Manual on the Basic Set of Environment Statistics of the FDES 2013

Forests, Use of Forest Land, Timber Resources and Other Non-cultivated Biological Resources Statistics

(Topics 1.2.3: Forests, 2.3.2: Use of forest land, 2.5.1: Timber resources, and 2.5.5: Other non-cultivated biological resources of the Basic Set of Environment Statistics of the FDES 2013)

Elaborated by the Environment Statistics Section
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Methodology sheet of the Basic Set of Environment Statistics of the FDES

https://unstats.un.org/unsd/envstats/fdes/manual_bses.cshtml
https://unstats.un.org/unsd/envstats/fdes.cshtml

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				▪ UNECE Timber Committee ▪ UNECE/FAO Joint Working Party on Forest Statistics, Economics and Management ▪ ISIC Rev. 4, Section A, Division 02 ▪ FAOSTAT database
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2. Introduction/Relevance

Forests offer timber, food, shelter, fuel and medicinal products and they also perform significant ecosystem functions such as hydrological regulation, soil protection, biodiversity protection, and act as carbon sinks. Therefore, it is crucial to understand the extent and characteristics of forests and to produce statistics about their diverse dimensions.[1]

The ways in which forests contribute to human and environmental well-being are varied and far-reaching. These cut across many components of the Framework for the Development of Environment Statistics (FDES 2013).[2] They play a key role in combating rural poverty, achieving food security and securing decent livelihoods. Forests also offer opportunities for green growth over the medium term and provide key environmental services such as clean air (oxygen generation), clean water, providing habitats for biodiversity and mitigation of the effects of climate change through capture of carbon dioxide, one of the main greenhouse gases.[3]

Forests are at the forefront of reduction in the effects of climate change. For example, forests have four major roles in climate change: their clearance, overuse and degradation contribute about one-sixth of global carbon emissions; they react sensitively to a changing climate; when managed sustainably, they produce wood fuels as a benign alternative to fossil fuels; and finally, they have the potential to absorb about one-tenth of global carbon emissions projected for the first half of this century into their biomass, soils and products and store them - in principle in perpetuity.[4]

In addition, negative effects of climate change may hinder forests' role in the provision of environmental services, such as altering forests' role in regulating water flows and influencing the availability of water resources. With respect to water, one benefit is forests' cooling effect on the environment produced through evapotranspiration and the provision of shade. The impacts of climate change may also be manifested in an increase in catastrophes such as floods, droughts and landslides – all of which may be influenced by forest cover. Moreover, large-scale deforestation can have an impact on precipitation patterns.[5]

The pressure on forests from competing land uses continues. Globally, the extent of the world's forests continues to decline as human populations continue to grow and demand for food and land increases. However, there has been a slowing in the net annual rate of loss, and this has been offset by annual gains. The importance placed on forests and their sustainable management is reflected in the Sustainable Development Goal 13 "Take urgent action to combat climate change and its impacts", which highlights the importance of generating statistics that show the relevance of agriculture, forestry and other land uses, and for capture of greenhouse gas emissions; and Goal 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", which monitors changes in forested areas to prevent deforestation which can have negative impacts on fragile areas and jeopardize a country's food security.

Furthermore, the UN Strategic Plan for Forests, agreed by the United Nations Forum on Forests (UNFF) in early 2017 and adopted by the UN Economic and Social Council later in the year, introduced six Global Forest Goals and 26

[1] United Nations Statistics Division (2017) *Framework for the Development of Environment Statistics (FDES 2013)*, https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf (accessed 06 September 2018)
[2] United Nations Statistics Division (2017) *Framework for the Development of Environment Statistics (FDES 2013)*, https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf (accessed 06 September 2018)
[3] FAO (2015) *Global Forest Resources Assessment 2015*, *Desk reference*, Rome: FAO, http://www.fao.org/docrep/013/i1757e/i1757e.pdf (accessed 06 September 2018)
[4] FAO *Forestry communication toolkit* webpage, http://www.fao.org/forestry/communication-toolkit/76361/en/ (accessed 06 September 2018)
[5] FAO *Forestry communication toolkit* webpage, http://www.fao.org/forestry/communication-toolkit/76361/en/ (accessed 06 September 2018)

associated targets.[6] In support of the UNFF, the Collaborative Partnership on Forests is developing a common and concise Global Core Set of forest-related indicators[7] supporting the implementation of the 2030 Agenda for Sustainable Development and the Strategic Plan.

The attention paid to sustainable forest management has never been higher: more land is designated as permanent forest; more measurement, monitoring, reporting, planning and stakeholder involvement is taking place; and the legal framework for sustaining forest management is nearly universal. Larger areas are being designated for conservation of biodiversity at the same time as forests are meeting increasing demand for forest products.[8] To continue positive progress in forest management, a clear understanding of the situation of the world's forests and ongoing trends is needed.

The methodology sheet provides information on Topic 1.2.3: Forests, Topic 2.3.2: Use of forest land, Topic 2.5.1: Timber resources, and selected statistics from Topic 2.5.5: Other non-cultivated biological resources. Topic 1.2.3 and Topic 2.3.2 provide a description of forest area and the change processes related to forest area, including disturbances such as forest fires. Under Topic 2.5.1 are statistics on timber resources assets, wood products from timber resources and under Topic 2.5.5 are statistics on non-wood forest products.

[6] United Nations (2017) *United Nations strategic plan for forests 2017-2030*, Economic and Social Council Resolution E/RES/2017/4, https://documents-dds-ny.un.org/doc/UNDOC/GEN/N17/184/62/PDF/N1718462.pdf?OpenElement (accessed 06 September 2018)
[7] *Collaborative Partnership on Forests webpage* http://www.cpfweb.org/73055/en/ (accessed 06 September 2018)
[8] FAO (2015) *Global Forest Resources Assessment 2015*, *Desk reference*, Rome: FAO, http://www.fao.org/docrep/013/i1757e/i1757e.pdf (accessed 06 September 2018)

3. Definitions and description of the statistics

Forest is land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use.[9]

Remarks[10]

1. Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters *in situ*.
2. Includes areas with young trees that have not yet reached but which are expected to reach a canopy cover of 10 percent and tree height of 5 meters. It also includes areas that are temporarily unstocked due to clear-cutting as part of a forest management practice or natural disasters, and which are expected to be regenerated within 5 years. Local conditions may, in exceptional cases, justify that a longer time frame is used.
3. Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific environmental, scientific, historical, cultural or spiritual interest.
4. Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters.
5. Includes abandoned shifting cultivation land with a regeneration of trees that have, or are expected to reach, a canopy cover of 10 percent and tree height of 5 meters.
6. Includes areas with mangroves in tidal zones, regardless whether this area is classified as land area or not.
7. Includes rubber-wood, cork oak and Christmas tree plantations.
8. Includes areas with bamboo and palms provided that land use, height and canopy cover criteria are met.
9. Includes areas outside the legally designated forest land which meet the definition of "forest".
10. Excludes tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations, olive orchards and agroforestry systems when crops are grown under tree cover. Note: Some agroforestry systems such as the "Taungya" system where crops are grown only during the first years of the forest rotation should be classified as forest.

The following sections provide definitions of the statistics for these topics. The FDES 2013 statistics have been based on the terms used in the FAO Forest Resource Assessment (FRA) 2015, some of these have been updated in the FRA 2020, in which case the current FRA term is provided under the definition.

3A. Component 1, Sub-component 1.2, Topic 1.2.3: Forests and Component 2, Sub-component 2.3, Topic 2.3.2: Use of forest land

Data for statistics in Section 3A. are often provided for the FAO Global Forest Resources Assessment (FRA), therefore the definitions have been aligned to that source. The equivalent terms used in the FRA 2020 are provided in Section 4C. The relevant land area for statistics in this section is forest area, with the concept of forest defined as above.

[9] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[10] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

3A1. Forest area (FDES 1.2.3.a)

Total (forest area) (FDES 1.2.3.a.1)

The total area of forest, with forest defined as above.

Natural (forest area) (FDES 1.2.3.a.2)

Forest predominantly composed of trees established through natural regeneration.[11]

Termed naturally regenerating forest in FRA 2020.

Remarks:[12]

- Includes forests for which it is not possible to distinguish whether planted or naturally regenerated.
- Includes forests with a mix of naturally regenerated native tree species and planted/seeded trees, and where the naturally regenerated trees are expected to constitute the major part of the growing stock at stand maturity.
- Includes coppice from trees originally established through natural regeneration.
- Includes naturally regenerated trees of introduced species.

