of future improvement for forest monitoring system.

1e Annual reforestation

National Data

Data sources + type of data source eg NFI, etc

-

National classification and definitions

-

Original data

-

Analysis and processing of national data

Estimation and forecasting

-

Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Reforestation				

Comments

Although there are afforestation programme in Myanmar through people participation in the greening season (i.e. June to August) throughout the country, we don't have specific data on it. Many institutions and local communitites are trying with their own effort to plant new woodlots. Up to now, dataset is not yet ready.

1f Other land with tree cover

National Data

Data sources + type of data source eg NFI, etc

-

National classification and definitions

-

Original data

-

Analysis and processing of national data

Estimation and forecasting

-

Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Palms (a)					
Tree orchards (b)					
Agroforestry (c)					
Trees in urban settings (d)					
Other (specify in comments) (e)					
Total (a+b+c+d+e)	–	–	–	–	–
Other land area	11 009.52	15 359.89	18 787.00	16 559.51	18 008.06

Comments

There is lack of adequate data in order to report for above table.

## 2 Forest growing stock, biomass and carbon

### 2a Growing stock

#### National Data

##### Data sources + type of data source eg NFI, etc

The first national scale ground survey-based forest inventory with a probability sampling approach was initiated in 1980-81 (first phase) and supported by a UNDP/FAO project (first phase) which eventually was extended until 1992 (second phase). The target precision for the key parameter (timber volume) was an error margin of 20% (at 95% confidence level) at the 50,000 ha level. However, the NFI work was never fully finished for several reasons. Since then, the Forest Department has carried on with district level inventories for periodic management planning purposes including the definition of annual allowable cut (AAC) planning and the development of stand and stock tables at the forest management unit (FMU) level. The inventory design is based on the former NFI design with a systematic distribution of plots within two basic strata: closed forests ( $\geq 40\%$  tree cover) and open forests ( $\geq 10\%$  -  $<40\%$  tree cover). For the plot design, over the years four different types were in use: (1) the 1.05 ha L shape original NFI plot, (2) a nested rectangular 1 ha plot with two sub-plots in the upper right edge of the main plot area, (3) a circular 50 m radius plot and (4) a rectangular 1-acre size plot.

The best available data are therefore the management plan inventory data and district level inventories were carried out in 40 districts (here we used 39 as combine use of Taunggyi) out of 68 districts during the period of 2005-2017. For the remaining 28 districts no full inventory data are available as yet. However, the management plan inventory data cover forests in 11 out of 15 states and regions of Myanmar and all tropical and sub-tropical forest types, with the exception of Mangroves, and high mountain temperate hardwood and conifer forests (the latter to be found mostly in protected areas). The data were generated from 11,284 inventory plots of district level forest inventory that were collected during 2005 to 2017.

##### National classification and definitions

Growing Stock means the sum total of all trees, by number or volume or biomass, growing within a particular area of interest. Myanmar Forest Department measures all living trees over 20cm diameter at breast height (1.3m) in district forest inventory. Volume equations (only cover for above 20 cm DBH trees)were constructed in the manner of forest inventory surveys during 1980s and used to calculate tree volume. Sample trees are measured from 30cm above ground to the crown point is taken as length and calculated. Branches etc. are not measured. This means growing stock given is the commercial (marketable part as timber) above stump.

##### Original data

No.	District Name	Year	Total Volume per ha	Sample Size in Ha	Total Volume per ha
1	Bago	2012	7688.36	567.00	13.56
2	Dawei	2015	13746.05	44.11	311.61
3	Falam	2015	10490.28	64.35	163.03
4	Hinthada	2015	2715.29	53.41	50.84
5	Bhamo	2004-2007	19181.55	448.35	42.78
6	Myitkyina	2004-2007	11692.49	210.00	55.68
7	Katha	2015	17877.25	661.00	27.05
8	Shwebo	2015	3556.66	174.00	20.44
9	Monywa	2015	5056.13	190.00	26.61
10	Magwe	2013	93.36	8.00	11.67
11	Gangaw	2013	9460.12	311.00	30.42
12	Minbu	2013	11337.91	467.00	24.28
13	Pakkoku	2013	532.76	33.00	16.14
14	Thayet	2013	7052.22	274.00	25.74
15	Myaungmya	2015	29.68	7.85	3.78
16	Dakinathiri	2008	2990.50	110.25	27.12
17	Ottarathiri	2008	1797.67	101.85	17.65



18	Pyarpon	2015	27.56	19.02	1.45
19	Pyay	2017	8933.96	430.00	20.78
20	Sittwe	2005	933.22	6.30	148.13
21	Taungoo	2010	21707.75	755.55	28.73
22	Thandwe	2015	3613.39	115.45	31.30
23	Tharyarwaddy	2011	8658.54	350.29	24.72
24	Kalay	2014	26476.15	869.00	30.47
25	Khamti	2015	19780.44	951.00	20.80
26	Mawlaik	2014	38907.89	971.00	40.07
27	Tamu	2014	806.90	45.00	17.93
28	Linkhay	2007	8772.59	245.70	35.70
29	Taunggyi(North and South)	2007	8318.78	570.25	14.59
30	Kyaukme	2007	37747.44	544.95	69.27
31	Pathein	2015	1200.01	59.69	20.10
32	Kyaukphyu	2015	5649.64	88.63	63.74
33	Maungdaw	2005	830.45	54.60	15.21
34	MyaukOo	2005	1393.86	80.85	17.24
35	KyaukSe	2015-16	4626.06	163.00	28.38
36	Mandalay	2015-16	250.91	19.00	13.21
37	Meiktila	2015-16	1324.27	90.00	14.71
38	Pyin Oo Lwin	2015-16	11285.65	465.00	24.27
39	Yamethin	2015-16	1114.37	77.00	14.47
			337658.07	10696.46	31.57
					Mean Per Volume per ha (only for above 20 cm DBH trees)

