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European forest accounts handbook

2024 edition

MANUALS AND GUIDELINES

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Foreword

I am pleased to present the Eurostat Handbook for European Forest Accounts, edition 2024.

The Handbook supports the compilation of European Forest Accounts and thus the availability of Europe-wide comparable statistics on the stocks and flows of forest resources (wooded land and timber stocks), economic activity of the forestry and logging industry, and material flows of wood in the rough.

The EFA Handbook aims to provide guidance to national statisticians in the process of data collection, compilation, presentation and reporting to Eurostat, by explaining the underlying conceptual framework (scope, terms and definitions, and classifications), methodological approaches and data sources, clarifying the treatment of various entries, adjustments and conversions, and presenting country examples and practical case studies of valuation. The EFA Handbook also includes a chapter connecting forest accounting and related reporting frameworks.

Furthermore, the Handbook can also be useful to advanced users and environmental experts by providing a reference for the interpretation and application of results to respond to present policy interests and facilitate the implementation of future policy measures directed at forests, and the forestry and logging industry.

The concepts, recording rules, terms and definitions in the EFA Handbook stem from Regulation (EU) 691/2011 Annex VII on forest accounts. They reflect the statistical treatments from the Food and Agriculture Organisation's Forest Resources Assessment (FAO FRA T&D 2020 and 2025), the System of Environmental-Economic Accounting 2012 - Central Framework (SEEA CF), the SEEA Ecosystem Accounting (SEEA EA 2021), the System of National Accounts (SNA 2008), and the European System of Accounts (ESA 2010). The conceptual framework uses the statistical classification of economic activities in the European Community (NACE Rev. 2.1) and the statistical classification of products by activity (CPA Ver. 2.1).

This handbook is the result of a lot of work by many people. I am grateful to my colleagues in Eurostat unit E.2 ‘environmental statistics and accounts; sustainable development’ for their expertise and project management, and to the members of the Eurostat Expert Group on Forestry Statistics for their many valuable contributions provided through the consultations undertaken between 2023 and 2024. Finally, a special thank you to Carl Obst and Maria Angelopoulos (IDEEA Global), who have worked tirelessly to make this Handbook a reality.

Arturo de la Fuente
Head of Unit E2: Environmental statistics and accounts; sustainable development

Acronyms and abbreviations

AEI	agro-environmental indicators
AWS	available for wood supply
AWU	Annual Working Unit
CEP	classification of environmental purposes
CFC	consumption of fixed capital
CIF	cost, insurance, freight
CLC	CORINE Land Cover
CLMS	Copernicus Land Monitoring Service
CPA	Classification of Products by Activity
CPC	Central Product Classification (of the United Nations)
DLT	dominant leaf type
EAA	Economic Accounts for Agriculture
EAA / EAF	Economic Accounts for Agriculture and Forestry
EAF	Economic Accounts for Forestry
EEA	European Environment Agency
EFA	European Forest Accounts
EFTA	European Free Trade Association
EGSS	Environmental Goods and Services Sector
ENFIN	European National Forest Inventory Network
ESA	European System of Accounts
ESA	European Space Agency
EU	European Union
EUNIS	European Nature Information System
EW-MFA	Economy-wide material flow accounts
FAO	Food and Agriculture Organization (of the United Nations)
FAWS	Forest available for wood supply
FISE	Forest Information System for Europe
FISIM	Financial Intermediation Services Indirectly Measured

FNAWS	Forest not available for wood supply
FOB	free-on-board
FRA	Forest Resources Assessment
FSS	farm structure survey
FTY	forest type
GCF	gross capital formation
GDP	gross domestic product
GFCF	gross fixed capital formation
GFS	Government Finance Statistics
GHG	greenhouse gas
GVA	gross value added
HRL	high-resolution layers
IEEAF	Integrated Environmental Economic Accounting for Forests
IFSM	Integrated Farm Statistics Manual
IOT	input and output table
IPCC	Intergovernmental Panel on Climate Change
ITTO	International Tropical Timber Organization
IUFRO	International Union of Forest Research Organizations
JFSQ	Joint Forest Sector Questionnaire (Eurostat, FAO, ITTO, UNECE)
JRC	Joint Research Centre
KAU	Kind-of-Activity Unit
LCLU	Land Cover / Land Use
LiDAR	Light Detection and Ranging
LKAU	Local Kind-of-Activity Unit
LUCAS	Land Use Cover Area Frame Survey
LULUCF	Land-Use, Land-Use Change and Forestry
MFA	material flow accounts
NAC	national currency
NACE	Nomenclature of Economic Activities
NAI	net annual increment
NAWS	not available for wood supply
n.e.c.	not elsewhere classified
NFI	National Forest Inventory
NPISH	non-profit institutions serving households
NPV	net present value

NVA	net value added
OECD	Organization for Economic Cooperation and Development
OSB	oriented strand board
OWL	other wooded land
RR	resource rent
RS	remote sensing
SDG	Sustainable Development Goals
SEEA AFF	System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries
SEEA CF	System of Environmental-Economic Accounting Central Framework
SEEA EA	System of Environmental-Economic Accounting Ecosystem Accounting
SME	small-to-medium enterprise
SNA	System of National Accounts
SUT	supply and use table
TBFRA	Temperate and Boreal Forests Resource Assessment
TCD	tree cover density
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
UNSPF	United Nations Strategic Plan for Forests
VA	value added
VAT	value-added tax

Chapter 1. About the European Forest Accounts Handbook

1.1. Introduction

1.1 Forest accounts are a set of inter-related accounts describing a number of key features of forests and associated land areas, timber resources and forestry and logging activity. The European Forest Accounts (EFA) are one module of a wider suite of European environmental-economic accounting data that are compiled and collected from EU Member States to respond to the growing needs for information about the environment and its connections to the economy. EFA and the other European environmental-economic accounts reflect the conceptual underpinnings described in the UN System of Environmental-Economic Accounting (SEEA) and the System of National Accounts (SNA).

1.2 The European Forest Accounts Handbook (EFA Handbook) provides guidance on the scope, concepts and data compilation methods of the EFA and aims to facilitate the production of harmonised and comparable data across time and countries. It has been developed to support the compilation of data for the associated European Forest Accounts Questionnaire (EFA Questionnaire) under the legal framework for the collection of forest accounts data defined in Annex VII of the Regulation (EU) No 691/2011 of the European Parliament and the Council.

1.3 The Handbook primarily addresses compilers of EFA to support the collection, organization and reporting of relevant data. Nonetheless, it will also be of interest to users of EFA data who would like to understand more of the underlying statistical details.

1.4 The EFA Handbook updates and replaces the guidance contained in the 2002 edition of "The European Framework for Integrated Environmental and Economic Accounting for Forests" (Eurostat, 2002). The update was necessary for several reasons:

- First, the release of a new version of the European System of Accounts (ESA 2010) and of the System of Environmental-Economic Accounting – Central Framework (SEEA CF 2012).

- Second, the amendment of Regulation (EU) No 691/2011, establishing in Annex VII the legal framework for reporting EFA data to Eurostat as well as some key definitions and classifications.

- Third, lessons learnt from running a voluntary EFA data collection since 2016 and other recent developments and experience gained in methodological discussions and implementation projects on forest statistics and accounts.

- Finally, further development work on other environmental-economic accounts and national accounts, in particular on ecosystem accounting and on the measurement of natural resources in the update of the 2008 SNA planned for adoption in 2025.

1.2. History of the development of European Forest Accounts

1.5 Accounting for European forests has been a long-standing program of work involving EU countries, European Free Trade Association (EFTA) countries, and candidate and potential candidate countries. Initial research and investigation took place in the 1990s culminating in the European Framework for Integrated Environmental and Economic Accounting for Forests (IEEAF) released in 2002. Since then, there has been ongoing work to compile accounts and related data on forests.

1.6 Key stages in the development of EFA have been:

- The Eurostat environmental satellite accounts initiative, which began in the late 1990s, aiming to provide additional richness to the national accounts information set for specific industries and activities including the development, compilation and collection of Economic Accounts for Forestry (EAF) (Eurostat, 2000) until 2006.

- The development of the IEEAF which proposed 19 tables on physical assets (land and timber resources), economic production, and environmental flows (including ecosystem services). Pilot studies were progressively undertaken and reporting on the 19 tables commenced on a voluntary basis in 2006.

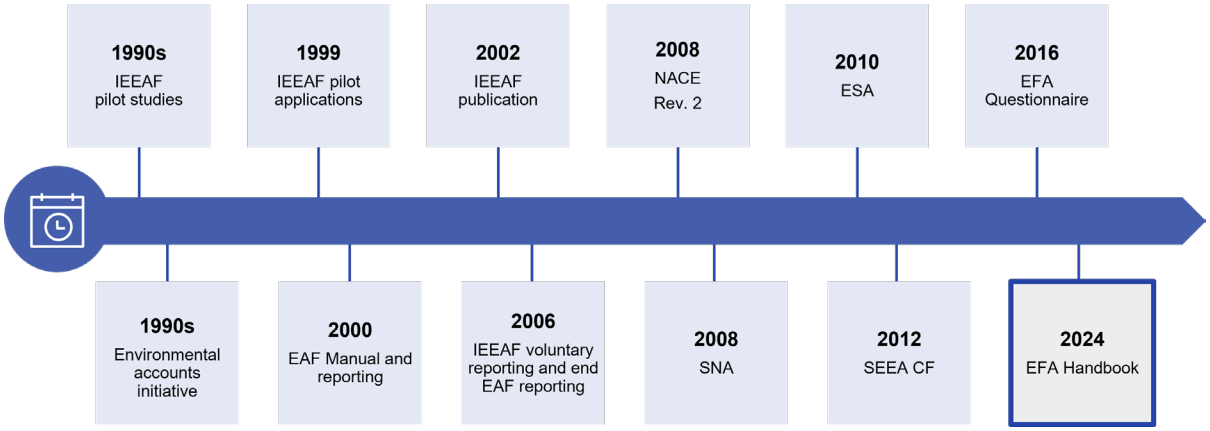
- The revision to the classification of economic activities for Europe (NACE) which saw the previously combined activities of forestry and logging separated (NACE A, 02.1 Silviculture and other forestry activities, 02.2 Logging) and separate products for each activity established. This revision supported the implementation of the SNA 1993 recommendations on measurement of the output of the industry wherein output of timber resources for cultivated production contexts was to be recorded on a progressive basis rather than at the time of felling. These developments were reinforced in the revision of the SNA 2008 and the ESA 2010.