Primary forest (related term)

A related term is primary forest from the FRA 2020. Primary forest is a sub-category of naturally regenerating forest)[13]

Primary forest is naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.[14]

Remarks:[15]

- Includes both pristine and managed forests that meet the definition.
- Includes forests where indigenous peoples engage in traditional forest stewardship activities that meet the definition.
- Includes forest with visible signs of abiotic damages (such as storm, snow, drought, fire) and biotic damages (such as insects, pests and diseases).
- Excludes forests where hunting, poaching, trapping or gathering have caused significant native species loss or disturbance to ecological processes.
- Some key characteristics of primary forests are:
  - they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure and natural regeneration processes;
  - the area is large enough to maintain its natural ecological processes;
  - there has been no known significant human intervention or the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.

[11] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

[12] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

[13] FAO (2018) *Guidelines and specifications FRA 2020, Version 1.0*, Annex 1, http://www.fao.org/3/I8699EN/i8699en.pdf (accessed 06 September 2018)

[14] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

[15] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

Planted (forest area) (FDES 1.2.3.a.3)
The area of forest predominantly composed of trees established through planting and/or deliberate seeding.[16]

Remarks:

- In this context, predominantly means that the planted/seeded trees are expected to constitute more than 50 percent of the growing stock at maturity.
- Includes coppice from trees that were originally planted or seeded.[17]

Protected forest area (FDES 1.2.3.a.4)
Forest area within formally established protected areas independently of the purpose for which the protected areas were established.[18]

Termed forest area within legally established protected areas in the FRA 2020.

Remarks:

- Includes IUCN Categories I – IV.
- Excludes IUCN Categories V – VI.
- Forest area within protected areas that has a long-term (ten years or more) documented management plan, aiming at defined management goals, and which is periodically revised, is reported under "Forest area with long-term management plan" in the FRA 2020.[19]
- Forest area may be designated for specific management objectives, including protection of soil and water and conservation of biodiversity. The forest area designated primarily for conservation of biological diversity is not necessarily equivalent to the area of forest in protected areas because some forests in protected areas may be designated for other management objectives than the conservation of biological diversity, such as the conservation of soil and water resources or cultural heritage. Conversely, forest areas may be designated for the conservation of biodiversity without forming part of a protected area network or system.

Forest area affected by fire (FDES 1.2.3.a.5)
Forest area affected by fire.[20]

Burned area (related term)
A related term is burned area from the FRA 2020 which is land area affected by fire.[21] Land area can include area which is not forest.

Remark:

- Both estimates reflect areas affected by unplanned and/or uncontrolled vegetation fire events that destroy forest vegetation and biomass, over a period of time. Forest fires also affect ecosystem services, emit pollutants and release GHGs.

[16] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[17] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[18] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[19] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[20] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[21] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

3A2. Forest biomass (FDES 1.2.3.b)

Total (forest biomass) (FDES 1.2.3.b.1)

Total forest biomass stock is composed of above-ground, below-ground and dead wood biomass. Biomass refers to the total mass of living matter within a given unit of environmental area.

Above-ground biomass: All biomass of living vegetation, both woody and herbaceous, above the soil including stems, stumps, branches, bark, seeds, and foliage.

Below-ground biomass: All biomass of live roots. Fine roots of less than 2 mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.

Dead wood: All non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots down to 2 mm, and stumps larger than or equal to 10 cm in diameter.[22]

Growing stock (related term)
A related term is growing stock (of forests) from the FRA 2020, which is used for calculations of biomass. It is the volume over bark of all living trees with a minimum diameter of 10 cm at breast height (or above buttress if these are higher). Includes the stem from ground level up to a top diameter of 0 cm, excluding branches.[23]

Remarks:

- Diameter breast height refers to diameter over bark measured at a height of 1.3 m above ground level, or above buttresses, if these are higher.
- Includes laying living trees.
- Excludes branches, twigs, foliage, flowers, seeds, and roots.[24]

Carbon storage in living forest biomass (FDES 1.2.3.b.2)
This is carbon in above-ground and below-ground biomass.

Termed carbon stock in living forest biomass in the FRA 2020.

Carbon in above-ground biomass refers to carbon in all living biomass above the soil, including stem, stump, branches, bark, seeds, and foliage.

Remark:

- In cases where forest understorey is a relatively small component of the above-ground biomass carbon pool, it is acceptable to exclude it, provided this is done in a consistent manner throughout the time series.

Carbon in below-ground biomass refers to carbon in all biomass of live roots. Fine roots of less than 2 mm diameter are excluded, because these often cannot be distinguished empirically from soil organic matter or litter.[25]

Remarks:

- Includes the below-ground part of the stump.
- The country may use another threshold value than 2 mm for fine roots, but in such a case the threshold value used must be documented.

[22] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[23] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[24] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[25] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

3A3. Use of forest land (FDES 2.3.2)

This section covers forest dynamics used to identify forest area change.

Area deforested (FDES 2.3.2.a.1)

Area of conversion of forest to other land use independently whether human-induced or not.[26]

Termed deforestation in FRA 2020.

Remarks:

- Includes permanent reduction of the tree canopy cover below the minimum 10 percent threshold.
- It includes areas of forest converted to agriculture, pasture, water reservoirs, mining and urban areas.
- The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures.
- The term also includes areas where, for example, the impact of disturbance, over-utilization or changing environmental conditions affects the forest to an extent that it cannot sustain a canopy cover above the 10 percent threshold.[27]

Area reforested (FDES 2.3.2.a.2)

Area of re-establishment of forest through planting and/or deliberate seeding on land classified as forest.[28]

Termed reforestation in FRA 2020.

Remarks:

- Implies no change of land use.
- Includes planting/seeding of temporarily unstocked forest areas as well as planting/seeding of areas with forest cover.
- Includes coppice from trees that were originally planted or seeded.
- Excludes natural regeneration of forest.[29]
- The IPCC/UNFCCC term revegetation roughly corresponds to reforestation as defined above.[30] Revegetation is defined by IPCC as: direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation contained here.[31] [32]

Area afforested (FDES 2.3.2.a.3)

Area of establishment of forest through planting and/or deliberate seeding on land that, until then, was under a different land use, implies a transformation of land use from non-forest to forest.[33]

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[26] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[27] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[28] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[29] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[30] FAO (2018) *Guidelines and specifications FRA 2020, Version 1.0*, Annex 1, http://www.fao.org/3/I8699EN/i8699en.pdf (accessed 06 September 2018)
[31] UNFCCC (2013) *Afforestation and Reforestation Projects under the Clean Development Mechanism*, http://unfccc.int/resource/docs/publications/cdm_afforestation_bro_web.pdf (accessed 06 September 2018)
[32] IPCC (2003) *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/GPG_LULUCF_FULL.pdf (accessed 06 September 2018)
[33] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, Working Paper 188, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

Remarks:

- The IPCC/UNFCCC terms reforestation and afforestation correspond to area afforested (FDES 2.3.2.a.3).[34]
- The IPCC/UNFCCC term afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.[35]
- The IPCC/UNFCCC term reforestation is direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land.[36] [37]

Natural growth (FDES 2.3.2.a.4)

Area of expansion of forest through natural succession on land that, until then, was under a different land use, implies a transformation of land use form non-forest to forest (e.g., forest succession on land previously used for agriculture).[38]

Termed natural expansion of forest in FRA 2020. It is a sub-category of FRA 2020 forest expansion.

Forest expansion (related term)

Expansion of forest on land that, until then, was under a different land use, implies a transformation of land use from non-forest to forest.[39]

Forest area by primary designated function (FDES 2.3.2.b)

The area of forest under a primary designated management objective assigned to a management unit.[40]

Termed primary designated management objective in FRA 2020.

Remarks:

- Examples of primary designated functions include: production, protection of soil and water, conservation of biodiversity, social services, multiple use, among others.
- In order to be considered primary, the management objective should be significantly more important than other management objectives.
- Primary management objectives are exclusive and area reported under one primary management objective should not be reported for any other primary management objectives.
- Nation-wide general management objectives established in national legislation or policies (such as e.g., *"all forest land should be managed for production, conservation and social purposes"*) should not be considered as management objectives in this context.