## Analysis and processing of national data

### Estimation and forecasting

According to the definition of the growing stock means the sum total of all trees, by number or volume or biomass, growing within a particular area of interest. Myanmar Forest Department measures all living trees over 20cm diameter at breast height (1.3m) in district forest inventory. Volume equations (only cover for above 20 cm DBH trees)

Although inventory data are available in Myanmar, developed volume equations only cover for above 20 cm DBH trees. The above mention table of national data sets cover the data only for these big trees. Therefore, we would like to use the

### Reclassification into FRA 2020 categories

-

FRA categories	Growing stock m³/ha (over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57
Planted forest	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57
...of which plantation forest	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57
...of which other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57	31.57
Other wooded land									

FRA categories	Total growing stock (million m³ over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	1 237.14	1 099.81	982.93	934.04	924.51	915.10	905.96	896.81	887.67
Planted forest	0.97	0.97	9.64	12.82	13.21	13.48	13.48	13.48	13.48
...of which plantation forest	0.97	0.97	9.64	12.82	13.21	13.48	13.48	13.48	13.48
...of which other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest	1 238.13	1 100.79	992.59	946.86	937.72	928.57	919.42	910.28	901.13
Other wooded land									

## Comments

The growing stock in this report only cover the big trees, i.e. above 20 cm DBH.

Myanmar don't have the accurate data concerning with planted forest so the growing stock of naturally regenerating forest was used for the planted forest.

Myanmar is planning to conduct forest inventory in other wooded land in future NFI.

## 2b Growing stock composition

### National Data

#### Data sources + type of data source eg NFI, etc

The data sources are the same with above section concerning with growing stock.

#### National classification and definitions

-

#### Original data

Sr.	Common Name	Scientific Name	Total Volume of all inventory areas
1	In	Dipterocarpus tuberculatus	22618.73
2	Kanyin	Dipterocarpus spp.	48904.78
3	Kyun	Tectona grandis	20055.81
4	Pyinkado	Xylia dolabriformis	17363.28
5	Ingyin	Pentacme siamensis	10290.11
6	Taukkyan	Terminalia tomentosa	15291.91
7	Thitya	Shorea oblongifolia	7197.31
8	Thabye	Eugenia spp.	7585.63
9	Sagat	Quercus spicata	5741.23
10	Thadi	Protium serrata	6250.59
11	total others (remaining species)		176358.67
	total		337658.07

### Analysis and processing of national data

#### Estimation and forecasting

-

#### Reclassification into FRA 2020 categories

-

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#1 Ranked in terms of volume	Dipterocarpus tuberculatus	In	82.93	73.73	66.49	63.42	60.36
#2 Ranked in terms of volume	Dipterocarpus spp.	Kanyin	179.31	159.42	143.75	137.13	130.50
#3 Ranked in terms of volume	Xylia dolabriformis	Pyinkado	73.53	65.38	58.95	56.24	53.52
#4 Ranked in terms of volume	Terminalia tomentosa	Taukkyan	63.66	56.60	51.04	48.69	46.33
#5 Ranked in terms of volume	Pentacme siamensis	Ingyin	37.73	33.54	30.25	28.85	27.46
#6 Ranked in terms of volume	Shorea oblongifolia	Thitya	56.07	49.85	44.95	42.88	40.81
#7 Ranked in terms of volume	Schima wallichii	Laukya	26.39	23.46	21.16	20.18	19.21
#8 Ranked in terms of volume	Tectona grandis	Kyun	27.81	24.73	22.30	21.27	20.24
#9 Ranked in terms of volume	Castanopsis spp.	Thit-e	21.05	18.72	16.88	16.10	15.32
#10 Ranked in terms of volume	Melanorrhoea usitata	Thitsi	22.92	20.38	18.37	17.53	16.68
Remaining native tree species			646.61	574.89	518.39	494.50	470.62
Total volume of native tree species			1 238.01	1 100.70	992.53	946.79	901.05
Introduced tree species							
#1 Ranked in terms of volume							
#2 Ranked in terms of volume							
#3 Ranked in terms of volume							
#4 Ranked in terms of volume							

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#5 Ranked in terms of volume							
Remaining introduced tree species							
Total volume of introduced tree species			–	–	–	–	–
Total growing stock			1 238.01	1 100.70	992.53	946.79	901.05

Comments

2c Biomass stock

National Data

Data sources + type of data source eg NFI, etc

As mention in Section 2a, the data generated from 11,284 inventory plots of district level forest inventory that were collected during 2005 to 2017

National classification and definitions

-

Original data

Description of the forest types and respective value of R (Ratio of BGB to AGB) and Litter Range for each district (Myanmar FRL 2018, May Version)