- The adoption of the SEEA 2012 Central Framework (SEEA CF) as the first statistical standard for environmental-economic accounting. This adoption gave additional impetus to the compilation of forest and other natural resource accounts and drove higher expectations around reporting.

- The refinement of the IEEAF-based questionnaire in 2016 to establish the EFA Questionnaire. This refinement focused on alignment with the SEEA CF and the SNA 2008 / ESA 2010. The set of tables in the EFA Questionnaire is the result of the pilot study run in 2015, the recommendations of the Task Force on the review of IEEAF, and a comparison with the data collected in 2015 by FAO Forest Resources Assessment and Forest Europe, as published on the UNECE database.

Figure 1.1

Timeline of developments in European forest accounting



1.7 The present EFA Handbook was prepared in consultation with the Expert Group on Forestry Statistics throughout 2023 and 2024 to support the compilation of data for the EFA Questionnaire in line with the new legal modules on environmental-economic accounting. Currently, the EFA Questionnaire involves both mandatory and voluntary elements, with results reported annually to Eurostat by EU and EFTA states, candidate, and potential candidate countries.

1.3. Applications of Forest Accounts

1.8 The importance of forests in the European context is very high and increasing from economic, environmental and social perspectives and hence ensuring the quality, comparability and robustness of the information set available to policy makers at national and European scale has a high priority. This primary driver has been embodied in the ongoing process to establish a legal module for reporting on forest accounts, the

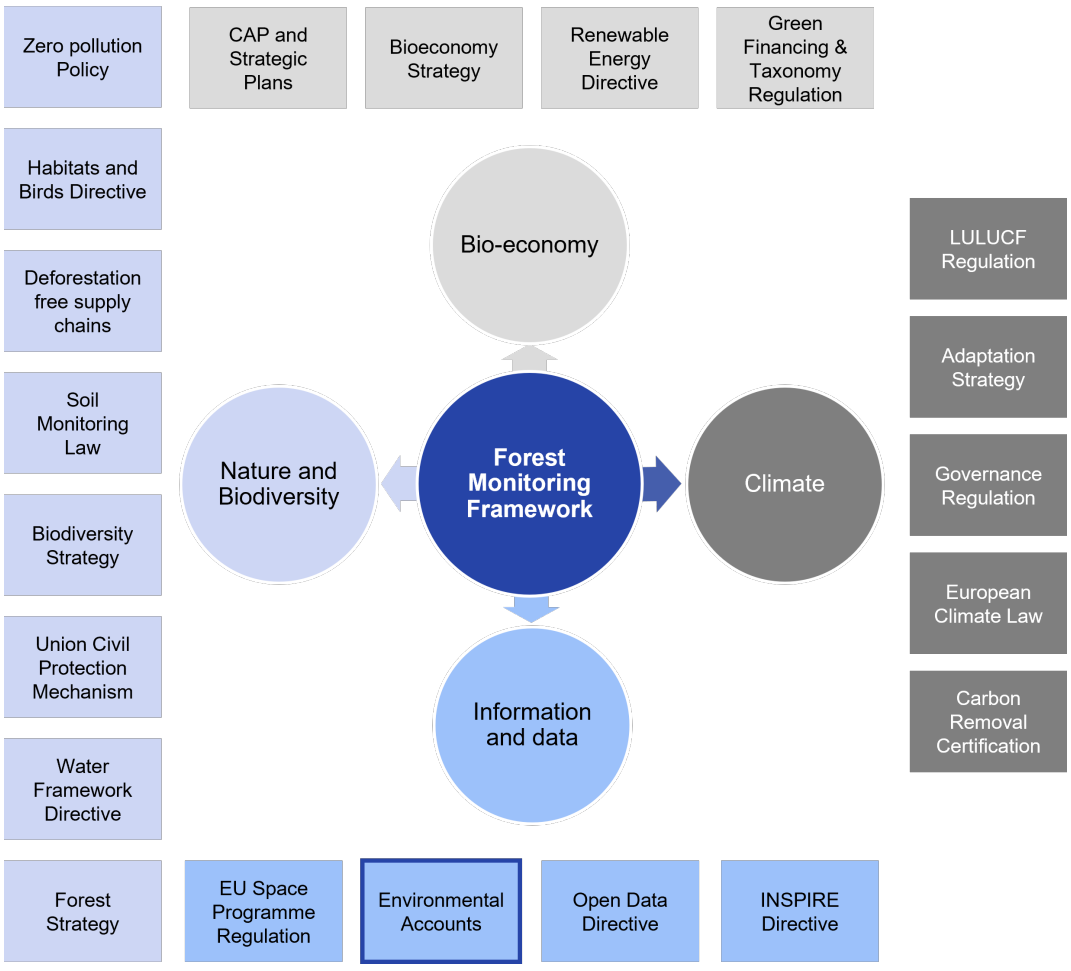
development of the New EU Forest Strategy for 2023 and the foreseen EU framework for forest monitoring.

1.9 More broadly, the European Union is committed to tackling climate and environmental related challenges through the European Green Deal. The Green Deal is a key element of EU's strategy to implement the United Nation's 2030 Agenda and the sustainable development goals (SDGs), and current EU policy priorities.

1.10 Building on the European Green Deal, the 8th Environment Action Programme (EAP), entered into force on 2 May 2022. The EAP is EUs legally agreed common agenda for environmental policy until 2030, within a 2050 vision of living well and within planetary boundaries. It sets out priority objectives for 2030, and conditions to achieve these, calling for engagement of all stakeholders at all levels of governance, to ensure that EU climate and environment laws are effectively implemented.

Figure 1.2

Forests and the Forest Monitoring Framework in the policy context



Source: DG-Environment (2024), modified.

1.11 To achieve both forest and wider sustainability objectives, the availability of high-quality, coherent and comparable data on forests and the forestry industry is of high relevance. The data from the EFA can thus be used to:

- Plan and monitor various forest related policies and the associated goals and targets including:
  - Sustainable forest management
  - Multiple uses of forests including non-wood forest products, climate regulation, recreation, and other ecosystem services
  - Biodiversity protection and ecosystem restoration
  - Protection against avalanches and soil erosion, water quality
  - Circular economy
- Consider forests and forestry activity in a comparable way to other ecosystems, other land uses and economic activities.
- Increase the knowledge and shared understanding of forests.
- Support reporting on wider sustainability objectives.

Data from the EFA should complement the range of forest data from other data collection and reporting mechanisms.

1.4. Structure of the EFA Handbook

1.12 The focus of the EFA Handbook is on a complete description of forest accounts (i.e. all the elements that are to be measured) and hence goes further than describing only those items explicitly noted as part of the legal reporting requirements. Thus, the EFA Handbook describes in detail the concepts, terms and definitions, methods and data sources related to the treatment of all entries across the EFA Questionnaire tables. Additionally, the EFA Handbook presents an overview of related forest accounting and statistics reporting frameworks and measurement, clarifying links and deviations.

- Chapter 2 provides an overview of the EFA framework, including the various accounts and the connections between them, the common accounting principles and treatments, and reporting requirements and expectations in relation to the questionnaire.
- Chapter 3 describes the asset accounts for wooded land in both physical (i.e. hectares) and monetary terms, and associated concepts, definitions, data sources and methods for compilation.

- Chapter 4 describes the asset accounts for timber resources in both physical (i.e. cubic metres) and monetary terms, and associated concepts, definitions, data sources and methods for compilation.

- Chapter 5 describes the economic accounts for forestry and logging activities, primarily expressed in monetary terms and concerning economic units classified to NACE 02. It includes measures of output, intermediate consumption, capital formation and employment.

- Chapter 6 describes supply and use tables for wood in the rough in physical and monetary terms covering measures of output, intermediate consumption, imports, exports and household consumption.

- Chapter 7 provides an introduction to the range of forest related accounts and reporting systems which all have connections to different parts of the EFA framework. The primary connections and areas of alignment and difference are noted.

1.13 In addition, there are two annexes providing additional detail to support compilation, namely industry and product correspondence tables and conversion factors. A glossary of terms and bibliography are also included.

2

Chapter 2. Overview of European Forest Accounts

2.1. Introduction

2.1 Forest accounts are a set of inter-related accounts describing a number of key features of forests and associated land areas, timber resources and forestry and logging activity. The European Forest Accounts (EFA) consists of accounts in four main areas: asset accounts for wooded land, asset accounts for timber stocks, economic accounts for the forestry and logging industry and supply and use tables for flows of wood in the rough. Each of these accounting areas are considered in turn in Chapters 3 to 6 of the EFA Handbook. This section provides a short overview of the accounts and the connections between them.

2.2 A useful structure for considering the scope of the EFA is in terms of the ten tables that are collected through the EFA Questionnaire. Table 2.1 shows, for each accounting area, the relevant tables and the units of measurement. The structures of the various accounts are adapted from those of the international statistical standards for accounts from the System of National Accounts (SNA) and the System of Environmental-Economic Accounting Central Framework (SEEA CF). It is highlighted that the asset accounts for wooded land and timber stocks are to be recorded in both physical and monetary terms, that the economic accounts are recorded in monetary terms and focus on the activity of just the forestry and logging industry (NACE Division 02) and that the supply and use tables are recorded in both physical and monetary terms but only for the product wood in the rough.