[34] FAO (2018) *Guidelines and specifications FRA 2020, Version 1.0*, Annex 1, http://www.fao.org/3/I8699EN/i8699en.pdf (accessed 06 September 2018)
[35] UNFCCC (2013) *Afforestation and Reforestation Projects under the Clean Development Mechanism*, http://unfccc.int/resource/docs/publications/cdm_afforestation_bro_web.pdf (accessed 06 September 2018)
[36] UNFCCC (2013) *Afforestation and Reforestation Projects under the Clean Development Mechanism*, http://unfccc.int/resource/docs/publications/cdm_afforestation_bro_web.pdf (accessed 06 September 2018)
[37] IPCC (2003) *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/GPG_LULUCF_FULL.pdf (accessed 06 September 2018)
[38] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[39] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[40] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

3B. Component 2, Sub-component 2.5, Topic 2.5.1: Timber resources

Data for statistics in Section 3B. are often provided for the System of Environmental-Economic Accounting (SEEA) therefore the definitions have been aligned to the SEEA – Central Framework[41] and the SEEA – Agriculture, Forestry and Fisheries.[42] The relevant concept for statistics in this section is timber resources which covers trees in all relevant land uses, including forests, other wooded land and other land uses, such as small-scale farms, crop plantations, urban tree management etc.[43]

3B1. Timber resources (FDES 2.5.1.a)

Stocks of timber resources (FDES 2.5.1.a.1)
The stock of timber resources is defined by the volume of trees, living or dead, and include all trees regardless of diameter, tops of stems, large branches and dead trees lying on the ground that can still be used for timber or fuel.[44]

Remarks:

- Under the definition above, standing dead trees are included, for which data are not always available. It may therefore be difficult to obtain statistics exactly according to the definition, in which case any omissions should be noted. A related term, which is often more readily available, is growing stock of timber resources, which includes only living trees.
- The volume should be measured as the stem volume over bark at a minimum breast height from the ground level or stump height up to the top. Excluded are smaller branches, twigs, foliage, flowers, seeds and roots.[45]
- The volume of timber resources is often referred to as the volume of standing timber. This definition includes trees on the ground either because they have been felled but not yet removed from the area, or because they have fallen through natural causes (e.g., disease or lightning strike) but are still useful for timber products or fuel. The volume of standing timber also includes dead trees remaining standing. The volume of standing timber should be distinguished from the growing stock which relates to living trees and forms the basis for the calculation of the natural growth in timber resources over a period.[46]

[41] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. 12.XVII.12, https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)
[42] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)
[43] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)
[44] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)
[45] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)
[46] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

Natural growth (FDES 2.5.1.a.2)
The volume of increment over the reference period of all trees with no minimum diameter. This is also termed gross annual increment.[47]

Remark:

- The calculation of natural growth should be based on the timber resources available at the beginning of the accounting period. Increases in the area of forest land, other wooded land and other areas of land that lead to increases in the volume of available timber resources should not be considered natural growth but should, instead, be recorded as reclassifications.[48]

Fellings (FDES 2.5.1.a.3)
This is also termed gross fellings. Gross fellings are the total volume of all trees, living or dead that are felled. Felling includes thinning and clearing for commercial or silvicultural purposes.[49]

Remarks:

- The main difference between removals and gross fellings reflects felling residues generally comprising the volume of timber found to be rotten, damaged or undersized at the time of felling. The volume of gross fellings and removals may also be different due to the time of recording.[50]
- Gross felling is equivalent to removals (over bark) plus felling residues.[51]

Removals (FDES 2.5.1.a.4)
The volume of all trees, living or dead, that are felled and removed from the forest, other wooded land or other felling sites. It includes natural losses that are recovered (i.e., harvested), removals during the year of wood felled during an earlier period, removals of non-stem wood such as stumps and branches (where these are harvested) and removal of trees killed or damaged by natural causes (i.e., natural losses), e.g., fire, windblown, insects and diseases. Please note that this includes removals from all sources within the country including public, private, and informal sources. It excludes bark and other non-woody biomass and any wood that is not removed, e.g. stumps, branches and tree tops (where these are not harvested) and felling residues (harvesting waste). It is reported in cubic metres solid volume underbark (i.e. excluding bark). Where it is measured overbark (i.e., including bark), the volume has to be adjusted downwards to convert to an underbark estimate.[52]

[47] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)
[48] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)
[49] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)
[50] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)
[51] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)
[52] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)

Remarks:

- The term “removal” differs from "felling" as removal does not include trees that were felled but not removed.[53]
- Removals includes non-stem wood (stumps and branches). Non-stem wood can be recorded as a separate entry to allow for calculation of balances with other statistics which include only stem volume (e.g., stocks, growth and fellings).

Felling residues (FDES 2.5.1.a.5)

Felling residues are harvesting waste, which arise because at the time of felling, a certain volume of timber resources is rotten, damaged or excess below in terms of size requirements. Felling residues exclude small branches and other parts of the tree (which are also excluded from the scope of timber resources). Estimates of felling residues may provide important information on the nature of forestry practice.[54] [55]

Natural losses (FDES 2.5.1.a.6)

Natural losses are the losses to the growing stock (i.e., living, standing trees) during a period due to mortality from causes other than felling. Examples include losses due to natural mortality, insect attack, fire, wind throw or other physical damages. Natural losses should include only those losses that can be reasonably expected when considering the timber resources as a whole. Natural losses should be recorded only when there is no possibility that the timber resource can be removed. All timber removed should be recorded as removals.[56]

Catastrophic losses (FDES 2.5.1.a.7)

Exceptional and significant losses of timber resources due to natural causes.[57]

Remark:

- Catastrophic losses should be recorded only when there is no possibility that the timber resource can be removed. All timber removed should be recorded as removals.[58]

Reclassifications (FDES 2.5.1.a.8)

Increases or decreases in the increments in volume of timber resources due to increases or decreases in the area of forest land, other wooded land and other areas of land. Reclassifications may also occur as a result of changes in management practice that shift timber resources from cultivated to natural or vice versa. [59]

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[53] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)

[54] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, White Cover version, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)

[55] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[56] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[57] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[58] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[59] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

Remark:

- Reclassifications may also occur as a result of changes in management practice that shift timber resources from cultivated to natural or vice versa.[60]

3B2. Inputs (FDES 2.5.1.b)

Fertilizers (amounts used of) (FDES 2.5.1.b.1)

Fertilizers are measured by organic and mineral fertilizers. The definition provided is the same as that contained in the Methodology Sheet of the Basic Set of Environment Statistics of the FDES on Crops and Livestock Statistics.[61]

Organic fertilizers - International guidelines on agriculture refer to organic fertilizers (International Standard ISO 7851),[62] and the term organic fertilizers is commonly used. The term organic fertilizers can be used as an alternative to natural fertilizers. Organic fertilizers comprise residues of plants and animals, and human wastes. They include farmyard manure and animal droppings, crop wastes and residues, sewage sludge and other human wastes; and various industrial wastes.[63]

Remarks:

- Organic fertilizers exclude lime, which is an inorganic fertilizer.
- Organic fertilizers can be summed by type of product (e.g., farmyard manure, animal slurry and guano; vegetable material; stabilized sewage sludge) to produce total quantities of organic fertilizer or total quantity for each type of product. They can also be summed by nutrient, to give total quantities of each type of nutrient content. Different types of nutrients cannot be summed to produce a total.
- Quantity of fertilizers used should be analysed together with the area fertilized (if possible by type of crop) as rate of use and environmental impact is determined by area as well as quantity.

Mineral fertilizers - International guidelines on agriculture commonly refer to chemical fertilizers. The term chemical fertilizers can be used as an alternative to mineral fertilizers. Inorganic (also termed mineral or chemical) fertilizers are defined in International Standard ISO 7851 as fertilizers in which the declared nutrients are as inorganic salts obtained by extraction and/or by industrial physical and/or chemical processes. Fertilizers can be classified into:[64]

- STRAIGHT FERTILIZERS: These fertilizers have a declarable content of only one of the three primary plant nutrients (N, P or K).
- COMPOUND FERTILIZERS: These fertilizers have a declarable content of more than one of the three primary plant nutrients. They may be NP, NK, PK or NPK compounds, and include mixed fertilizers, produced by a physical process (e.g., blends, which comprise materials of matching granule size), and complex fertilizers, produced by a process of chemical reaction (all nutrients being present in the same granule).
- OTHER FERTILIZERS: Inorganic products that have fertilizer value in at least one of the fertilising elements nitrogen, phosphorous or potassium but are not included in any of the categories above.