Sr. No.	Forest Type according to NFI Field Instruction 1985 of Myanmar	Districts	Forest Type for BGB Calculation	R Value Range	Litter Range (Tonne C per ha)
1	Mangrove, typical	Kyaukphyu	Tropical Rain Forest	0.37	2.1
	Mangrove, high (kanazo forest)	Pyarpon			
3	Swamp forest	Bago, Dawei, Bhamo, Katha, Shwebo, Minbu, Thayet, Myaungmya, Kalay, Mawlaik, Taunggyi South, Kyaukme, Pathein, Maungdaw, MyaukOo, Pyin Oo Lwin	Tropical Rain Forest	0.37	2.1
	Evergreen forest, riverine	Bago, Myaungmya, Thandwe, Kalay, Khamti, Mawlaik, Tamu, Taunggyi South			
4	Evergreen forest, typical	Bhamo, Myitkyina, Katha, Thayet, Myaungmya, Pyay, Thandwe, Khamti, Kyaukme, Pathein, Kyaukphyu	Tropical Rain Forest	0.37	2.1
	Evergreen forest, giant	Bago, Bhamo, Myitkyina, Katha, Minbu, Thayet, Myaungmya, Kalay, Khamti, Mawlaik, Tamu, Pathein			
	Bamboo forest (degraded rain forests)	Bago, Katha, Minbu, Thayet, Pyay, Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Pathein, Pyin Oo Lwin			
5	Mixed deciduous forest, lower	Bago, Hinthada, Bhamo, Katha, Shwebo, Monywa, Magwe, Gangaw, Minbu, Thayet, Dakinathiri, Ottarathiri, Pyay, Taungoo, Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Linkhay, Taunggyi North, Taunggyi South, Kyaukme, Maungdaw, MyaukOo, KyaukSe, Pyin Oo Lwin, Yamethin	Tropical Moist Deciduous Forest	AGB< 125 Tonne/ Ha = 0.20 (0.09-0.25) AGB> 125 Tonne/Ha = 0.24 (0.22-0.33)	2.1
	Mixed deciduous forest, upper moist	Bago, Hinthada, Bhamo, Myitkyina, Katha, Shwebo, Monywa, Gangaw, Minbu, Pakkoku, Thayet, Dakinathiri, Ottarathiri, Taungoo: Nay Pyi Taw, Taunggyi: Nay Pyi Taw, Pyay, Sittwe, Taungoo, Thandwe, Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Linkhay, Taunggyi North, Taunggyi South, Kyaukme, Kyaukphyu, Maungdaw, MyaukOo, KyaukSe, Meiktila, Pyin Oo Lwin, Yamethin			
6	Mixed deciduous	Bago, Hinthada, Bhamo, Myitkyina, Katha, Shwebo, Monywa, Magwe, Gangaw, Minbu, Pakkoku, Thayet, Dakinathiri, Ottarathiri, Taungoo: Nay Pyi Taw, Pyay, Taungoo,	Tropical Moist	AGB< 125 Tonne/ Ha = 0.20 (0.09-0.25) AGB>	2.1

	forest, upper dry	Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Linkhay, Taunggyi North, Taunggyi South, Kyaukme, Pathein, MyaukOo, KyaukSe, Mandalay, Meiktila, Pyin Oo Lwin, Yamethin	Deciduous Forest	125 Tonne/Ha = 0.24 (0.22-0.33)	
7	Dipterocarp (indaing) forest, high	Bhamo, Myitkyina, Katha, Shwebo, Monywa, Gangaw, Minbu, Pakkoku, Thayet, Dakinathiri, Pyay, Taungoo, Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Linkhay, Taunggyi North, Taunggyi South, Kyaukme, KyaukSe, Mandalay, Pyin Oo Lwin	Tropical Dry Forest	AGB< 20 Tonne/ Ha = 0.56 (0.28-0.68) AGB> 20 Tonne/Ha = 0.28 (0.27-0.28)	2.1
	Dipterocarp (indaing) forest, low	Bhamo, Myitkyina, Katha, Shwebo, Monywa, Gangaw, Minbu, Pakkoku, Thayet, Dakinathiri, Ottarathiri, Pyay, Taungoo, Tharyarwaddy, Kalay, Khamti, Mawlaik, Tamu, Linkhay, Taunggyi North, Taunggyi South, Kyaukme, KyaukSe, Mandalay, Meiktila, Pyin Oo Lwin, Yamethin			
8	Dry forest, than-dahat	Shwebo, Gangaw, Minbu, Pakkoku, Taungoo, Taunggyi North, Taunggyi South, KyaukSe, Pyin Oo Lwin	Tropical Dry Forest	AGB< 20 Tonne/ Ha = 0.56 (0.28-0.68) AGB> 20 Tonne/Ha = 0.28 (0.27-0.28)	2.1
	Dry forest, thorn	Bago, Gangaw, Minbu, KyaukSe, Pyin Oo Lwin			
	Dry forest, aukchinsa-thinwin	Shwebo, KyaukSe, Mandalay, Pyin Oo Lwin			
9	Hill forest, evergreen	Falam, Bhamo, Katha, Minbu, Thayet, Ottarathiri, Pyay, Kalay, Khamti, Mawlaik, Taunggyi North, Taunggyi South, KyaukSe, Meiktila, Pyin Oo Lwin, Yamethin	Tropical Mountain Systems	0.27 (0.27-0.28)	2.8
10	Hill forest, dry	Bago, Katha, Shwebo, Gangaw, Minbu, Thayet, Pyay, Taungoo, Kalay, Khamti, Mawlaik, Linkhay, Taunggyi North, Taunggyi South, KyaukSe, Meiktila, Pyin Oo Lwin, Yamethin	Tropical Dry Forest	AGB< 20 Tonne/ Ha = 0.56 (0.28-0.68) AGB> 20 Tonne/Ha = 0.28 (0.27-0.28)	2.1
11	Hill forest, pine	Monywa, Gangaw, Minbu, Kalay, Taunggyi North, Taunggyi South	Temperate: Conifers	AGB< 50 Tonne/ Ha = 0.40 (0.21-1.06) AGB 50-150 Tonne/ Ha = 0.29 (0.24-0.50) AGB >150 Tonne/ Ha = 0.20 (0.12-0.49)	4.1