Table 2.1

EFA and corresponding EFA Questionnaire tables

Accounting area	Table no.	Table name
Assets		
Asset accounts for wooded land	A 1a	Area of wooded land, in 1000ha
	A 1b	Area of wooded land, in million national currency
Asset accounts for timber stocks	A 2a	Timber on wooded land, in 1000m³ over bark
	A 2b	Timber on wooded land, in million national currency
Economic data		
Economic accounts for the forestry and logging industry	B 1	Economic aggregates of the forestry and logging industry (excluding other industries), in million national currency (extended Economic Accounts for Forestry)
	B 2	Output of the forest and logging industry by type, in million national currency
Supply and use tables for wood in the rough	B 3a	Supply of wood in the rough by all industries, in million national currency
	B 3b	Use of wood in the rough by all industries, in million national currency
Material flow		
Supply and use tables for wood in the rough	C 1a	Supply of wood in the rough by all industries, in 1000m³ over bark
	C 1b	Use of wood in the rough by all industries, in 1000m³ over bark

2.1.1. Asset Accounts

2.3 Following the SEEA CF, the intent of asset accounts is to record the opening and closing stock of various environmental assets and the different types of changes in the stock over an accounting period. An asset account is structured as shown in Table 2.2. It starts with the opening stock of environmental assets and ends with the closing stock of environmental assets. In physical terms, the changes between the beginning and the end of the accounting period are recorded as either additions to the stock or reductions in the stock and, wherever possible, the nature of the addition or reduction is recorded. In monetary terms, the same entries are made but an additional entry is included for the purpose of recording the revaluation of the stock of environmental assets. This entry accounts for the changes in the

value of assets over an accounting period that are due to movements in the price of the assets.

Table 2.2

Basic form of an asset account

Opening stock of environmental assets
Additions to stock
Growth in stock
Discoveries of new stock
Upward reappraisals
Reclassifications
Total additions of stock
Reductions of stock
Extractions
Normal loss of stock
Catastrophic losses
Downward reappraisals
Reclassifications
Total reductions in stock
Revaluation of the stock*
Closing stock of environmental assets

* Only applicable for asset accounts in monetary terms.
Source: SEEA CF, Table 2.3.

2.4 There are many and varied reasons for changes in the quantity and value of a stock of environmental assets over an accounting period. Many of these changes are due to interactions between the economy and the environment, for example, in the context of the harvest or planting of timber resources. Other changes in environmental assets are caused by natural phenomena, for example, catastrophic losses of timber resources due to forest fires. The details and structure of the asset accounts for wooded land and timber resources (EFA Tables A1 and A2) are described in detail in Chapter 3 and Chapter 4, respectively.

2.1.2. Supply and use tables

2.5 Following the SNA and the SEEA CF, supply and use tables can be compiled using either monetary or physical (quantitative) data. Monetary supply and use tables record all flows of products in an economy between different economic units in monetary terms. They are compiled to describe the structure of an economy and the level of economic activity.

2.6 Products are “supplied” within the economy when they are either (a) produced by industries in the national economy (a flow known as output); or (b) brought in from the rest of the world (a flow known as imports).

2.7 All products that are supplied must be recorded as being “used”. Use can occur in a number of ways, i.e., the products can be:

i. Used by other industries to make different products (a flow known as intermediate consumption);

ii. Consumed by households (a flow known as household final consumption expenditure);

iii. Consumed by Governments (a flow known as government final consumption expenditure);

iv. Sold to the rest of the world (a flow known as exports);

v. Held as inventories for later use;[1] or

vi. Used as fixed assets (e.g., buildings) over a longer period of time to produce other products (these longer-term uses are flows known as gross fixed capital formation).

2.8 As shown in Table 2.3, these flows are classified by type of product in the rows and by type of economic unit (enterprises, households, government) and the rest of the world in the columns. Enterprises are classified to industries on the basis of their principal activity. The exception in the naming of the columns is “Accumulation”. Accumulation flows are recorded separately for the following reason: while they concern supply in the current accounting period, they are not used in the current period and instead accumulate for future use or sale by economic units and the rest of the world – in the form either of inventories or of fixed assets.

[1] When products are withdrawn from inventories in subsequent accounting periods, they are effectively re-supplied to the economy at that time. By accounting convention, the change in inventories (additions to inventories less withdrawals) during an accounting period is recorded as a use of products.

Table 2.3

Basic form of a monetary supply and use table

	Industries	Households	Government	Accumulation	Rest of the world	Total
Supply table						
Products	Output	-	-	-	Imports	Total supply
Use table						
Products	Intermediate consumption	Household final consumption expenditure	Government final consumption expenditure	Gross capital formation (incl. changes in inventories)	Exports	Total use
	Value added					

Note: Dark grey cells with dashes are null by definition.
Source: SEEA CF, Table 2.1.

2.9 The monetary supply and use table (EFA Table B3) is divided into two parts: the supply table and the use table. Overall, the total supply of each product must equal the total use of each product. This equality between the total supply and total use of each product is known as the supply and use identity, a fundamental identity in both the monetary supply and use tables and in the physical supply and use tables.

2.10 The row of the supply table shows that for each product total supply is equal to output plus imports. The row for the use table shows that total use is equal to intermediate consumption plus household final consumption expenditure plus government final consumption expenditure plus gross capital formation[2] plus exports.

2.11 Physical flows are recorded by compiling supply and use tables in physical units of measurement. These tables, which are commonly known as physical supply and use tables (PSUT), are used to assess how an economy supplies and uses energy, water and materials, as well as to examine changes in production and consumption patterns over time. In combination with data from monetary supply and use tables, changes in productivity and intensity in the use of natural inputs and the release of residuals can be examined.

2.12 The PSUT structure is based on the monetary supply and use tables described above with extensions to incorporate a column for the environment, and rows for natural inputs and residuals. SEEA CF Chapter 2 and Table 2.2 provides a more detailed introduction to PSUT. However, this detail is not required for the EFA since the PSUT for wood in the rough only concerns product flows, i.e. there are no flows of natural inputs or residuals to record. As a

[2] Gross capital formation is equal to gross fixed capital formation plus changes in inventories plus acquisition less disposals of valuables noting that for NACE 02 transactions in valuables is expected to be zero.

result, the basic structure of the PSUT for wood in the rough (EFA Table C1) is the same as for the monetary supply and use table shown in Table 2.3.

2.1.3. Economic accounts

2.13 The structure of the economic accounts for the forestry and logging industry in the EFA follows the sequence of economic accounts described in the SNA and the ESA. The sequence of accounts is a comprehensive set of linked accounts covering all economic transactions, other flows and stocks and changes in stocks of other assets. The accounts of most relevance to the EFA are the:

a. Production account which records entries for output (market and non-market), intermediate consumption, value-added, consumption of fixed capital and other taxes and subsidies on production (NB: The monetary supply and use table provides a more elaborated version of the entries in the production account by providing a structure to record the entries by industries and by product).

b. Distribution of income accounts which records entries for a wide range of transactions and transfers of income between economic units including compensation of employees, operating surplus, mixed income and property income (including interest, dividends and rent).

c. Capital account which records entries for gross fixed capital formation, changes in inventories (including work in progress) and capital transfers.

d. Other change in volume of asset accounts which records entries for changes in the monetary value of economic assets that are not due to transactions, for example catastrophic losses and discoveries of resources.

e. Balance sheet which records entries for the monetary value of economic assets, including natural resources as at the beginning and end of the accounting period.

2.14 A complete overview of the sequence of economic accounts is provided in the 2008 SNA Chapter 2 (ESA 2010, Chapter 8); and SNA Chapters 6-13 (ESA 2010, Chapters 3-7) provide detail for all of the entries in the accounts and descriptions of associated treatments.

2.15 The entries in the EFA economic accounts for the forestry and logging industry (EFA Table B1) represent a selection of entries from the full sequence of accounts and primarily concern entries for the production account, the distribution of income accounts and the capital account. Entries concerning the other change in the volume of asset account and the balance sheet are recorded in the EFA asset accounts for wooded land and timber resources.

2.1.4. Connections across the EFA

2.16 As noted in the previous sections, there are connections between different types of accounts. In the context of the EFA, the following main connections are highlighted. The details of the connections are described in the following chapters.

2.17 **Asset accounts for wooded land and timber stocks**: The asset accounts in both physical and monetary terms for these accounting areas use the same measurement coverage and structure of data recording. Thus, for both sets of asset accounts the relevant area of wooded land encompasses forest (both available for wood supply and not available for wood supply), other wooded land and other land with tree cover available for wood supply. In the case of the asset accounts for wooded land the focus of measurement is on the total area and changes in that area, while in the case of timber stocks the focus is on those stocks and changes in stocks that are presented within the areas of wooded land.

2.18 **Net increment and output of forest trees**: In the asset accounts for timber stocks an important entry concerns the net increment of those stocks. In the economic accounts, the measurement of output of forestry is also based on estimating the monetary value of the net increment of timber resources. In concept, the values of these two entries can be the same (noting that in the economic accounts the entry refers to output of trees, tree plants and forest tree seeds rather than net increment) but will differ if some of the net increment of timber stocks is not managed by economic units classified to NACE 02 since the economic accounts only include output for NACE 02 economic units. Note that the scope of measurement of the output of forest trees in the economic accounts only relates to cultivated production contexts whereas the recording of net increment in the asset account makes no differentiation as to whether the production context is cultivated or natural. Note also that some net increment of timber stocks will relate to areas not available for wood supply and hence, in physical terms this will not be included in measure of output in the economic accounts.