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[60] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[61] UNSD (2017) *Methodology Sheet of the Basic Set of Environment Statistics of the FDES on Crops and Livestock Statistics*, https://unstats.un.org/unsd/environment/FDES/MS2.5%20Crops%20and%20Livestock%20Statistics.pdf (accessed 06 September 2018)

[62] FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf (accessed 25 July 2018)

[63] FAO (2017) *FAO Questionnaire on Fertilizers 2016/17*, http://www.fao.org/economic/ess/ess-home/questionnaires/en/ (accessed 06 September 2018)

[64] FAO (2017) *FAO Questionnaire on Fertilizers 2016/17*, http://www.fao.org/economic/ess/ess-home/questionnaires/en/ (accessed 06 September 2018)

Remarks:

- Fertilizer statistics can be reported by quantity of product or by quantity of nutrient: N (nitrogen), P_2O_5 (phosphorous) and K_2O (potash).[65] When reporting by nutrient the chemical composition should be included.
- Note summations cannot be produced over different nutrient types - only if converted to nutrient equivalent amounts.
- However, totals can be given for quantities of product, e.g., tonnes of material of straight nitrogenous fertilizers, straight phosphatic fertilizers, straight potassic fertilizers, complex fertilizers or total tonnes of fertilizers.[66]
- Various methods exist for obtaining and reporting fertilizer use/consumption.[67] Where there are difficulties in reporting consumption, countries often report fertilizer use as 'apparent consumption', i.e., as a residual of production plus imports minus exports. Further information can be found in the FAO Questionnaire on Fertilizers.[68]

Data may refer to fertilizer year, rather than calendar year, in which case the period should be referenced.

Pesticides (amount used of) (FDES 2.5.1.b.2)

The physical amount (mass) of pesticides products used in agricultural activities. This covers the use of major pesticide groups (Insecticides, Herbicides, Fungicides, Plant growth regulators and Rodenticides) and of relevant chemical families.[69]

Remark:

- Pesticides are generally reported based on the active ingredient of the pesticide with statistics for quantity of active ingredient and quantity of product. Where there are difficulties in reporting use, statistics are reported based on sales, used as a proxy. The different types of pesticides such as herbicides, insecticides and fungicides contain different pollution potential and impact ecosystems in different ways; it is not recommended that they be aggregated into one single mass unit, but should be kept separate when constructing time series, and shown in parallel when disseminated.[70]

3B3. Production (FDES 2.5.1.c)

This section covers production and trade in wood products. Data for statistics in Section 3B3 are often provided for the Joint Forest Sector Questionnaire (JFSQ)[71] therefore the definitions have been aligned to that source. The scope covers wood products from trees in all relevant land uses, including forests, other wooded land, or other sites such as small-scale farms, crop plantations, urban tree management etc.

Forest production (FDES 2.5.1.c) and Fuelwood production (FDES 2.5.1.d)

Wood forestry products cover removals of roundwood (including wood fuel and industrial roundwood) and production of wood products (e.g., sawnwood, wood pulp, veneer sheets etc.).

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[65] FAO (2017) *FAO Questionnaire on Fertilizers 2016/17,* http://www.fao.org/economic/ess/ess-home/questionnaires/en/ (accessed 06 September 2018)
[66] FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf (accessed 06 September 2018)
[67] FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf (accessed 06 September 2018)
[68] FAO (2017) *FAO Questionnaire on Fertilizers 2016/17,* http://www.fao.org/economic/ess/ess-home/questionnaires/en/ (accessed 06 September 2018)
[69] FAOSTAT metadata on pesticides, http://www.fao.org/faostat/en/#data/RP/metadata (accessed 06 September 2018)
[70] FAOSTAT metadata on pesticides, http://www.fao.org/faostat/en/#data/RP/metadata (accessed 06 September 2018)
[71] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)

The FDES covers roundwood and fuelwood (also called wood fuel) in FDES 2.5.1.a.4 removals (under bark). However, fuelwood is also identified separately in FDES 2.5.1.d Fuelwood production. Other wood products are covered in FDES 2.5.1.c Forest production. Another category of forestry products is non-wood forest products which are covered under FDES 2.5.5.f Non-wood forest products and other plants.

Statistics on wood products can be produced as for the Joint Forest Sector Questionnaire[72] which is the international standard data collection on forest products. Definitions of the wood forest products covered in the questionnaire can be found in the Joint Forest Sector Questionnaire.[73]

The wood products in the JFSQ are from harvesting of timber and products from processing of raw timber and manufacturing wood products - the latter are termed production. Group 1 of the questionnaire covers the products from harvesting, i.e., roundwood (i.e., removals underbark), which includes fuelwood, industrial roundwood, sawlogs and veneer logs, pulpwood and other industrial roundwood. Groups 2-10 of the questionnaire cover products from production such as charcoal, wood chips particles and residues, wood pellets and other agglomerates, sawnwood, wood-based panels (i.e., veneer sheets, plywood etc), wood pulp, other pulp, recovered paper, paper and paperboard; and secondary wood and paper products.

Imports of forest products (FDES 2.5.1.e)
Products imported for domestic consumption or processing shipped into a country. It includes imports into free economic zones or for re-export. It excludes "in-transit" shipments.[74]

Remarks:

- It is reported in cubic metres of solid volume or metric tonnes and values normally include cost, insurance and freight (i.e. CIF).[75]
- It can be reported in quantity or value.

Exports of forest products (FDES 2.5.1.f)
Products of domestic origin or manufacture shipped out of the country. It includes exports from free economic zones and re-exports. It excludes "in-transit" shipments.[76]

Remarks:

- It is reported in cubic metres of solid volume or metric tonnes and values are normally recorded as free-on-board (i.e. FOB).[77]
- It can be reported in quantity or value.

[72] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)
[73] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)
[74] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)
[75] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)
[76] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)
[77] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017*, http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)

3C. Component 2, Sub-component 2.5, Topic 2.5.5: Other non-cultivated biological resources

This section does not cover all non-cultivated biological resources, only those relevant to forestry products.

Non-wood forest products and other plants (FDES 2.5.5.f)
Goods derived from forests that are tangible and physical objects of biological origin other than wood.[78]

Remarks:

- Generally includes non-wood plant and animal products collected from areas defined as forest (see definition of forest).
- Specifically includes the following regardless of whether from natural forests or plantations:
    a. Gum arabic, rubber/latex and resin;
    b. Christmas trees, cork, bamboo and rattan.
- Generally excludes products collected in tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations and agroforestry systems when crops are grown under tree cover.
- Specifically excludes the following:
    c. woody raw materials and products, such as chips, charcoal, fuelwood and wood used for tools, household equipment and carvings;
    d. grazing in the forest;
    e. fish and shellfish.

[78] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)

4. International sources and recommendations

4A. Classifications and groupings

4A1. International Standard Industrial Classification of All Economic Activities (ISIC)

Following the ISIC, the boundaries of the forest sector are covered by: forestry and logging (ISIC Rev. 4 Division 02),[79] wood industry (ISIC Rev. 4 Division 16)[80] and the pulp and paper industry (ISIC Rev. 4 Division 17).

The FAO Forest Resources Assessments covers primary production in the sector, i.e. the category forestry and logging (ISIC Rev. 4 Division 02). Therefore, the statistics of gross value added from forestry and the statistics on employment denote only activities within the category forestry and logging.[81] Employment refers to activities related to production of goods derived from forests. This category corresponds to the ISIC/NACE Rev. 4 activity A02 (Forestry and logging).