## Analysis and processing of national data

### Estimation and forecasting

According to the above, the following tables is representing about above ground biomass and below ground biomass,

No.	District Name	Total No of sample plots:	Plot Size	Sample Size in Ha	Sum of AGB/ha	Sum of BGB/ha
1	Bago	567	1	567	13530.76	2771.12
2	Dawei	109	0.4047	44.1123	24403.48	9029.29
3	Falam	159	0.4047	64.3473	17155.92	4632.10
4	Hinthada	68	0.7854	53.4072	3984.32	832.27
5	Bhamo	427	1.05	448.35	37778.02	9685.38
6	Myitkyina	200	1.05	210	22743.36	5643.92

7	Katha	661	1	661	27854.76	6560.82
8	Shwebo	174	1	174	6903.92	1744.49
9	Monywa	190	1	190	9334.14	1967.56
10	Magwe	8	1	8	217.65	43.53
11	Gangaw	311	1	311	17221.51	3844.80
12	Minbu	467	1	467	21820.98	5721.41
13	Pakkoku	33	1	33	1111.17	283.04
14	Thayet	274	1	274	12477.21	3007.21
15	Myaungmya	10	0.7854	7.854	61.09	22.60
16	Dakinathiri	105	1.05	110.25	6270.29	1324.18
17	Ottarathiri	67	1.05	70.35	3583.57	753.34
	Taungoo: Nay Pyi Taw	10	1.05	10.5	447.51	89.50
	Taunggyi: Nay Pyi Taw	20	1.05	21	1357.85	271.57
18	Pyarpon	47	0.4047	19.0209	145.26	53.75
19	Pyay	430	1	430	15358.94	3319.77
20	Sittwe	6	1.05	6.3	2349.68	555.41
21	Taungoo	962	0.7854	755.5548	33946.90	6923.21
22	Thandwe	147	0.7854	115.4538	5364.77	1454.00
23	Tharyarwaddy	446	0.7854	350.2884	13609.70	2906.62
24	Kalay	869	1	869	46112.64	11024.24
25	Khamti	951	1	951	34188.06	8706.33
26	Mawlaik	971	1	971	62412.52	15746.03
27	Tamu	45	1	45	1386.73	319.43
28	Linkhay	234	1.05	245.7	9906.43	2320.59
29	Taunggyi North	225	1.05	236.25	21032.84	5210.31
30	Taunggyi South	334	1	334	24881.00	6157.71
31	Kyaukme	519	1.05	544.95	73972.98	18551.87
32	Pathein	76	0.7854	59.6904	1810.86	668.78
33	Kyaukphyu	219	0.4047	88.6293	8963.41	2002.53
34	Maungdaw	52	1.05	54.6	2302.37	461.65
35	MyaukOo	77	1.05	80.85	3417.82	693.78
36	KyaukSe	163	1	163	9033.08	2033.04



37	Mandalay	19	1	19	574.43	140.90
38	Meiktila	90	1	90	2355.82	544.04
39	Pyin Oo Lwin	465	1	465	21751.77	5293.31
40	Yamethin	77	1	77	1039.72	283.33
	Total	11284		10696.4584	624175.26	153598.74
				Mean	58.35	14.36

Reclassification into FRA 2020 categories

-

FRA categories	Forest biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass	127.37	127.38	126.26	125.77	125.70	125.63	125.60	125.57	125.54
Below-ground biomass	35.66	35.67	35.35	35.22	35.19	35.18	35.17	35.16	35.15
Dead wood									

Comments

According to the available national data, mean AGB and mean BGB are 58.36 and 14.36 tonnes/ha respectively. The value of national data is quite lower than the that results coming out from the Biomass calculator.

FD applied FAO provided biomass calculator to estimate AGB and BGB. The national data is only applied as the reference. There are no statistics concerning with lack of data on below 50mm DBH, regeneration and bamboo.

## 2d Carbon stock

### National Data

#### Data sources + type of data source eg NFI, etc

In this report, district forest managagement inventory data were used to estimate the growing stock, biomass stock as well as carbon stock. For the net biomass increment from plantations, the lower default value from table 4.10, IPCC GL, 2006 for tropical dry forests and tropical moist deciduous forests with 7 tonnes biomass dry matter per ha has been used.

#### National classification and definitions

-

#### Original data

-

### Analysis and processing of national data

#### Estimation and forecasting

-

#### Reclassification into FRA 2020 categories

-

FRA categories	Forest carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Carbon in above-ground biomass	59.86	59.87	59.34	59.11	59.08	59.05	59.03	59.02	59.01
Carbon in below-ground biomass	16.76	16.76	16.62	16.55	16.54	16.53	16.53	16.53	16.52
Carbon in dead wood									
Carbon in litter	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Soil carbon									

Soil depth (cm) used for soil carbon estimates	
--	--

Comments

Carbon in dead wood and soil carbon data are not yet available currently.