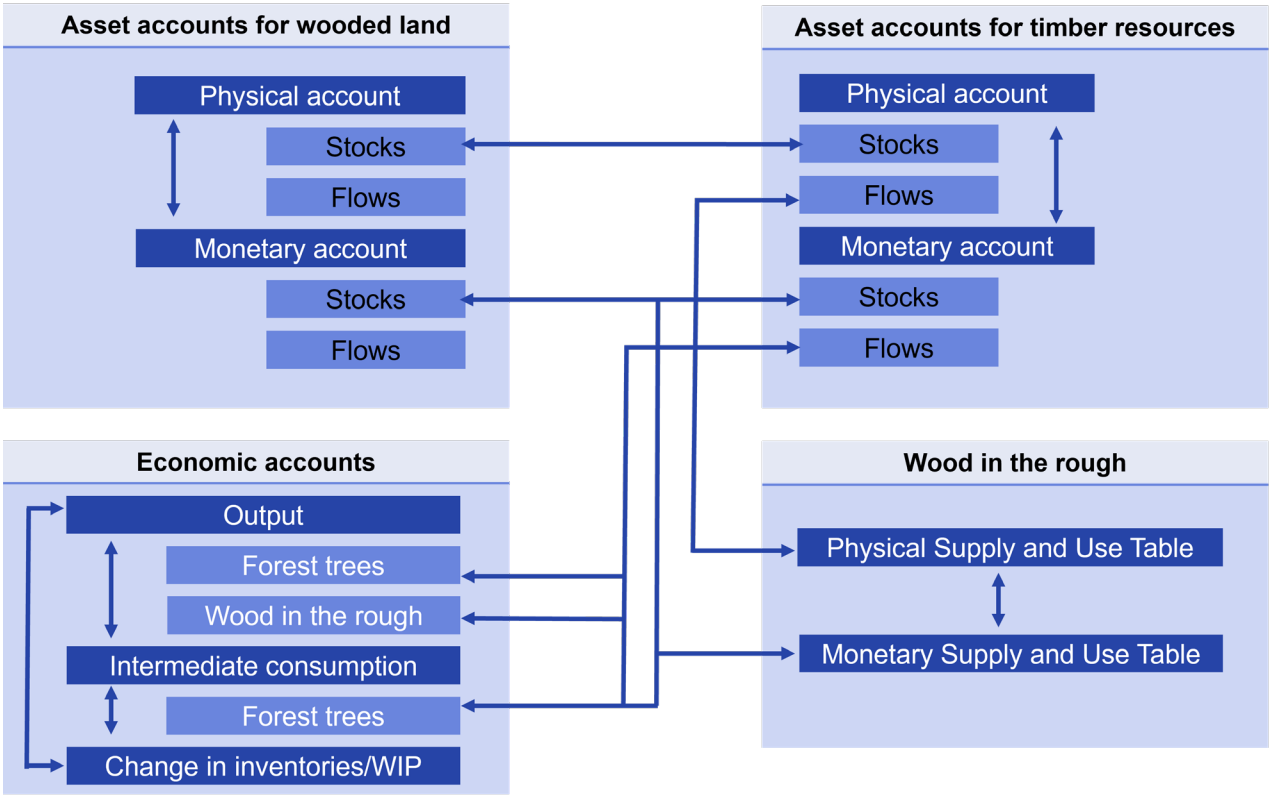
2.19 **Net increment and work in progress of forest trees**: Building on the connection just described, it is recognised that the entry for work in progress of forest trees in the economic accounts will be linked to measures of net increment which represents the increase in work in progress over an accounting period. Work in progress is derived by then deducting removals of forest trees (i.e. when the stock is felled). Note that work in progress can also be derived by differencing the closing stock and the opening stock thus highlighting another connection to entries in the asset account for timber stocks. Under either method of derivation of work in progress, changes due to other causes should not be included.

2.20 **Value of work in progress and the value of standing timber**: At the opening and closing of each accounting period the value of standing timber, i.e. the timber stock available for harvest, will be equal to the value of the work in progress for the stock that is considered cultivated (produced). Note however, that the balance sheet value of work in progress is not recorded in the EFA economic accounts, only the change in the value of work in progress is recorded.

2.21 **Removals and output of wood in the rough**: In the asset accounts for timber stocks the entry for removals is a key reduction in stock reflecting the harvest of timber. In the economic accounts, the sale of harvested timber is recorded as sales of wood in the rough, either as logs or fuel wood. In physical terms, the flows will be the same. In monetary terms, the estimate of output of wood in the rough will be higher than the entry for removals in the asset account for timber stocks because the former is valued using roadside pickup prices while the latter is valued using stumpage prices. In terms of measurement scope, the entries should be the same except in cases where the timber stock is not managed by economic units classified to NACE 02 since the economic accounts only include output for NACE 02 economic units. Note however that in the supply and use tables, since the coverage of output is all economic units, the estimate for removals in the asset accounts for timber stocks (in physical and monetary terms) and the estimate for output in the supply table (in physical and monetary terms) should be the same. Note, that total supply in the supply and use tables may be greater than output if there are imports of wood in the rough.

Figure 2.1

Links among different EFA tables and accounting entries



2.2. Common accounting principles and treatments

2.22 As noted in the previous section, conceptually all of the EFA are based on the relevant accounts described in the SNA / ESA and the SEEA CF. The previous section introduced the main elements of the structure of the EFA that are connected to these accounting frameworks. This section considers other key principles of recording that are applied in the EFA and are also based on the SNA and the SEEA CF principles and treatments. The following paragraphs provide selected excerpts from the SEEA CF and are intended to provide an introduction to the issues. For more detailed consideration of the treatments, compilers are encouraged to consult the underlying statistical documents, i.e. the SNA, ESA and SEEA CF.

2.23 **Institutional sectors**: The starting point for the measurement of economic accounts is defining and classifying economic units. This has a focus on the purposes, objectives and behaviours of individual economic units. *An **institutional unit** is an economic entity that is capable, in its own right, of owning assets, incurring liabilities, and engaging in transactions and other economic activities with other entities*. Institutional units may be either households, or legal or social entities (such as corporations) that are recognized independently of the people that own or control them. Groupings of institutional units that are similar in their purposes, objectives and behaviours are defined as institutional sectors.

2.24 Following the SNA, five types of institutional sector are recognised: households, non-financial corporations, financial corporations, general government and non-profit institutions serving households (NPISH). Chapter 4 of the SNA 2008 (ESA 2010 Chapter 2) describes the different institutional sectors in detail.

2.25 Enterprises, Kind-of-Activity Units, establishments, and industries: *An **enterprise** is the view of an institutional unit as a producer of goods and services.* An enterprise may comprise one or more establishments and hence may be located across multiple locations within a single economy. Further, an enterprise may engage in a number of different productive activities. Therefore, to better focus measurement the SNA / ESA defines two other types of units: Kind-of-Activity Units and establishments.

> *A **Kind of Activity Unit (KAU)** is an enterprise, or a part of an enterprise, that engages in only one kind of productive activity or in which the principal productive activity accounts for most of the value added.*
>
> *An **establishment** is an enterprise, or part of an enterprise, that is situated in a single location and in which only a single productive activity is carried out, or in which the principal productive activity accounts for most of the value added.*

2.26 The groupings of KAU (ESA 2010, 2.148; SNA 2008, 5.12-14) or establishments that undertake similar types of productive activity are referred to as industries, for example the forestry and logging industry. Ideally, an industry is composed of KAU or establishments that undertake the same activity and only that activity, i.e., the grouping would be

homogeneous. In practice, KAU can undertake a variety of secondary activities and so are classified to an industry class on the basis of their primary activity.

2.27 In both physical and monetary terms, the activities undertaken within KAU and establishments are referred to as "own account" activities. In the EFA, own-account activity covers activity undertaken for either the final consumption or the investment of the economic unit (own-account final use) with examples including the collection of fuel wood by households and the use of logs for constructing bridges by logging companies.

2.28 **Geographical boundaries**: The geographical boundary that defines the scope of an economy is based on the concept of economic territory, which is the area under effective control of a single government. It includes the land area of a country, including islands, airspace, territorial waters and territorial enclaves[3] in the rest of the world. Economic territory excludes territorial enclaves of other countries and international organizations located in the reference country.

2.29 A national economy comprises the set of all institutional units that are resident in an economic territory, i.e., the unit has its centre of predominant economic interest in a particular economic territory. In general, there will be a large overlap between those units that are resident, and those units located within the geographically defined boundaries of a country.

2.30 **Statistical units** (ESA 2010, 1.54-63): The discussion of economic units and economic territory above focused on the ability of those units to operate within an economy as active participants. In statistical terms, these units are often also the focus of measurement and in this context are referred to as statistical units. Depending on the structure of information within a country, economic data are likely to be available for different types of economic unit, particularly for enterprises and, in some cases, for individual establishments. Consequently, the economic unit and the statistical unit will align in scope. However, since the ownership structures of enterprises can vary significantly and since some enterprises may produce a range of different products, matching the information available to the ideal conceptual model of economic units may not be straightforward, and statistical units will need to be defined for measurement purposes.

2.31 **Time of recording**: In monetary accounts, the general principle is that transactions are recorded when ownership changes and the corresponding claims and obligations arise or are transformed or cancelled. Transactions internal to one unit are recorded when economic value is created, transformed or extinguished. This approach to the time of recording is called an ***accrual approach*** (ESA 2010, 1.101-105; SNA 2008, Chapter 3 Section E.3).

[3] Territorial enclaves include embassies, consulates and military bases and the operations of international organisations. For more details, see SNA 2008, 26.24-26.45.

2.32 The key factor to be monitored with respect to timing is that the time of the transactions under an accrual basis of recording may not align to the time the cash flow associated with the transaction occurs. For example, if a good is purchased and the purchaser is invoiced for payment within 30 days, the time of recording under an accrual approach is the date of the purchase, not the date when the invoice is paid.

2.33 Ideally, the time of the recording of physical flows should align with the time of recording of the flows in monetary terms using an accrual approach. However, in practice, environmental processes may operate with quite different cycles and time frames compared with the standard calendar and financial years used in monetary accounting. Adjustments to account for different underlying cycles in physical and monetary terms should be made as required.

2.34 **Units of measurement**: For accounts compiled in monetary terms, all entries in the accounts must be measured in terms of money and therefore the components from which the entries are built up must be measured in terms of money. In most cases, the entries are the monetary values of the actual transactions. In other cases, the entries are estimated by reference to other equivalent monetary values (for own-account consumption) or valued at the cost of production (for non-market output).