4A2. Forest resources groupings

The appropriate groupings and tabulations for international reporting on Forest Resources are set out in the FAO Forest Resources Assessment 2020.[82]

4A3. Forest products

The FAO/UNECE classification and definitions of forest products 1982 provides a classification of forest products for forestry and forest industry production, industry capacity and trade.[83]

- Group 1: Wood in the rough
- Group 2: Residues of wood processing; recoverable wood products
- Group 3: Wood chips and particles
- Group 4: Wood simply worked or processed
- Group 5: Wood sawn lengthwise: veneer sheets
- Group 6: Wood-based panels (including similar panels from other ligna-cellulosic materials)
- Group 7: Pulp of wood or other ligna-cellulosic materials and pulp of waste paper
- Group 8: Paper and paperboard
- Group 9: Waste paper
- Group 10: Raw, semi-processed and worked cork

For statistical reporting the forest products in the *Joint Forest Sector Questionnaire 2017 of* Eurostat, FAO, ITTO, UNECE can be used.[84]

[79] United Nations (2008) *International Standard Industrial Classification of All Economic Activities – Rev 4*, Div. 02 https://unstats.un.org/unsd/publication/seriesM/seriesm_4rev4e.pdf (accessed 06 September 2018)
[80] United Nations (2008) *International Standard Industrial Classification of All Economic Activities – Rev 4*, Div. 16 https://unstats.un.org/unsd/publication/seriesM/seriesm_4rev4e.pdf (accessed 06 September 2018)
[81] FAO (2015) *Global Forest Resources Assessment 2015*, *Desk reference*, Rome: FAO, http://www.fao.org/3/a-i4808e.pdf (accessed 06 September 2018)
[82] FAO (2018) Global *Forest Resources Assessment 2020: Terms and Definitions (FRA 2020)*, http://www.fao.org/3/I8661EN/i8661en.pdf (accessed 06 September 2018)
[83] FAO (1982) *Classification and definitions of forest products*, http://www.fao.org/3/a-ap410m.pdf (accessed 06 September 2018)
[84] Eurostat, FAO, ITTO, UNECE (2017) *Joint Forest Sector Questionnaire definitions 2017* http://www.fao.org/forestry/7800-0f3bd783f4d81da943d201e3c40aaf887.pdf (accessed 06 September 2018)

4A4. Non-wood forest products (NWFP) groupings[85]

Detailed NWFP data are collected for top ten NFWP products in terms of their economic value. The reporting includes product names, key species, quantity, unit and value in chosen currency. Furthermore, each product is classified according to one of the following categories:

Plant products / raw material
1 Food
2 Fodder
3 Raw material for medicine and aromatic products
4 Raw material for colorants and dyes
5 Raw material for utensils handicrafts construction
6 Ornamental plants
7 Exudates
8 Other plant products

Animal products / raw material
9 Living animals
10 Hides skins and trophies
11 Wild honey and bee wax
12 Wild meat
13 Raw material for medicine
14 Raw material for colorants
15 Other edible animal products
16 Other non-edible animal products

The classification provides a correspondence between non-wood forest products and groupings in ISIC Rev.4, HS2017 and CPC Ver.2.1 for the major products of forest food (mushrooms and truffles, forest berries, wild edible nuts, bamboo shoots, wild edible fruits, maple syrup/sugar), raw materials for medicine and aromatic products (bark, leaves, ginseng roots, other roots and part of plants); raw materials for colorants and dyes (barks, roots, stems, stalks, leaves and flower, gall nuts); exudates (latex, gums and resins, lac); other plant products (bamboo, rattan, cork, bark, Christmas trees, ornamental plants); and animal products of hides skins trophies, wild honey and beeswax; and edible insects and game meat.

4B. Reference to international statistical recommendations, frameworks and standards

The following international sources provide statistical recommendations and guidance for the production of forest statistics and for compiling forest indicators.

- Forest resources: FAO Global Forest Resources Assessment (FRA) provides guidance on statistics on forest resources, http://www.fao.org/forest-resources-assessment/en/
- Forest products: Joint Forest Sector Questionnaire provides guidance on forest products statistics, http://www.fao.org/forestry/statistics/80572/en/
- UN Forum on Forests: guides the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end. It has provided guidance on monitoring, assessment and reporting on sustainable development of forest, http://www.un.org/esa/forests/events/monitoring-assessment-and-reporting/index.html
- Montreal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests is an intergovernmental group composed of Argentina, Australia, Canada, Chile, China, Japan, Korea, Mexico, New Zealand, Russian Federation, United States of America, and Uruguay to provide a voluntary network of practice supporting conservation and sustainable forest management. It was

[85] FAO (2017) *Non-wood forest products in international statistical systems*, Non-Wood Forest Products 22, Rome, FAO, http://www.fao.org/3/a-i6731e.pdf (accessed 06 September 2018)

formed in response to the Rio Forest Principles of the 1992 Rio Summit. The group has produced criteria and indicators for conservation and sustainable management of temperate and boreal forests, https://www.montrealprocess.org/

4C. Sources of global and regional environment statistics and indicators series

4C1. Global Forest Resources Assessment of the Food and Agriculture Organization of the United Nations

The most important global initiative to compile forest statistics is the Global Forest Resources Assessment (FRA) of the Food and Agriculture Organization of the United Nations (FAO) which is conducted every 5 years.[86] Data are collected using a network of officially nominated National Correspondents (NCs). The NCs are responsible for coordination of the preparation of County Reports, which are reviewed by the FRA Secretariat with the support of a number of international experts. Finally, the Country Reports are submitted to the highest forest authority (usually Head of Forestry) in the country/region for their official approval. FAO reporting guidelines include are FRA 2020 Terms and Definitions, Guide for Country Reporting and the online data entry, analysis and reporting Platform. The latest available results for FRA were reported in 2015 and are available at http://www.fao.org/forest-resources-assessment/past-assessments/fra-2015/en/.

The institutions that typically carry out the primary data collection for reporting to the FAO FRA include agricultural, forest and/or environment authorities at the national level. The primary data on area of forests are collected in countries using a combination of forest inventories and remote sensing, with varying periodicities. The lag between the reference year and the actual production of data series as well as the frequency of data production varies between countries.

FRA works together with the members of the Collaborative Forest Resources Questionnaire (CFRQ)[87] to avoid duplication in data collection and to collect data for common set of variables through the FRA process.

Table 4.1. Basic Set of Environment Statistics mapped to FAO Forest Resources Assessment 2020: Guidelines and specifications

Basic Set of Environment Statistics of the FDES 2013		FAO-Forest Resources Assessment 2020
FDES Topic	**BSES Environment Statistic**	
Topic 1.2.3: Forests	a. Forest area	
	1. Total	Table 1a. Extent of forest and other wooded land: Forest (a)
	2. Natural	Table 1b. Forest characteristics: Naturally regenerating forest (a)
	3. Planted	Table 1b. Forest characteristics: Planted forest (b) composed of Plantation forest of which introduced species and Other planted forest
	4. Protected forest area	Table 3b. Forest area within protected areas and forest area with long-term management plans: Forest area within legally established protected areas
	5. Forest area affected by fire	Table 5b. Area affected by fire: total land area affected by fire of which on forest
	b. Forest biomass	

[86] FAO (2018) *Guidelines and specifications FRA 2020, Version 1.0*, http://www.fao.org/3/I8699EN/i8699en.pdf (accessed 06 September 2018)
[87] The six CFRQ partners are: the Central African Forest Commission (COMIFAC/OFAC), FAO, FOREST EUROPE, the International Tropical Timber Organization (ITTO), the Montréal Process, and the United Nations Economic Commission for Europe (UNECE).

	1. Total	Table 2c. Biomass stock: Above-ground biomass
		Table 2c. Biomass stock: Below-ground biomass
	2. *Carbon storage in living forest biomass*	Table 2d. Carbon stock: Carbon in above-ground biomass
		Table 2d. Carbon stock: Carbon in below-ground biomass
Topic 2.3.2: Use of forest land	a. Use of forest land	
	1. Area deforested	Table 1c. Annual forest expansion, deforestation and net change: Deforestation
	2. Area reforested	Table 1d. Annual reforestation: Reforestation
	3. Area afforested	Table 1c. Annual forest expansion, deforestation and net change: Forest expansion (a) of which afforestation
	4. Natural growth	Table 1c. Annual forest expansion, deforestation and net change: Forest expansion (a) of which natural expansion
Topic 2.5.5 Other non-cultivated biological resources	f. Non-wood forest products and other plants	Table 7c. Non-wood forest products removals and value 2015

Source: FAO (2018) *Guidelines and specifications FRA 2020, Version 1.0*, http://www.fao.org/3/I8699EN/i8699en.pdf (accessed 25 July 2018) and United Nations Statistics Division (2017) *Framework for the Development of Environment Statistics (FDES 2013)*, https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf (accessed 06 September 2018)

4C2. Forest Europe/UNECE/FAO Statistical database

FRA covers all countries and territories. In Europe, more detailed data on pan-European indicators for Sustainable Forest Management are collected through Ministerial Conference on the Protection of Forests in Europe (FOREST EUROPE), FAO and UNECE. The latest FOREST EUROPE report is available at Forest Europe/UNECE/FAO Statistical database http://w3.unece.org/PXWeb2015/pxweb/en/STAT/STAT__26-TMSTAT1__005-TM15Others.[88]

4C3. Eurostat/UNECE/FAO/ITTO Wood Products Statistics

Eurostat, the Timber Committee of the United Nations Economic Commission for Europe (UNECE), the Forestry Section of the Food and Agriculture Organization of the United Nations (FAO) and the International Tropical Timber Organisation (ITTO) collect and collate statistics on the production and trade of wood and wood products (primary and secondary) through the Joint Forest Sector Questionnaire. Each partner collects data from a different part of the world.