### 3 Forest designation and management

#### 3a Designated management objective

##### National Data

**Data sources + type of data source eg NFI, etc**

District Forest Management Plans of Myanmar Forest Department classifies the forest area of the country into 7 categories (known as working circles) in general for management purposes. Some of the other wooded lands are including in these working circle areas. Working circle can also overlap each other (eg. NWFP extraction working circle and production working circle). The following data is extracted from District forest management plan. District forest management plans were prepared by ten years period and according to the administrative boundary. The data are available for the plan periods (1996-97 to 2005-06, 2006-07 to 2015-16, 2016-17 and 2025-2026).

For 1990, 2000 and 2010 figures for Protection, production and conservation forest have been taken from previous FRA2015 report. The rest of the forest area has been considered as multiple forests.

Working Circle Area of 61 Forest Management Units were collected for 2000 through (1996-97 to 2005-06) district management plans. Then the data updated with data of actual areas of Protected Area System and forest plantations for 2000.

For 2010, information of 2006-07 to 2015-16 was updated with the help of Protected Area System and plantation area of 2010.

Similarly for 2020, The figures were updated with the help of Protected Area System (already established and proposed areas) and plantation area up to 2018.

**National classification and definitions**

According to the

National class	Definition
Non Wood Forest Products working circle	for meeting NWFP products
Production Working Circle	for meeting timber requirements
Plantations Working Circle	For meeting timber requirements through artificial regeneration
Local Supply/Community Forestry W.C	For meeting fuelwood and other minor forest products for local community
Watershed Forests W.C	For meeting conservation of soil and water resources
Mangrove Forests	For utilizing, and also conservation of coastal mangrove forests
Protected Areas System W.C	National Parks and Sanctuaries
	The following table from old working plans (expired in 1970 but no updated till 1995) provides the description of the designation of the Forests for year 1990.
Teak Selection Working Circle	For meeting teak timber requirements, it includes hardwood supply working circle
Teak Eradication Working Circle	For eradication of teak in unfavorable non forest areas (rice fields etc.)
Hardwood supply working Circle	For meeting hardwood requirements, it is part of teak selection working circle.
Public Forest Working circle	For meeting timber needs from public forests (not forest reserved areas)
Local Supply Working Circle	For meeting fuelwood and other minor forest products for local community
Cutch Working Circle	For special manufacturing of cutch (acacia catechu)
Fuelwood Working Circle	For meeting fuelwood products for local community
Tidal Forest Working Circle	For meeting mangrove timber, fuelwood and charcoal products
Special Working Circles	For meeting special needs

**Original data**

**Data for 1990**

Working Circle Area of 36 Forest Divisions (expired at 1970 but not updated till 1995)

Type of working Circles		Area in 000 hectares
1	Teak Selection Working Circle	2854
2	Teak Eradication Working Circle	239
3	Hardwood Supply Working Circle	1178
4	Public Forest Working Circle	290
5	Local Supply Working Circle	101
6	Cutch Working Circle	87
7	Fuelwood Working Circle	50
8	Tidal Forest Working Circle	46
9	Special Working Circles	312
Total		5157

(Note: Teak Selection Working Circle area contains Hardwood supply working circles)

This information has been updated for 1990 as under with information on “Protected Areas System”.

Type of working Circles		Area in 000 hectares
Teak Selection Working Circle		2854
Teak Eradication Working Circle		239
Hardwood Supply Working Circle		1178
Public Forest Working Circle		290
Local Supply Working Circle		101
Cutch Working Circle		87
Fuelwood Working Circle		50
Tidal Forest Working Circle		46
Special Working Circles		312
Protected Area System Areas		720
Total Under management plans		5877
Forest area not under management plans		33625

Data for 2000

Working Circle Area of 61 Forest Management Units ( 1996-97 to 2005-06 )

Type of working Circles		Area in 000 hectares (2000)
1	Non Wood Forest Product W.C	5182

2	Production Working Circle	12017
3	Plantations Working Circle	651
4	Local Supply/Community Forestry W.C	6749
5	Watershed Forests W.C	1499
6	Mangrove W.C	76
7	Protected Areas System W.C	964

The above data updated with data of Protected Area System for 2000 and actual area under plantations in 2000.

Type of working Circles	Area in 000 hectares (2000)
Non Wood Forest Product W.C	5182
Production Working Circle	12017
Plantations Working Circle	696
Local Supply/Community Forestry W.C	6749
Watershed Forests W.C	1499
Mangrove W.C	76
Protected Areas System W.C	1220
Total Area under management plans	27439
Forest area not under management plan	7683

For 2010, information of 2006-07 to 2015-16 was updated with the help of Protected Area System and plantation area of 2010 as follows;

Year 2010	Working Circles	000 hectares
1	Non Wood Forest Product W.C	1237
2	Production Working Circle	11503
3	Plantations Working Circle	972
4	Local Supply/Community Forestry W.C	6758
5	Watershed Forests W.C	3349
6	Mangrove W.C	299
7	Protected Areas System W.C*	4466
8	Forest area not included in W.Cs	7960

For 2015, working circles of the last Management plans (2016-17 to 2025-26) were applied,

Sr.	Working Circles	000 hectares
1	Non Wood Forest Product W.C	856,209
2	Production Working Circle	9,958,200

3	Plantations Working Circle	1,509,733
4	Local Supply/Community Forestry W.C	6,167,930
5	Watershed Forests W.C	4,008,135
6	Protected Areas System W.C	4,962,400
7	Special Working Circles	435,548
8	Forest area not included in W.Cs	836,080

Notes: 10250 (000 ha) is overlapping areas (e.g. Non Wood Forest Production WC is overlapping with production WC, Plantation WC and Local Supply WC)

For 2020, areas of working circles are estimated based on the planning on the extension of protected areas.