2.35 For accounts compiled in physical terms, the unit of measurement will vary depending on the type of asset concerned. Thus, stocks and flows of timber resources are generally measured volume, such as cubic metres. The details regarding the choice of measurement unit are outlined in the description of specific accounts.

2.36 A common principle is that within a single account in physical terms only one unit of measurement should be used so that aggregation and reconciliation is possible across all accounting entries.

2.37 **Monetary valuation at market prices:** For accounts in monetary terms, the question of valuation is central. In the EFA, as in the SNA and the SEEA, the values reflected in the accounts are, in principle, the current transaction values or market prices for the associated goods, services, labour or assets that are exchanged.

2.38 Strictly speaking, market prices for transactions are defined as amounts of money that willing buyers pay to acquire something from willing sellers. The exchanges should be made between independent parties on the basis of commercial considerations only, sometimes called “at arm’s length” (SNA 2008, 3.119).

2.39 When market prices are not observable, valuation according to market price equivalents should be used to provide an approximation to market prices. Following the SNA, the own-account production of market producers (including own-account capital formation) should be valued as the sum of the costs of production, namely: intermediate consumption, compensation of employees, consumption of fixed capital, a net return to fixed assets used in production, and other taxes less subsidies on production. The valuation of all non-market production, for example by general government units, follows the same approach except that, by convention, a net return to fixed assets used in production is excluded.

2.40 There are special requirements associated with in the application of the market price principle to the valuation of assets, particularly non-produced assets such as natural timber resources. A number of techniques are suggested in the SNA for the estimation of market prices of assets in situations where there are no developed asset markets including the use of net present value (NPV) approaches (SNA 2008, Chapters 10 and 13).

2.41 **Basic, producers and purchasers' prices**: Transactions in products involve two economic units. Owing to a number of factors, the amount ultimately received by the producer or supplier of the product is likely to differ from the amount paid by the purchaser. These factors include the addition of taxes to the price of a product, the addition of delivering costs associated with the transport of the product from producer to final purchaser, the inclusion of wholesale and retail margins and the receipt of subsidies by the producer. To take these different factors into account, three different kinds of prices have been defined reflecting supply and use perspectives. The relationship among these three kinds of prices is shown in Figure 2.2.

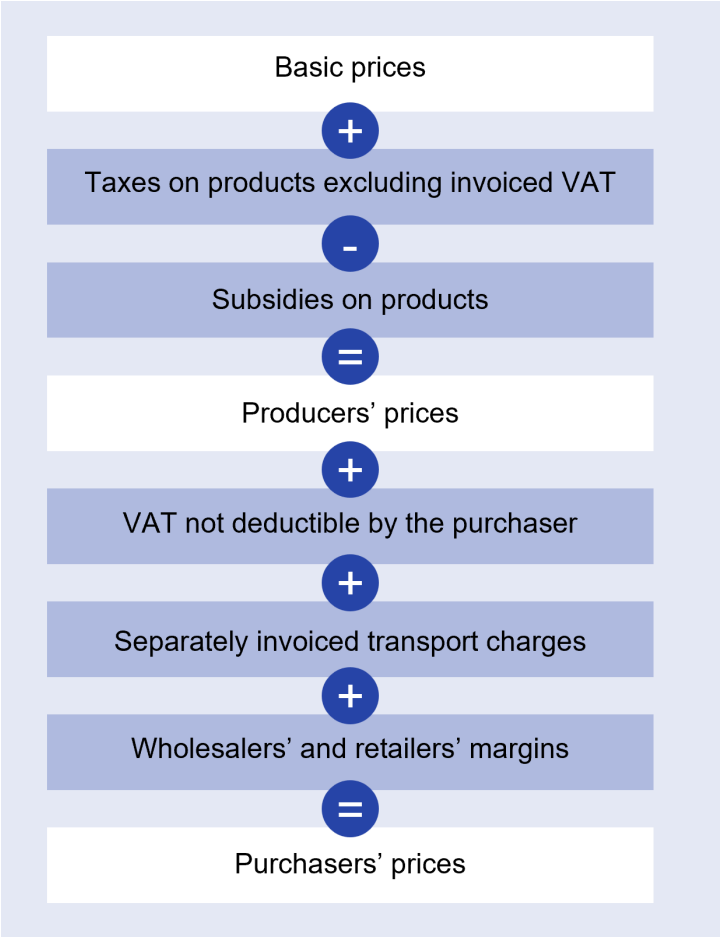
2.42 Two kinds of prices are used within the context of supply, namely, basic prices and producers' prices. The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output, minus any taxes payable on the product plus any subsidy receivable by the producer as a consequence of its production or sale. The basic price excludes any transport charges invoiced separately by the producer and any wholesale and retail margins that may be applicable.

2.43 The basic price measures the amount retained by the producer and is therefore the price most relevant for the producer's decision-making.

2.44 The producers' price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any VAT, or similar deductible tax, invoiced to the purchaser. The producers' price excludes any transport charges invoiced separately by the producer. Unlike the basic price, the producers' price includes any taxes on products other than a deductible VAT and excludes any product subsidies.

Figure 2.2

Basic, producers' and purchasers' prices



Source: SNA 2008, fig 6.1.

2.45 The purchasers' price is the amount paid by the purchaser, excluding any VAT or similar tax deductible by the purchaser, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchasers' price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place. This is the price most relevant for the purchaser.

2.46 The differences between the three sets of prices are most important in the context of the compilation of monetary supply and use tables. In the compilation of monetary supply and use tables in basic prices, the transport charges and wholesale and retail margins are allocated to the relevant services (transport, wholesale and retail services) rather than deducted from the table as a whole. Full details on the appropriate valuation approaches in the compilation of monetary supply and use tables, functional accounts, and the sequence of economic accounts are contained in SNA 2008, Chapter 14 (ESA 2010, Chapter 8).

2.2.1. EFA reporting requirements and guidance

2.47 European Member States will report EFA via a questionnaire to Eurostat on an annual basis following well-established procedures. In the past, reporting of EFA to Eurostat was completed on a voluntary basis but, following the adoption of the legal module on forest accounts, certain parts of the EFA will be mandatory from 2025 onwards. This section describes a number of relevant considerations noting that more detailed guidance and instructions on the submission of questionnaires and reporting requirements will be provided each year.

2.48 Note, that the focus of the EFA Handbook is on a complete description of accounting (i.e. all elements are to be measured), as opposed to whether the items are included or excluded from the legal reporting requirement. At the same time, the Handbook is built on the definitions expressed in the legal module and all definitions provided in the Handbook are considered reference definitions to facilitate comparisons across countries. To support implementation of these definitions, the Handbook outlines a range of data sources and methods that can be applied to compile the various accounts but there are no prescribed methods. Where appropriate, advice is provided on preferred methods but given the range of data sources and resource levels available to different Member States, it is not appropriate to expect that all countries will adopt exactly the same approaches to the compilation of EFA.

2.49 To establish the basis for reporting quality data by Member States, Eurostat has developed the following three components that are briefly introduced here.

2.50 **Metadata requirements:** The EFA Questionnaire contains a metadata sheet requesting Member States to submit responses to a range of concepts. Additionally, boxes are provided following each of the EFA tables allowing countries to provide feedback on the basic data used, difficulties encountered when estimating specific items, techniques used, quality of estimates, and any other problems or suggestions for improving the questionnaire.

2.51 A shift to an online ESS Metadata handler is expected to commence in 2025, allowing countries to also submit metadata through the new platform. From 2026 onwards, the ESS Metadata handler will become the core platform for metadata submissions.

2.52 **Data validation rules and checks:** To support the process of collecting and publishing data from countries by Eurostat, a set of data validation rules and checks has been put in place. These rules and checks are well documented and linked to the EFA Questionnaire completed by Member States and submitted to Eurostat. The document is structured in 6 Annexes:

a. Annex 1a – EFA Validation rules – validation of the questionnaire cell content

b. Annex 1b – EFA Validation rules – internal consistency checks

c. Annex 2 – EFA Validation rules – methodologically advanced plausibility checks

d. Annex 3 - EFA Validation rules – plausibility checks under development

e. Annex 4 – Validation tools for EFA and error reporting to countries

f. Annex 5 – Data publication

2.53 For the validation rules listed in annexes 1a – 3, the following attributes are presented:

a. Rule number

b. Coded format

c. Description

d. Threshold, if applicable

e. Validation outcome: PASS, WARNING, ERROR

2.54 **EFA revision process**: Countries will need to submit data for the reference year and revised data for the two preceding years, whether they change anything or not. The first mandatory data collection will be an exception, with countries having to submit data for the reference year 2023 and the revision for 2022 only. Apart from this, countries can resubmit revisions at any time for any years.

2.55 In the coming years, some revisions are expected to arise as a result of changes to the ESA 2010 and hence national accounts estimates which may be an input to various EFA tables. The changes to ESA 2010 will occur following completion of the process to revise the 2008 SNA which is due for adoption in March 2025. An important part of the SNA revision process has been a focus on accounting for natural resources, including timber resources. This focus reflects a rising interest in issues of sustainability, and it is expected that there will be increased measurement focus in a national accounting context on these resources.

3

Chapter 3. Asset accounts for wooded land

3.1. Introduction

3.1 In many European countries, the area of wooded land is a significant proportion of the total land area, and thus, as a matter of statistical practice, it is relevant to organise data on the total area and how it is changing over time. In many instances, the area of wooded land supports significant economic activities, primarily forestry, and hence understanding the dynamics of those activities requires an understanding of the changing nature of the stock underpinning them. Increasingly, the management of wooded land is recognised as central to global responses to climate change and biodiversity loss and thus understanding the balance of use of wooded land between the supply of wood and supporting environmental outcomes is of high relevance.

3.2 The asset accounts for wooded land present the core data for developing robust and coherent analysis on these various issues. The data presented in these accounts will support the derivation and validation of most other forest and forestry data and accounts and hence substantive efforts in measuring the area of wooded land are encouraged.