Data are available from:

- FAOSTAT: http://www.fao.org/faostat/en/#home
- Eurostat: https://ec.europa.eu/eurostat/web/forestry/data/database
- ITTO: http://www.itto.int/annual_review_output
- UNECE: http://www.unece.org/forests/fpm/onlinedata.html

[88] Forest Europe/UNECE/FAO Statistical database (2017), http://w3.unece.org/PXWeb/en (accessed 06 September 2018)

5. Data collection and sources of data

Scope
The scope for each topic is:

- Topics 1.2.3 Forests (forest area, forest biomass) and Topic 2.3.2 Use of forest land (forest dynamics) – scope is all forests).
- Topic 2.5.1.a Timber resources and Topic 2.5.1.c which covers wood products – scope is resources and products from all relevant areas, including forests, other wooded land, other land (e.g., orchards, plantations, city parks, etc.).
- Topic 2.5.5.f which covers non-wood forest products – scope is non-wood forest products from forests.

Category of measurement
The categories of measurement are:

- Forest area and forest dynamics (FDES Topics 1.2.3 and 2.3.2) are measured in area, e.g., 1000 ha.
- Forest biomass is measured in weight or density, e.g., tonnes/ha
- Timber resources (FDES 2.5.1.a) are measured in volume, e.g., m^3 or m^3/ha.
- Fuelwood is measured in volume or weight.
- Forest products (FDES 2.5.1.c) are reported in volume, such as m^3 or weight e.g., metric tons.
- Non-wood forest products may use various units, including volume.

Sources and institutions
Forestry data are collected by a wide variety of institutions: forestry institutions, agricultural authorities, statistical offices, industry, trade associations, customs, and others. These institutional partners usually collaborate to produce statistics about forest cover and forest resources and their use in the country.

National forest inventories are the primary source of comprehensive forest related information as they typically collect data on not only the extent of forest, but also on aspects related to growing stock, increment, site quality, biodiversity, biomass, non-wood forest products, forest health and other related aspects.

Remote sensing is commonly used in the context of national forest inventories to support mapping of forest whereabouts and to assess changes in land cover. With modern remote sensing techniques, it is even possible to assess the vegetation height and density and, when combined with in-situ data, derive estimates for variables such as growing stock and above ground biomass. However, in most of the countries the use of remote sensing is limited to production of forest area and area change estimates.

Ideally, the forest primary data are produced with coverage at the national level or of those areas that are susceptible to be covered by the different types of forest in the county (i.e., excluding high mountains, deserts, etc.). But sometimes, inventories or remote sensing can produce partial data of sub-national coverage.

Forest stocks are usually estimated using the results of a national forest inventory or, alternatively, expert estimates based on area statistics and available average stock information considering the type of forest (tree species and site characteristics).

Data on forest products (2.5.1.c) are collected from private owners, state owners (forestry agencies), and other public owners of forest land; industry partners, such as wood processors, sawmills, producer associations; and from customs or trade agencies for imports and exports.

The following Table 5.1 presents the main institutional partners and types of sources by topic of environment statistics at the national level.

Table 5.1. Forest statistics, institutional partners and types of sources

FDES Topic	Environment statistics	Type of data source	Institutional source
1.2.3 Forests	Forest area	National Forest Inventories (NFIs) and Remote sensing	National Forest and / or National Statistical Office
	Forest biomass	NFIs, special studies	National Statistical Office, Universities, research agencies and other organizations
2.3.2 Use of forest land	Use of forested land (deforested, afforested and reforested area)	NFIs and administrative records	National Forest Institution, National Statistical Office, Universities
2.5.1 Timber resources	Timber resources	NFI, special studies	National Statistical Offices, and other organizations
	Wood removals, including fuelwood	NFIs, special studies, administrative records/Surveys	National Forest Institution, National Statistical Office, Other organizations
	Imports of forest products	Administrative records	National Forest Institution, National Customs Registry and National Statistical Office
	Exports of forest products	Administrative records	National Forest Institution, National Customs Registry and National Statistical Office

Aggregation

Spatial aspects

If data on forest extent is produced in a geographically referenced manner, these data can be aggregated and disaggregated for different spatial domains administrative regions, ecological zones, etc. If the data allows, other possible disaggregation of forest area is possible, such as natural and planted forests or by primary designated management objective: production, protection of soil and water, conservation of biodiversity, social services, multiple uses, etc. These disaggregations are detailed in the FAO FRA 2020.

Forestry production and trade are usually produced at the national level. Non-wood forest products cannot easily be aggregated with wood products, therefore should be tabulated separately.

Temporal aspects

The situation of every county is very unique in terms of data availability and periodicity of data available for forest statistics. The categories of measurement, units of measurement, periodicity and potential aggregations and disaggregations are listed in Table 5.2.

Table 5.2. Category of measurement, unit, periodicity and aggregation/disaggregation for forest statistics as in international reporting

FDES Topic	Environment Statistic	Category of Measurement	Unit of measure	Periodicity in International Reporting	Potential aggregations and disaggregation FDES
Component 1: Environmental Conditions and Quality, Sub-component 1.2 Land Cover Ecosystems and Biodiversity					
1.2.3	Forest area – Natural (extent of forest)	Area	Hectare (ha)	Yearly	By forest type, national, sub-national, by dominant tree

FDES Topic	Environment Statistic	Category of Measurement	Unit of measure	Periodicity in International Reporting	Potential aggregations and disaggregation FDES
					species, distribution and age
1.2.3	Forest area – Planted, Natural (forest characteristics)	Area	Hectare (ha)	5 yearly	National, sub-national and by planted species
1.2.3	Forest area affected by fire	Area	Hectare (ha)	Yearly	By forest type, national, sub-national
1.2.3	Total forest biomass	Mass	Tonnes/ha	Yearly	By forest type or sub-type
1.2.3	Carbon storage in living forest biomass	Mass	Tonnes/ha	Yearly	By forest type or sub-type
Component 2: Environmental Resources and their use, Sub-component 2.3 Land					
2.3.2	Area deforested, reforested, and afforested (forest dynamics)	Area	Hectare (ha)	5-year change (y_0 – y_5)	By dominant tree species, by ownership category sub-national and national
Component 2: Environmental Resources and their use, Sub-component 2.5 Biological Resources					
2.5.1	Timber resources – Stocks of timber resources	Volume	m^3	Yearly	By type of product, national and sub-national
2.5.1	Timber resources - Natural growth	Volume	Metres cubed (m^3)	Yearly	By forest type or sub-type, sub-national and national
2.5.1	Timber resources – Fellings	Volume	m^3	Yearly	By type of product, national and sub-national
2.5.1	Timber resources – Removals	Volume	m^3	Yearly	By type of product, national and sub-national
2.5.1	Timber resources – Felling residues	Volume	m^3	Yearly	National
2.5.1	Timber resources – Catastrophic losses	Volume	m^3	As needed	By type (e.g., natural or planted), national and sub-national
2.5.1	Timber resources – Reclassifications	Volume	m^3	As needed	By type (e.g., natural or

FDES Topic	Environment Statistic	Category of Measurement	Unit of measure	Periodicity in International Reporting	Potential aggregations and disaggregation FDES
					planted), national and sub-national
2.5.1	Forest production	Volume	m^3 or Mt depending on product	Yearly	By type of product, national and sub-national. Note roundwood and fuelwood products are under removals.
2.5.5	Non-wood forest products	Various	Various	Latest years available	By type of product, national and sub-national