## Analysis and processing of national data

### Estimation and forecasting

-

### Reclassification into FRA 2020 categories

For 1990

National Category	Percentage of a National Class into a FRA 2020 classes						
	Production	Protection of soil and water	Conservation of Biodiversity	Social Services	Multiple use	Other (specify in comments)	None/unknown
Teak Selection WC	100						
Teak Eradication WC	100						
Hardwood supply WC	100						
Public Forest WC					100		
Local Supply	100						
Cutch WC					100		
Fuelwood WC	100						
Tidal Forest WC					100		
Special WC		100					
Protected Area Systems WC			100				

For 2000, 2010 and 2020

National Category	Percentage of a National Class into a FRA 2020 classes						
	Production	Protection of soil and water	Conservation of Biodiversity	Social Services	Multiple use	Other (specify in comments)	None/unknown
Non Wood Forest Product	100						
Production Working Circle	100						
Plantations Working Circle	100						



Local Supply/Community Forestry WC					100		
Watershed Forests WC		100					
Mangrove WC					100		
Special WC						100	
Protected Areas System WC			100				
Forest area not included in WC							100

Primary designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production (a)	4 422.00	17 895.11	13 712.00	12 324.14	12 324.14
Protection of soil and water (b)	312.00	1 499.00	3 349.00	4 008.14	4 008.14
Conservation of biodiversity (c)	720.00	1 220.00	4 466.00	4 962.40	5 237.07
Social Services (d)	0.00	0.00	0.00	0.00	0.00
Multiple use (e)		6 571.00	7 057.00	7 860.92	6 974.54
Other (specify in comments) (f)	0.00	0.00	0.00	0.00	0.00
None/unknown (g)	33 764.48	7 683.00	2 857.00	836.84	0.00
Total forest area	39 218.48	34 868.11	31 441.00	29 992.44	28 543.89

Total area with designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production					
Protection of soil and water					
Conservation of biodiversity					
Social Services					
Other (specify in comments)					

Comments

Working Circle of others consist of areas where bamboo working circles, bird nests production working circle, cutch production working circle.

### 3b Forest area within protected areas and forest area with long-term management plans

#### National Data

##### Data sources + type of data source eg NFI, etc

Protected areas cover the forest areas designated primarily for conservation of biological diversity. In addition, forest area within formally established protected areas independently of the purpose for which the protected areas were established.

##### National classification and definitions

-

##### Original data

-

#### Analysis and processing of national data

##### Estimation and forecasting

-

##### Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest area within protected areas	720.00	1 220.00	4 466.00	4 962.40	5 237.07	5 237.07	5 237.07	5 237.07	5 237.07
Forest area with long-term forest management plan	24 565.27	24 565.27	28 284.77	27 898.14	27 898.14	27 898.14	27 898.14	27 898.14	27 898.14
...of which in protected areas									

Comments

Marine Protected area consists of some extents of waterbody. Myanmar still need to breakout the waterbody areas from forest cover.

There are some changelless to mention forest areas under management plans. Based on remote sensing, temporary unstock areas are not defined as deforested areas because it is not land use change. It is still forest land use.

## 4 Forest ownership and management rights

### 4a Forest ownership

#### National Data

**Data sources + type of data source eg NFI, etc**

According to Forest law 2018 and previous forest law 1992 , forest lands; i.e. Reserved Forests and Protected Public Forests by two major legal classes. A legal notification in the government gazette defines the boundaries of Reserved Forests and Protected Public Forests. In addition, The revised Biodiversity and Protected Areas Conservation law 2018 highlight the Protected Area System.

All the three categories of forests are owned by the “State”.

All forest area whether notified as reserved and protected under forest act or not notified and categorized as un-classed forests belong to the “State”. However, there are some forest areas (34000 ha in 2003, 35000 ha in 2004, 41000 ha in 2005 and ) that are not under “state ownership”. These are the area brought under community forests owned by the local people with long-term lease permission of the government.

**National classification and definitions**

-

**Original data**

-

#### Analysis and processing of national data

**Estimation and forecasting**

-

**Reclassification into FRA 2020 categories**

-

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Private ownership (a)	0.00	0.00	0.00	0.00
...of which owned by individuals	0.00	0.00	0.00	0.00
...of which owned by private business entities and institutions	0.00	0.00	0.00	0.00
...of which owned by local, tribal and indigenous communities	0.00	0.00	0.00	0.00
Public ownership (b)	39 218.48	34 868.11	31 441.00	29 992.44
Unknown/other (specify in comments) (c)	0.00	0.00	0.00	0.00
Total forest area	39 218.48	34 868.11	31 441.00	29 992.44

## Comments

## 4b Holder of management rights of public forests

### National Data

**Data sources + type of data source eg NFI, etc**

-

**National classification and definitions**

-

**Original data**

All forest area whether notified as reserved and protected under forest act or not notified and categorized as un-classed forests belong to the “State”. However, there are some forest areas (34000 ha in 2003, 35000 ha in 2004, 41000 ha in 2005 and ) that are not under “state ownership”. These are the area brought under community forests owned by the local people with long-term lease permission of the government.