3.2. Account structure

3.3 This section presents the asset accounts for wooded land, covering the area of wooded land as proposed in the Regulation (EU) 691/2011 Annex VII, and the monetary value of wooded land, for voluntary reporting. The focus is on describing the structure of the accounts and providing definitions for all entries for each of the accounts.

3.2.1. Asset account for the area of wooded land

3.4 The structure of the asset account for the area of wooded land is shown in EFA Table A1a (see Table 3.1). The entries in the columns follow the standard asset account structure involving an opening stock, changes in stock and a closing stock. The entries across the columns will satisfy the accounting identity that the opening stock value plus change in stocks (additions less reductions) must equal the closing stock. The entries in the asset account for the area of wooded land should be expressed in 1000 hectares (ha) to one decimal place and the entries in a single account should relate to a single reference year, for example 2022. The opening stock is ideally measured at the beginning of the accounting year recognising that this is equivalent to the value of the closing stock measured at the end of the previous accounting year. A time series of accounts can be compiled with each account concerning a separate reference year.

3.5 The area of wooded land refers to all wooded land within the reference country plus relevant areas of other land with tree cover. The classes are Forest (1), Forest available for wood supply (1.1), Forest not available for wood supply (1.2), Other wooded land (2), Other wooded land available for wood supply (2.1), and Other land with tree cover available for wood supply (3). The general relationships among these different classes of wooded land are shown in Table 3.2.

Table 3.1

EFA Table A1a – Wooded land, Area of wooded land, in 1000ha

Assets Code	(stocks and flows) Description	Opening area (December t-1)	Afforestation and other increases	Deforestation and other decreases	Statistical re-classification (+/-)	Balancing item (+/-)	Closing area (December t)
1	**Forest**						
1.1	Forest available for wood supply						
1.2	Forest not available for wood supply						
2	**Other wooded land**						
2.1	Of which available for wood supply						
3	**Other land with tree cover available for wood supply**						

Note: Entries in dark grey cells (codes 1, 1.1, 1.2, and 2) are mandatory items for reporting. Entries in white cells are voluntary items for reporting.
Source: EFA Questionnaire.

Table 3.2

Relationships among areas of land

Canopy cover	Tree height: 0–5 m	Tree height: >5m
>10%	Other wooded land (AWS)	Forest (AWS)
	Other wooded land (NAWS)	Forest (NAWS)
		Other land with tree cover (AWS)
	Other land with tree cover (NAWS)	Other land with tree cover (NAWS)
5–10%		Other wooded land (AWS)
		Other wooded land (NAWS)

AWS: Available for wood supply; NAWS: Not available for wood supply. Cells tinted blue are included in the European Forest Accounts.

3.6 The definitions for these classes follow the Regulation (EU) 691/2011 Annex VII. The definitions of classes of wooded land included in the asset account are based on the FAO Forest Resources Assessment 2025 (FAO FRA 2025) and 2020 (when referring to the Regulation (EU) 691/2011 Annex VII), and the associated categories and definitions. As well, the definitions take into consideration the findings presented in the Forest Europe report (2020) that drew on past research and international reporting to FAO, UNECE and Forest Europe.

3.7 The definitions should be considered reference definitions. Where national definitions are different, all differences should be described in metadata provided to Eurostat together with submission of EFA questionnaires. Where the differences are quantitatively significant, appropriate adjustments should be made by countries to their data to support the comparability of statistics across countries and the derivation of meaningful aggregate statistics for Europe.

3.8 The class ***Forest*** *(1) is defined* as *land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10% or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural land use or trees in urban settings, such as city parks, alleys and gardens* (the Regulation (EU) 691/2011 Annex VII, based on FAO FRA 2025).

3.9 The class forest is divided into two sub-classes: Forest available for wood supply (FAWS) and Forest not available for wood supply (FNAWS). The sum of the area of FAWS and FNAWS must equal the total area of forest.

3.10 ***Forest available for wood supply (FAWS)*** *(1.1) is defined* as *forests where any environmental, social or economic restrictions do not have a significant impact on the current or potential supply of wood. These restrictions can be established by legal rules, managerial/owner's decisions or because of other reasons* (Regulation (EU) 691/2011 Annex VII).

3.11 ***Forest not available for wood supply (FNAWS)*** *(1.2) is defined as forests that are not considered available for wood supply. These are forests where environmental, social, economic or legal restrictions prevent any significant wood supply. It includes (a) forests with legal restrictions or restrictions resulting from other political decisions that totally exclude or severely limit wood supply for reasons such as environmental or biodiversity conservation (protection forest, national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest); (b) forests where physical productivity or wood quality is too low or harvesting and transport costs are too high to justify wood harvesting, apart from occasional cuttings for auto-consumption* (Regulation (EU) 691/2011 Annex VII). Note that occasional cuttings in FNAWS areas may also arise for safety or health reasons.

3.12 In applying the definitions of FAWS and FNAWS the understood intention of the definitions is not to exclude all areas without tree cover but rather to identify separately those areas

where timber production is restricted or abandoned for environmental, social or economic reasons. Consequently, there are a number of areas without trees, such as forest roads, that are within scope of FAWS.

3.13 More specifically concerning the interpretation of FNAWS the following two considerations are relevant. First, a “significant impact” occurs when harvesting is prohibited altogether or when restrictions severely limit the feasibility of harvesting for commercial purposes. As a consequence, the designation of a forest area, for example as a national park, may not be a sufficient condition for treatment as FNAWS if in fact harvesting from national parks is permitted to some degree. Second, it is important to consider not only legal restrictions, but also social and economic restrictions, to allow for the reality that even if not legally established, social, and economic restrictions may limit the use of forests for timber production. When making an assessment of economic restrictions, it is important to consider a long-term perspective, to avoid changes in classification due to short-term market fluctuations.

3.14 The following table (Table 3.3) presents recommended treatments concerning the allocation between AWS and NAWS to support consistent recording of different types of areas associated with forest land and other tree-covered areas. The table also includes a column for the types of areas that are excluded from the scope of EFA.

3.15 The treatments presented in the table assume that the definition of a forest (see paragraph 3.8) has already been applied and therefore the table does not encompass a full listing of all components of forest land. In particular, the table does not list explicitly those areas that satisfy the definition of forests, but which do not have any special features as listed in the table. Further, it is clarified that Forest NAWS should, in the first instance, be determined on the basis of the definition presented in paragraph 3.11, i.e. it is not only national parks and nature reserves that may qualify as Forest NAWS. Finally, it is noted that the treatment of Christmas tree plantations as forests should follow the advice in paragraph 3.24 and that forest nurseries should be considered part of forest land only when they constitute an integral part of the forest (FAO FRA 2000).

Table 3.3

Treatment of selected components of forest land

Component	Forest AWS	Forest NAWS	Excluded from EFA scope
Forest roads	X	-	-
Firebreaks	X	-	-
Small open areas	X	-	-
Windbreaks (trees planted to protect from high winds)	X	-	-
Shelterbelts	X	-	-
Corridors of trees	X	-	-
Areas with young trees yet to reach canopy cover and height criteria	X	-	-
Temporarily unstocked areas due to clearcutting or natural disaster	X	-	-
Forest in national parks, nature reserves and other protected areas	X (depending on production context)	X	-
Abandoned shifting cultivation land with regeneration of trees yet to reach canopy cover and height criteria	X	-	-
Areas with mangroves in tidal zones, whether the area is classified as land or not	-	-	X
Rubber wood plantations	-	X	-
Cork oak plantations	-	X	-
Christmas tree plantations	X (if considered part of forest land)	-	X (if on agricultural land)
Areas with Bamboo and palms with appropriate land use, height and canopy cover criteria	-	-	X
Areas outside legally designated forest land which meet the definition of "forest"	X (unless satisfying criteria for NAWS)	-	-
Stands in agricultural production systems:	-	-	-
- Fruit tree plantation	-	-	X

Component	Forest AWS	Forest NAWS	Excluded from EFA scope
- Oil palm plantation	-	-	**X**
- Olive orchard	-	-	**X**
- Agroforestry systems**	**	-	-
Taungya system	-	-	**X**
Cleared tracts	**X**	-	-
Forest nurseries	**X** (if considered part of forest land)	-	**X** (if on agricultural land)
Seed orchards	-	-	**X**
Groves	-	-	**X**
Hedgerows	-	-	**X** (unless satisfying definition of forest)

** Agroforestry systems are considered "available for wood supply" and are within the scope of EFA but will be recorded under other land with tree cover AWS, not as part of FAWS.

3.16 *The class **Other wooded land (OWL)** (2) is defined as land not classified as "forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10% or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees greater than 10%. It does not include land that is predominantly under agricultural land use or trees in urban settings, such as city parks, alleys and gardens* (Regulation (EU) 691/2011 Annex VII, based on FAO FRA 2025).

3.17 Note that following the explanatory notes in the FAO FRA, the definition of OWL has two options. The first option considers areas *"with trees higher than 5 meters and a canopy cover of 5-10% or trees able to reach 5 meters in situ".* The second option considers areas "*with a combined cover of shrubs, bushes and trees greater than 10%".* Under this second option it is further noted that it includes areas of shrubs and bushes where no trees are present, and it includes areas with trees that will not reach a height of 5 metres in situ and with a canopy cover of 10 percent or more, e.g. some alpine tree vegetation types, arid zone mangroves, etc. (FAO FRA 2025).

3.18 A sub-class of other wooded land is presented as an "of which" entry in the account and concerns the area of *Other wooded land available for wood supply (2.1*). The definition of land available for wood supply for this sub-class applies the same definition as for FAWS.

3.19 The asset account for wooded land also includes some types of *other land with tree cover* to ensure that all land used for timber production is included. Other land with tree cover will be out of scope of the area of forest included in national cadastre systems. Following FAO

FRA 2025, other land with tree cover concerns land that satisfies the definition of forest (i.e. has a canopy cover of greater than 10 percent and trees able to reach a height of 5 meters) but which has a different land use, primarily agriculture but also including meadows and pastures, built-up areas, barren land, land under permanent ice, etc.