6. Uses and dissemination

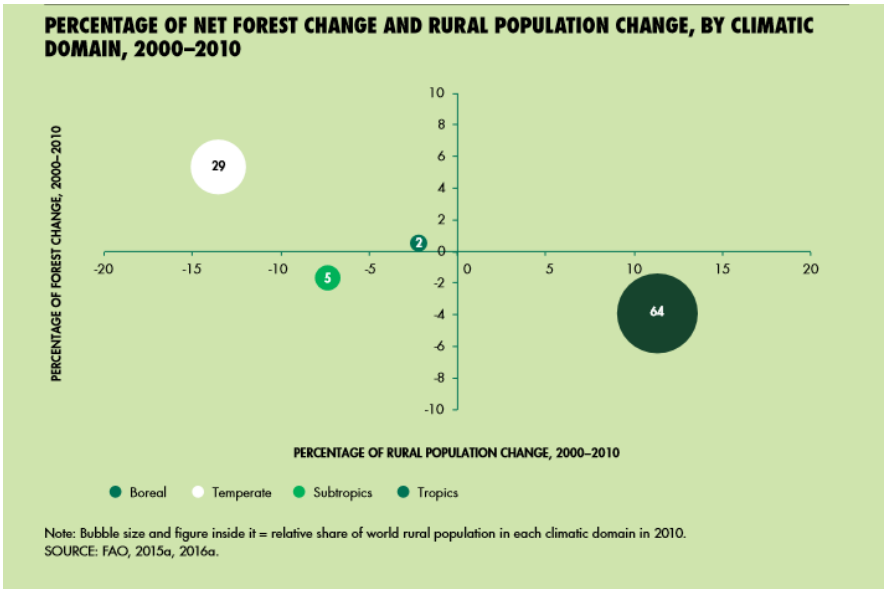
6A. Potential presentation/dissemination formats

Figure 6.1: Extent of forest 1990-2015, Forest Resources Assessment 2015

Country/Territory	Forest area (1 000 ha)						Annual change rate							
							1990–2000		2000–2010		2010–2015		1990–2015	
	1990	2000	2005	2010	2015	Tier trend	1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%	1 000 ha/yr	%
Grenada	17	17	17	17	17	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guadeloupe	73	73	73	72	71	2	0.0	0.0	-0.1	-0.2	0.0	-0.1	-0.1	-0.1
Guam	25	25	25	25	25	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guatemala	4748	4208	3938	3722	3540	2	-54.0	-1.2	-48.6	-1.2	-36.4	-1.0	-48.3	-1.2
Guernsey	r	r	r	r	r	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	7264	6904	6724	6544	6364	1	-36.0	-0.5	-36.0	-0.5	-36.0	-0.6	-36.0	-0.5
Guinea-Bissau	2216	2120	2072	2022	1972	1	-9.6	-0.4	-9.8	-0.5	-10.0	-0.5	-9.8	-0.5
Guyana	16660	16622	16602	16576	16526	2	-3.8	0.0	-4.6	0.0	-10.0	-0.1	-5.4	0.0
Haiti	116	109	105	101	97	1	-0.7	-0.6	-0.8	-0.8	-0.8	-0.8	-0.8	-0.7
Holy See	0	0	0	0	0	1	0.0		0.0		0.0		0.0	
Honduras	8136	6392	5792	5192	4592	1	-174.4	-2.4	-120.0	-2.1	-120.0	-2.4	-141.8	-2.3
Hungary	1801	1917	1983	2046	2069	3	11.6	0.6	12.9	0.7	4.6	0.2	10.7	0.6
Iceland	16	29	37	43	49	3	1.3	6.0	1.4	4.0	1.3	2.9	1.3	4.6

Source: FAO (2015) Global Forest Resources Assessment 2015: Desk reference, http://www.fao.org/3/a-i4808e.pdf (accessed 06 September 2018)

Figure 6.2: Percentage of net forest change and rural population change, by climatic domain, 2000-2010



Source: FAO (2016) *State of the World's Forests 2016*, Rome: FAO, http://www.fao.org/3/a-i5588e.pdf (accessed 06 September 2018)

The graphic shows the relationship between population change and net forest change. It highlights pressures leading to deforestation from population growth.

Figure 6.3: Forest cover of India

Table 2.1 : Forest Cover of India

Class	Area (sq km)	percent of Geographical Area
Forest Cover		
Very Dense Forest	85,904	2.61
Moderately Dense Forest	315,374	9.59
Open Forest	300,395	9.14
Total Forest Cover*	701,673	21.34
Scrub	41,362	1.26
Non Forest	2,544,228	77.40
Total Geographic Area	3,287,263	100.00

*Includes 4,740 sq km under mangroves

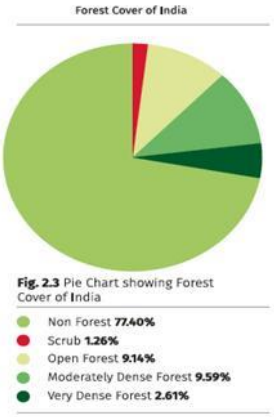


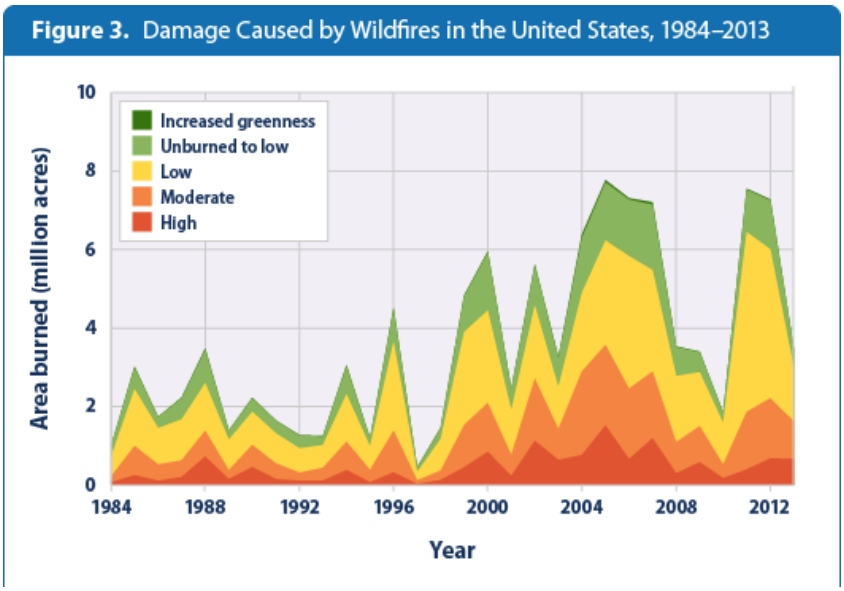
Fig. 2.3 Pie Chart showing Forest Cover of India

- Non Forest **77.40%**
- Scrub **1.26%**
- Open Forest **9.14%**
- Moderately Dense Forest **9.59%**
- Very Dense Forest **2.61%**

Source: Government of India, Environment Information System (ENVIS) Centre-Kerala (2016) *State of Environment and Related Issues 2016,* http://www.kerenvis.nic.in/Database/FOREST_819.aspx (accessed 06 September 2018)

Area of forest cover and other land cover categories in India.

Figure 6.4. Damage caused by wildfire on the United States (1984 - 2013)



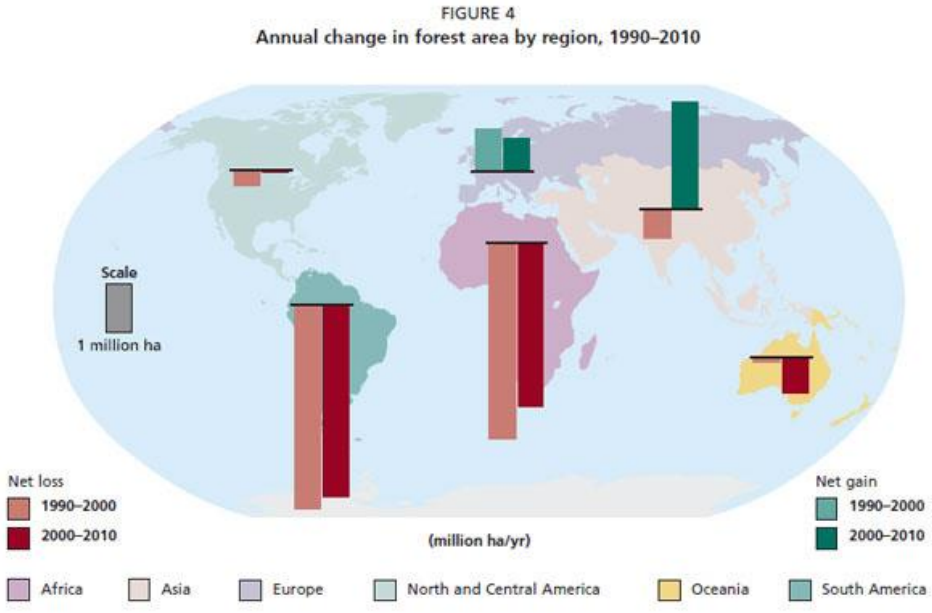
Source: United States Environmental Protection Agency, 2016
https://www3.epa.gov/climatechange/pdfs/print_wildfires-2016.pdf (accessed 06 September 2018)

Area burned in the United States by level of damage.