### Analysis and processing of national data

**Estimation and forecasting**

-

**Reclassification into FRA 2020 categories**

-

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Public Administration (a)	39 218.48	34 800.11	31 359.00	
Individuals (b)	0.00	0.00	0.00	
Private business entities and institutions (c)	0.00	0.00	0.00	
Local, tribal and indigenous communities (d)	0.00	34.00	41.00	
Unknown/other (specify in comments) (e)	0.00	34.00	41.00	29 992.44
Total public ownership	39 218.48	34 868.11	31 441.00	29 992.44

### Comments

2005 data on local tribal and indigenous communities were used for the year 2010 and 2003 data for the year 2000.



5 Forest disturbances

5a Disturbances

National Data

Data sources + type of data source eg NFI, etc

-

National classification and definitions

-

Original data

-

Analysis and processing of national data

Estimation and forecasting

-

Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Insects (a)																		
Diseases (b)																		
Severe weather events (c)																		
Other (specify in comments) (d)																		
Total (a+b+c+d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total forest area	34 868.11	-	-	-	-	-	33 011.14	-	-	-	31 441.00	-	-	-	-	29 992.44	29 702.73	29 413.02

Comments

## 5b Area affected by fire

### National Data

#### Data sources + type of data source eg NFI, etc

FRA 2020 Geospatial tools Module 3 (file uploaded in Links and repository)

#### National classification and definitions

-

#### Original data

-

### Analysis and processing of national data

#### Estimation and forecasting

-

#### Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total land area affected by fire	275.80	1 370.30	1 273.00	1 419.00	2 578.50	1 943.90	1 486.90	2 096.10	984.80	2 059.50	2 685.40	1 442.00	1 318.70	1 487.10	1 544.80	1 776.10	859.00	
...of which on forest	191.10	778.80	648.50	859.60	1 717.70	1 279.70	973.70	1 393.00	596.60	1 385.40	1 821.80	971.50	830.30	934.00	1 001.90	1 186.90	514.40	

Comments

We don't have national datasets which are based on regular forest monitoring. Data gap is still valid and there was also limitation on burnt area and forest fire data by mean of spatial database.

Myanmar is now using FRA 2020 Geospatial tools Module 3 for the above table.

5c Degraded forest

Does your country monitor area of degraded forest		No
If "yes"	What is the national definition of "Degraded forest"?	The term degradation is still under discussion among multi-stakeholders.
	Describe the monitoring process and results	

Comments

6 Forest policy and legislation

6a Policies, Legislation and national platform for stakeholder participation in forest policy

National Data

Data sources + type of data source eg NFI, etc

-

National classification and definitions

-

Original data

-

Indicate the existence of	Boolean (Yes/No)	
	National	Sub-national
Policies supporting SFM	Yes	Yes
Legislations and regulations supporting SFM	Yes	Yes
Platform that promotes or allows for stakeholder participation in forest policy development	Yes	No
Traceability system(s) for wood products	Yes	Yes

Comments

## 6b Area of permanent forest estate

### National Data

Data sources + type of data source eg NFI, etc

-

National classification and definitions

-

### Original data

Ministry of Planning and Finance, Central Statistical Organization-CSO published Statistical Year Book almost every year.

The data sources are from Statistical Year Book 2016.



FRA 2020 categories	Forest area (1000 ha)					
	Applicable?	1990	2000	2010	2015	2020
Area of permanent forest estate	Yes			20 041.36	20 616.78	

Comments

## 7 Employment, education and NWFP

### 7a Employment in forestry and logging

#### National Data

##### Data sources + type of data source eg NFI, etc

Ministry of Natural Resources and Environmental Conservation is the government ministry of Myanmar, founded by the combination of Ministry of Mines and Ministry of Environmental Conservation and Forestry in 30 March 2016. There are two main sectors under the Ministry; Mining sector and Forestry Sector (<https://myanmar.gov.mm/en/ministry-of-natural-resources-environmental-conservation>).

For forestry sector, we refer to the Ministry web page <http://www.monrec.gov.mm/> as data sources.

The following departments and organizations are mainly responsible for the country's forestry and logging sectors,

- The Forest Department (FD) is responsible for the protection, conservation and sustainable management of forests.

- The Myanmar Timber Enterprise (MTE) carries out timber harvesting, milling, downstream processing and marketing of forest products.

The Dry Zone Greening Department (DZGD) focuses on reforestation of degraded lands and restoration of the environment in the dry zone of central Myanmar.

Union Minister office coordinates and facilitates the work of the FD, MTE and DZGD.

We assumed that number of staff who are working at the above departments and organization are concerning with employment in forestry and logging.