3.20 In the asset account, the relevant entry concerns the class other land with tree cover available for wood supply (Other land or Remaining land area) (3). This class encompasses areas of agroforestry, short-rotation forestry, and short-rotation coppices, where these occur on agricultural land. It excludes orchards of fruit and nut trees and similar non-timber plantations. It also excludes wooded land in urban areas and similar built environment contexts.

3.21 Agroforestry refers to systems where crops are grown or livestock grazed under tree cover. ***Agroforestry*** *is defined as "other land with tree cover" with temporary agricultural crops and/or pastures/animals*. The explanatory notes indicate that following are included: (a) areas with bamboo and palms provided that land use, height and canopy cover criteria are met, and (b) agri-silvicultural, silvo-pastoral and agro-silvo-pastoral systems (FAO FRA 2025).

3.22 ***Short-rotation forestry*** *is considered a silvicultural practice in which high density, sustainable plantations of fast-growing tree species produce wood biomass either on agricultural fertile lands, wastelands or degraded lands generally outside the traditional forests.* The trees are grown with single stems or as coppice systems, with a rotation period of less than 30 years and with an annual wood production of at least 10 tonnes DM/ha (IUFRO). In Eurostat's Integrated Farm Statistics Manual (Eurostat, 2020), the rotation period for short-rotation forestry is set between 8-20 years for the purposes of forest statistics.

3.23 ***Short-rotation coppice*** *(i.e., Coppice Forest) refers to areas of woodland which has been regenerated from shoots formed at the stumps of the previous crop trees, root suckers, or both, i.e. by vegetative means.* Coppice is normally grown on a short rotation for small material, but sometimes, for example for some eucalypt species, to a substantial size (UNECE/FAO, 2018; IUFRO). The rotation period is generally less than 8 years.

3.24 Depending on the production context, plantations of Christmas trees may be treated as agricultural land or as forest land. Thus, where the plantations stand distinctly from other forest areas, they should be considered part of agricultural land. However, where they are part of a wider forest context then treatment as forest land is appropriate. Under either allocation, the output of Christmas trees is treated as agricultural production rather than the production of timber (data for estimating the volume of production of Christmas trees may be obtained through agricultural surveys – see Section 3.3.8). Further, Christmas tree plantations do not satisfy the requirements to be treated as FNAWS and, thus, when classified as part of forest land, they should also be considered FAWS. However, by convention, they should be excluded from other land with tree cover available for wood supply which is restricted to areas used for timber production.

3.25 The entries for forest, including FAWS and FNAWS, and other wooded land are priority items for reporting. The entries for other wooded land available for wood supply and other land with tree cover available for wood supply are voluntary items for reporting.

3.26 The entry for the ***opening area*** should refer to the area of wooded land as at 31 December of the previous reference year. For example, when reporting for the reference year 2022, the opening area should refer to 31 December 2021. The entry for the ***closing area*** should refer to the area of wooded land as at 31 December of the current reference year. For example, when reporting for the reference year 2022, the closing area should refer to 31 December 2022.

3.27 In applying these reference dates over time, it will be the case that the closing area for a given reference year will be equal to the opening area of the following reference year. Conceptually, the closing and opening entries of consecutive accounting periods pertain to a single point in time. Thus, a reference to 31 December or 1 January is equivalent, and conceptually there can be no changes recorded between the close of one accounting period and the opening of the next. Section 3.4.1 considers the ways in which estimates may be obtained where available data do not refer to the conceptually desired reference dates.

3.28 Three types of changes in the area of wooded land are included in the account: afforestation and other increase, deforestation and other decrease and statistical re-classification.

3.29 ***Afforestation and other increase*** *refers to increases in the area of classes of wooded land due to (i) the establishment of new forest on land that was previously not classified as wooded land; (ii) silvicultural measures such as planting and seeding (including conversion of other wooded land to forest); or (iii) natural succession arising from natural seeding, sprouting, suckering or layering* (adapted from SEEA Central Framework (SEEA CF), 5.291-292). Note that the reforestation of temporarily unstocked areas is not included in afforestation since this does not represent an increase in the area of wooded land. Increases in the stock of timber are recorded in the asset account for timber stock.

3.30 ***Deforestation and other decrease*** *refers to decreases in the area of classes of wooded land due to (i) the complete loss of tree cover and transfer of wooded land to other uses (e.g. use as agricultural land, land under buildings or roads) or to no identifiable use (noting that removals of standing timber or standing timber destroyed by fires do not lead to decreases in wooded land unless the land use also changes after felling or other exogenous event); or (ii) natural regression* (adapted from SEEA CF, 5.293-294).

3.31 ***Statistical re-classification*** *refers to all changes in the use or status of wooded land*, in line with the descriptions of reclassifications of environmental assets in the SEEA CF (5.48-5.49). For example, changes from land available for wood supply to not available for wood supply. Statistical re-classifications do not involve changes in the area of land across classes of forests or other wooded land that will arise due to changes in the biophysical characteristics of an area of land.

3.32 For forests, given that both FAWS and FNAWS are recorded in the asset account, there will be two matching entries for statistical re-classification – a positive value for the new class (e.g. FNAWS) and a negative value for the old class (e.g. FAWS). For other wooded land, a positive entry will be recorded against the "of which" class OWL available for wood supply if the area available increases (and a negative entry if the area available decreases) due to changes in the use or status of the land. However, note that the total area of OWL will be unaffected. For other land with tree cover available for wood supply there will also be a single positive or negative entry where changes in the use or status of the land arise. In this case the total area of other land will change.

3.33 Conceptually, statistical re-classifications should be recorded at the time the change in use or status takes effect, which may be during the accounting year. Generally, however, the precise timing will not be known, and hence statistical reclassifications should be assumed to occur at the beginning of the accounting period such that actual changes, for example due to afforestation, are recorded against the new class.

3.34 The entry balancing item should be used to balance out discrepancies between opening and closing stocks after recording the flows explicitly defined in this account (increases, decreases and statistical re-classification) and observed based on the source data. Recording entries under this item is intended to ensure that the accounting identity for asset accounts is applied.

3.35 In addition to balancing out discrepancies, this entry may incorporate other reasons for change including the economic appearance and disappearance of economic assets and catastrophic losses.[4] These types of changes would be considered unusual in the case of the area of wooded land since it requires a permanent change in land use. Potential reasons for such a change include land subsidence and avalanche. It is noted that since this account focuses on the area of land, it is not relevant to record changes in the stock of timber that may lost be due to catastrophic losses or other reasons. These should be accounted for in EFA Table A2a. This entry should not be used to record the net change in area between opening and closing points in time.

3.36 From these descriptions the entries for statistical re-classification and balancing item should be considered quite distinct and cannot be used interchangeably. It is recommended to finalise entries for statistical re-classification before finalising entries for balancing item, since the latter will need to consider all available information on changes in the area of wooded land for each class of wooded land including statistical re-classifications.

[4] Catastrophic losses are losses that occur due to catastrophic and exceptional events and should be recorded when large-scale, discrete, and recognizable events occur that may destroy a significantly large number of assets within any individual asset category (SEEA CF, 5.49(c)).

3.2.2. Asset account for the monetary value of wooded land

3.37 The structure of the asset account for the monetary value of wooded land is shown in Table A1b (see Table 3.4). The entries in the columns and the rows follow the same definitions as for the Asset account for the area of wooded land as presented in Section 3.2.1 (above) with the exception of the additional entry in the columns concerning revaluation. ***Revaluation*** *refers to changes in the value of wooded land due to changes in prices of land between the opening and closing of the accounting period*. This topic is discussed further in the section on methods.

Table 3.4

EFA Table A1b – Wooded land, Monetary value of wooded land, in million national currency

Assets (stocks and flows)		Opening area (December t-1)	Afforestation and other increase	Deforestation and other decrease	Revaluation (+/-)	Statistical re-classification (+/-)	Balancing item (+/-)	Closing area (December t)
Code	**Description**							
1	**Forest**							
1.1	Forest available for wood supply							
1.2	Forest not available for wood supply							
2	**Other wooded land**							
2.1	Of which available for wood supply							
3	**Other land with tree cover available for wood supply**							

Note: All entries in this account are voluntary items for reporting.
Source: EFA Questionnaire.

3.38 The monetary value of wooded land to be recorded refers to the value of the land excluding the value of timber stock or other biological resources situated on it. These biological resources are valued separately with the value of timber resources recorded in the asset accounts for timber resources described in Chapter 4. Following ESA 2010, the value of wooded land includes the value of the stock of major improvements to the land (a form of gross fixed capital formation) that cannot be physically separated from the land itself, for example, drainage channels.

3.39 The overall effect of these treatments is that the monetary value of wooded land concerns the value of the land with regard to the future supply of timber resources, i.e. beyond the current rotation, and the value of the land for alternative uses. The value of the current rotation of timber resources will be recorded in the asset account for the monetary value of timber stock.

3.40 As for the asset account for the area of wooded land, the entries across the columns will satisfy the accounting identity that the opening stock value plus change in stocks (additions less reductions) must equal the closing stock.

3.41 The entries in a single account should relate to a single reference year, for example 2022. A time series of accounts can be compiled with each account concerning a separate reference year.

3.42 The entries in a single account should have a scope that encompasses all wooded land within the reference country. If the scope is different, this should be explained in documentation accompanying the delivery of forest accounts. In particular, any differences in scope compared to the asset account for the area of wooded land should be explained as this will impact directly on the derivation of any indicators concerning these data, for example, the average monetary value of wooded land per hectare within a country.

3.43 The entries in the asset account for the monetary value of wooded land should be expressed in millions of national currency. The entries in this account are voluntary items for reporting.

3.44 Wooded land not available for wood supply may receive a positive value, even though no wood is harvested. Note that when forests are purchased for environmental protection purposes, since the felling of timber is prohibited, the value of the timber is inherently considered part of the value of the land.