Figure 6.5: Forest and land area 1990 to 2015

Source: FAO (2017) *Global Forest Resources Assessment 2015 Infographics* website, http://www.fao.org/resources/infographics/infographics-details/en/c/325836/ (accessed 06 September 2018)

Figure 6.6: Annual change in forest area by region (1990-2010)

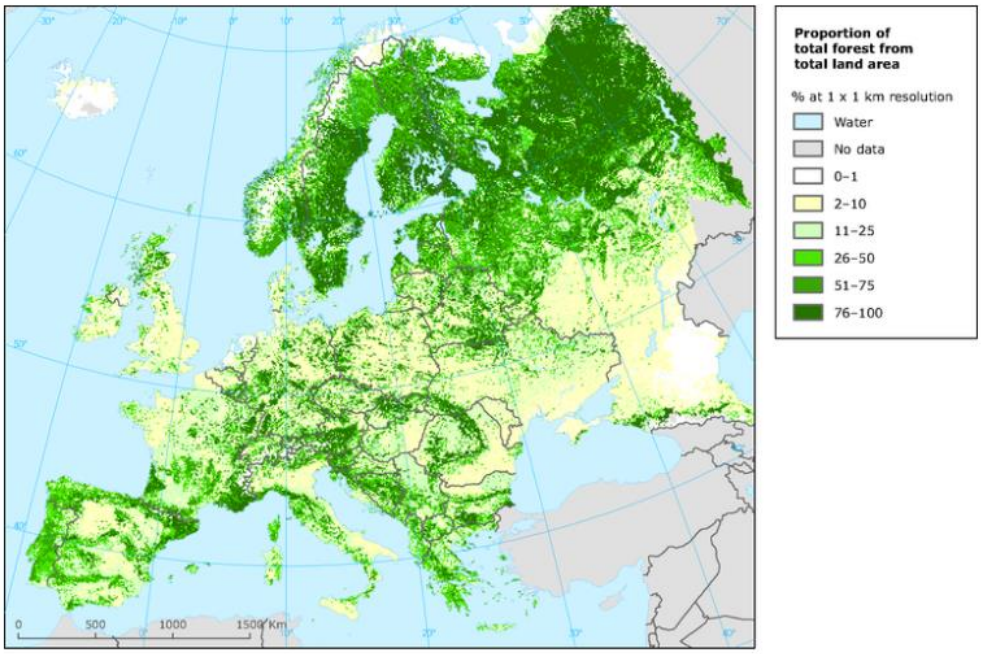


Source: FAO (2010) *Global Forest Resources Assessment 2010,* http://www.fao.org/forestry/fra/62219/en/ (accessed 06 September 2018)

Change in forest area by region over a twenty-year period.

Figure 6.7: Forest cover in Europe

Note: Based on remote sensing technologies and forest inventory statistics.



Source: European Environment Agency (2009*) Forest map of Europe*, http://www.eea.europa.eu/data-and-maps/figures/forest-map-of-europe-1 (accessed 06 September 2018)

Area of forest as a percentage of land area in Europe.

6B. SEEA accounts/tables that use these statistics

The forest statistics contained in the FDES are used in environmental accounts for forestry and timber resources contained in the System of Environmental-Economic Accounting (SEEA-CF) Central Framework 2012[89] and the SEEA Agriculture, Forestry and Fisheries (SEEA-AFF).

Table 5.15 Physical asset account for forest and other wooded Land: The account can be compiled by type of forest. Relevant statistics are from Topic 1.2.3.a Forest Area. Additions and reductions to stock are provided by FDES 2.3.2.a Use of forest land.

Table 5.19 Physical asset account for timber resources uses FDES statistics 2.5.1.a Timber resources. The SEEA account distinguishes between cultivated timber resources and natural timber resources; and within natural timber resources between natural timber resources available for wood supply and natural timber resources not available for wood supply.

Physical flow accounts for wood forestry products records the supply and use of forestry products in physical terms.[90] Covers all production of roundwood, including for own consumption. FDES statistics from 2.5.1.a.4 Removals and 2.5.1.c Forest production apply.

[89] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. E.12.XVII.12. https://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 06 September 2018)

[90] Food and Agriculture Organization of the United Nations, United Nations Statistics Division (2018) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA-AFF*, White Cover version,

6C. Commonly used indicators that incorporate these statistics

Commonly used forest indicators include but are not restricted to:

- Proportion of natural forest over total forest area: shows the area of natural forest to total forest area.
  FDES 1.2.3.a.2 Natural forest area / FDES 1.2.3.a.1 Total forest area

- Proportion of planted forest: shows the area of planted forest to total forest area.
  FDES 1.2.3.a.3 Planted forest area / FDES 1.2.3.a.1 Total forest area

- Deforestation rates (per year) = $((Area_2/Area_1)^{1/(t2-t1)})-1$
  FDES 2.3.2.a.1 Area deforested, FDES 2.3.2.a.2 Area reforested, FDES 2.3.2.a.3 Area afforested, FDES 2.3.2.a.4 Natural growth and *FDES 1.2.3.a.1 Total forest area*

- Reforestation rates (per year) = $((Area_2/Area_1)^{1/(t2-t1)})-1$ (compound interest formula as per SDG).
  FDES 2.3.2.a.1 Area deforested, FDES 2.3.2.a.2 Area reforested, FDES 2.3.2.a.3 Area afforested, FDES 2.3.2.a.4 Natural growth and *FDES 1.2.3.a.1 Total forest area*

- Area affected by fire over total forest area (per year): shows area burned per year.
  FDES 1.2.3.a.5 Forest area affected by fire

- Protected forest area: shows extent of forest area protected.
  FDES 1.2.3.a.4 Protected forest area

6D. SDG indicators that incorporate these statistics

Goal 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", seeks to monitor changes in forested areas (expansion and decline) as deforestation can increase negative impacts in fragile areas and jeopardize the country's food security.

Goal 15 has two directly forest-related indicators 15.1.1 “Forest area as a proportion of land area” and 15.2.1 “Progress towards sustainable forest management”, and one on “Mountain Green Cover Index (15.4.2).

- Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

  Indicator 15.1.1 forest cover: [91] Forest area as a proportion of total land area. Forest area is defined as per the FAO definition given in this methodology sheet and total land area is the total surface area of a country less the area covered by inland waters, like major rivers and lakes.

  *FDES 1.2.3.a.1 Total forest area / FDES 1.1.3.a.2 Area of country * 100*

http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/Agrienvironmental/SEEA_AFF_FINAL_Clean_03.pdf (accessed 06 September 2018)

[91] SDG Metadata, https://unstats.un.org/sdgs/metadata/files/Metadata-15-01-01.pdf (accessed 06 September 2018)

- Target 15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

  Indicator 15.2.1:[92] Progress towards sustainable forest management. The indicator is measured by sub-indicators:

  - Forest area net change rate
    $((Area_2/Area_1)^{1/(t2-t1)})-1$ (compound interest formula as per SDG) uses FDES 1.2.3.a.1 Total forest area, FDES 2.3.2.a.1 Area deforested, FDES 2.3.2.a.2 Area reforested and *FDES 2.3.2.a.3 Area afforested and FDES 2.3.2.a.4 Natural growth*

  - Above-ground biomass stock in forest
    FDES 1.2.3.b.1 Biomass stock in forest (tonnes) / FDES 1.2.3.a.1 Total forest area (ha)

  - Proportion of forest area located within legally established protect areas
    *FDES 1.2.3.a.4 Protected forest area / FDES 1.2.3.a.1 Total forest area * 100*

  - Proportion of forest area under a long-term forest management plan
    *Forest area under a long-term forest management plan / FDES 1.2.3.a.1 Total forest area * 100*

  - Forest area under an independently verified forest management certification scheme (not covered by FDES)

[92] SDG Metadata, https://unstats.un.org/sdgs/metadata/files/Metadata-15-02-01.pdf (accessed 06 September 2018)

F D E S

Manual on the Basic Set of Environment Statistics 2018