##### National classification and definitions

-

##### Original data

-

FRA 2020 categories	Full-time equivalents (1000 FTE)											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Employment in forestry and logging										65.17		
...of which silviculture and other forestry activities										19.00		
...of which logging										46.00		
...of which gathering of non wood forest products												
...of which support services to forestry										0.17		

Comments

## 7b Graduation of students in forest-related education

### National Data

**Data sources + type of data source eg NFI, etc**

University of Forestry and Environmental Sciences

**National classification and definitions**

-

**Original data**

-

FRA 2020 categories	Number of graduated students											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Doctoral degree												
Master's degree							2.00	2.00	0.00	1.00	1.00	0.00
Bachelor's degree				46.00	0.00	46.00	32.00	6.00	26.00	176.00	46.00	130.00
Technician certificate / diploma				2.00	1.00	1.00						
Total												

Comments

The statistics used in the table mentioned above is based on records of University of Forestry and Environmental Sciences. The former name was University of Forestry which was established in 1992.

Forest Department-FD, Planning and Statistics Division is focal to prepare the FRA report and FD officially sent a request letter to University to fill the above table. University officially sent back after filling the table. FD filled this figures to fill into the platform.

# 7c Non wood forest products removals and value 2015

## National Data

### Data sources + type of data source eg NFI, etc

Data sources are based on Myanmar Statistical Year Book 2016 published by Central Statistical Organization, Myanmar.

Please refer to the dataset here: [http://www.mmsis.gov.mm/sub\\_menu/statistics/fileDb.jsp?code\\_code=001](http://www.mmsis.gov.mm/sub_menu/statistics/fileDb.jsp?code_code=001).

And the following table shows about the production of Minor Forest Products which are not only from Forest Department but also from Co-operative Department and Department of Agriculture.

No.	By Description	2015
1	Firewood ((000)Cu-Ton)	20911
2	Charcoal ((000)Cu-Ton)	233
3	Bamboo ((000)no)	1213301
4	Rattan ((000)no)	35769
5	Cutch ((000)Viss)	153
6	Indwe-Pwenyet ((000)Viss)	260
7	Kanyin Resin ((000)Viss)	675
8	Turpentine ((000)Viss)	0.6
9	Dani-Thetkye ((000)byit)	932263
10	Honey ((000)Viss)	51
11	Bees-wax (Viss)	1193
12	Bats Guano ((000)Viss)	379
13	Orchid ((000)no)	20
14	Edible Birds Nest (Viss)	1512
15	Lac ((000)Viss)	66
16	Barks	1227
17	Thanatkha	249
18	Jute	77
19	Bastard Sandal Wood	8
20	Cardanon	58
21	Serpent Wood	31
22	Lacquer	33

### National classification and definitions

-

### Original data

-

	Name of NWFP product	Key species	Quantity	Unit	Value (1000 local currency)	NWFP category
#1	Bamboo		1 213 301	(000) No		8 Other plant products
#2	Dani-Thetke		932 263	(000) Byit		8 Other plant products
#3	Edible Bird's Net		1 512	Viss		15 Other edible animal products
#4	Rattan		36 569	(000) No		8 Other plant products
#5	fireWood		20 911	(000) Cu-Ton		8 Other plant products
#6	Charcoal		233	(000) Cu-Ton		8 Other plant products
#7	Bees-wax		1 193	Viss		11 Wild honey and bee wax
#8	Kanyin Resin		675	Viss		7 Exudates
#9	Bat's Guano		379	(000)Viss		16 Other non-edible animal products
#10	Indwe-pwenyet		260	(000)Viss		8 Other plant products
All other plant products						
All other animal products						
Total					—	

Name of currency	Myanmar Kyat
------------------	--------------

## Comments

There are more than 22 minor forest products and the prices are different based on the states and regions. It is quite difficult to get the national level Value (1000 local currency).

According to the EITI report-Forestry sector for the period April 2015-March 2016 (Pre-final), the total revenue collected from Non-timber forest products was 3,151 million Kyats.



## 8 Sustainable Development Goal 15

### 8a Sustainable Development Goal 15

#### SDG Indicator 15.1.1 Forest area as proportion of total land area 2015

Indicator	Percent							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area as proportion of total land area 2015	53.39	48.14	45.92	45.48	45.04	44.59	44.15	43.71

Name of agency responsible	Forest Department, Ministry of Natural Resources and Environmental Conservation
----------------------------	---

#### SDG Indicator 15.2.1 Progress towards sustainable forest management

Sub-Indicator 1	Percent						
	2000-2010	2010-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Forest area annual net change rate	-1.03	-0.94	-0.98	-0.98	-0.99	-1.00	-1.01

Name of agency responsible	Forest Department, Ministry of Natural Resources and Environmental Conservation
----------------------------	---

Sub-Indicator 2	Forest biomass (tonnes/ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass stock in forest	127.38	126.26	125.77	125.70	125.63	125.60	125.57	125.54

Name of agency responsible	Forest Department, Ministry of Natural Resources and Environmental Conservation
----------------------------	---

Sub-Indicator 3	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area located within legally established protected areas	4.07	14.89	16.55	17.46	17.46	17.46	17.46	17.46

Name of agency responsible	Forest Department, Ministry of Natural Resources and Environmental Conservation
----------------------------	---

Sub-Indicator 4	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area under long-term forest management plan	81.90	94.31	93.02	93.02	93.02	93.02	93.02	93.02

Name of agency responsible	Forest Department, Ministry of Natural Resources and Environmental Conservation
----------------------------	---

Sub-Indicator 5	Forest area (1000 ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area under independently verified forest management certification schemes	0.00	0.00	0.00	0.00	0.00	0.00	–	–