3.3. Data sources

3.3.1. Data sources for the area of wooded land

3.45 This section describes the main data sources that are applied in compiling the asset account entries for the area of wooded land. The availability and quality of these data sources will vary from country to country and hence the data source or combination of data sources that will provide the best estimates for a given country cannot be determined a priori. Also, it is likely that data sources will change in availability and quality over time and that some data sources may not be available every year. Usually, these data collection matters are not within the control of the account's compiler. Consequently, focus must remain on measuring, as well as possible, the agreed concepts and utilising all data that are available.

3.46 Further, it should be recognised that the descriptions of the primary data sources for measuring wooded land listed here are general descriptions. Each country will collect and transform data using different thresholds, methods, sampling sizes, etc. It is assumed, for accounting purposes, that the choices made by the compilers of source data are doing so taking account of the relevant country circumstances, including especially the environmental and economic significance of forests and also the availability of resources for data collection and processing.

3.47 It is not the role of this Handbook to prescribe accepted methods for the collection of data via any of these data sources. At the same time, it will be beneficial for the quality of the accounts if account compilers are familiar with the methods used and engage directly with source data managers to understand measurement challenges and appropriately interpret the published data. In some cases, this engagement and understanding of multiple data sources may be used for the purposes of editing and data confrontation, for example in Poland data from surveys of public and private forests are verified using cadastral data. In other cases, the use of two or more sources may be a core part of the methodology. For example, in the Netherlands estimates of forest area are based on linking data from land use surveys and national forest inventories (NFI).

3.48 The summary table below provides an overview of the data sources used in different European countries for the measurement of the area of wooded land.

Table 3.5

Overview of data sources for measuring the area of wooded land in selected European countries

Country	Data source					
	National Forest Inventory	Cadastre*	Spaceborne remote sensing	Forest management data**	Land use survey data	Farm and agricultural survey
Czechia (CZ)	X	X	-	X	-	-
Germany (DE)	X	X	X	-	-	X
Estonia (EE)	X	-	-	-	-	-
Spain (ES)	X	-	-	X	-	-
France (FR)	X	-	-	-	X	-
Croatia (HR)	-	-	-	X	-	-
Poland (PL)	X	-	-	X	X	-
Portugal (PT)	X	-	X	-	-	-
Slovenia (SI)	-	-	-	X	X	-
Norway (NO)	X	-	-	-	-	-
Switzerland (CH)	X	-	-	-	X	X

* Cadastre data include forest registry data and land parcel information
** Forest management data includes forestry administrative data

3.3.2. National Forest Inventories

3.49 For many countries, the primary source of quantitative information for the area of wooded land is national forest inventories. Forest inventories are based on statistical sampling over forest stands grouped in homogeneous strata. They are implemented at different levels of detail and can be designed to assess forest resources at different scales: forest unit, municipal, regional, national, or supranational level.

3.50 Different sampling techniques can be applied. A common approach is to identify sample plots over the forest area and collect data from the selected plots progressively over a five- or ten-year period such that the entire sample is covered by the end of the reference period. Plots may be based on grid cells, e.g. 1km, or using a fixed radius, e.g. 9m. Plots are also often sampled using clusters within a given area, and a mixture of temporary and permanent plots may be used.

3.51 Data collected through forest inventories include field data from sample plots; satellite images; digital maps providing details on, for example, land uses, soil types, and protected area status; and topographic data providing details on, for example elevation, slope and aspect (orientation). The data from forest inventories may be available at aggregated national levels and also, in some instances at the level of individual stands. This finer level of forest data may be useful in supporting a range of accounts compilation tasks.

3.52 Notwithstanding the suitability of forest inventories data for constructing the asset accounts, some limitations have been identified. The frequency with which forest inventories are conducted and the area inventoried may not match the envisioned accounting period or the geographical coverage. When the forest inventories are not available every year, different estimation methods will probably be necessary for “inventory years” and other years. When the focus is on timber or other tree resources, conventional forest inventories may fail to include the stock of trees outside the forest.

3.53 There is a substantive literature on the methods underpinning national forest inventories and ongoing work in Europe to better harmonise approaches. Work by the European National Forest Inventory Network (ENFIN) is important in this context with a recent publication by Gschwantner et al (2022) documenting the variation in methods applied across Europe.

3.3.3. Cadastres

3.54 A cadastre is a comprehensive recording of data on the boundaries and location of properties or “land parcels” within a jurisdiction. This information underpins the legal management of properties including transactions in property, taxation and the preparation of maps. Generally, as part of a national cadastral register, each land parcel will be attributed with a range of information including the size and location but also ownership and use. Thus,

estimates of wooded land may be obtained by collating the data on the area of land that is managed by forestry units and classified as forest in the national cadastre systems. Using this approach means that all such land managed by forestry units is included in the accounts regardless of whether there is active logging and regardless of the current land cover. Related data sources include state forest registers and land use data (including maps) compiled using administrative sources.

3.3.4. Spaceborne remote sensing

3.55 Developments in spaceborne remote sensing (RS) have been greatly motivated by the need to monitor natural resources. Spaceborne RS is possible because of the reflective properties of vegetation. Spaceborne RS measures energy interacting with objects on the earth's surface. Sensors on satellite platforms are able to capture energy reflected by objects on earth in certain electromagnetic regions. Due to growing interest in monitoring vegetation from space, several satellite platforms have sensors that are able to capture the distinctive reflective properties of vegetation. That is important for forest accounting as the main concern will be the quantification of vegetative systems.

3.56 The developments in spaceborne RS are ongoing and have seen a surge in applications because of increases in computational power and the need for addressing environmental challenges at a global level. Spaceborne RS can be an important data source for forest accounting because it is likely to be an efficient data collection mechanism, especially for countries with large, forested areas. Three particular features of spaceborne RS stand out:

- **Georeferencing:** One can think of forests as spatial entities. Many of the environmental services provided by forests are related to the forest's position in respect to other landscape elements (urban areas, floodplains, agriculture areas, steep slopes, etc). Data from RS are related to specific locations on earth according to a particular geographical projection. One can therefore combine remote sensing imagery with other spatial datasets when quantifying forest resources within the administrative or water catchment boundaries, localizing the provision of ecosystem services or implementing modelling schemes.

- **Spatial and temporal resolution:** One of the most appealing factors of remote sensing is the pace at which images are generated and the increasing spatial resolution of the products. For Europe, as part of the European Space Agency's (ESA) Copernicus program, Sentinel satellites include Sentinel-1 (radar imaging), Sentinel-2 (multispectral imaging), and Sentinel-3 (ocean and land monitoring). The frequency with which these satellites revisit points on earth range from 1-6 days. Sentinel-3 provides global coverage every 1-2 days. The spatial resolution of each satellite varies as well ranging from 1km for Sentinel-3 to 5m for the high-resolution products of Sentinel-1. Considering the spatial resolution and frequency, the selection of RS products often presents a trade off in that high spatial resolution accompanies low frequency and vice versa.

- **Affordability***:* In addition to the suitability of the technical aspects of RS for studying vegetation, it is also relatively inexpensive to access RS data. High resolution data or on-demand delivered data offer valuable information that serve specific purposes but may not be affordable for projects with budget constraints. Fortunately, an increasing number of RS datasets are offered free of charge by public institutions, including the European Space Agency and the European Environment Agency. In addition to the growing access to RS data sources, it is important to mention that software options for managing geographic information have been growing as well. In particular, free and open-source options are becoming more available.

3.57 Across Europe, the broadest RS dataset is co-ordinated by the European Environment Agency (EEA) and produces satellite image mosaics, land cover / land use (LC/LU) information in the CORINE Land Cover data, and the High-Resolution Layers. The CORINE Land Cover is provided for reference years 1990, 2000, 2006, 2012 and 2018. This vector-based dataset includes 44 land cover and land use classes. The time-series also includes a land-change layer, highlighting changes in land cover and land-use. The high-resolution layers (HRL) are raster-based datasets which provides information about different land cover characteristics and is complementary to land-cover mapping (e.g. CORINE) datasets. Five HRLs describe some of the main land cover characteristics: impervious (sealed) surfaces (e.g. roads and built-up areas), forest areas, (semi-) natural grasslands, wetlands, and permanent water bodies. The High-Resolution Image Mosaic is a seamless pan-European ortho-rectified raster mosaic based on satellite imagery covering 39 countries.

3.58 To secure high-quality RS data for use in compiling accounts, it is important to incorporate on-ground field observations to calibrate and adjust the RS data appropriately. For this purpose, information from forest inventory surveys may be able to be used.

3.3.5. Forest management data

3.59 Data collected on a continuous basis by national forest authorities can also aid in the compilation of forest accounts. The mandate of forest authorities normally includes keeping track of management activities (e.g. thinning, harvesting) as well as data on afforestation, reforestation, and land use change. Generally, the spatial coverage of these data would be expected to align with the information about the land holdings of forests and other wooded land for areas identified as such within national cadastral registers.

3.60 Note that other institutions including research institutions, forester associations, environmental organizations, and commercial forest companies may also maintain valuable datasets and could be questioned regarding specific forest-related topics in case forest inventories or official forest statistics are not complete or up to date.

3.3.6. Land use survey data

3.61 Data on land use may be collected via surveys based on data collected at sampled locations which are then scaled to provide aggregate measures of overall land use and land cover. In an EU context the long-running Land Use / Cover Area frame Survey (LUCAS) has been run every three years since 2006 and provides estimates of the area of forest and other wooded land for all EU countries. Given the method and the focus, the data are not expected to be as accurate as those data sources targeted specifically at defining forest areas, but the information will be useful in data confrontation and validation process.

3.3.7. Airborne remote sensing

3.62 Airborne remote sensing (RS) has a long history in forest measurement. Aerial photographs and photogrammetric techniques are part of the conventional toolkit of forest surveyors. Optimal use of aerial photos takes place when the flight campaign has been designed such that there is overlap between two consecutive aerial photos and between adjacent flight lines. This feature makes interpretation of photos with stereoscopic views (3D) possible. Stereoscopy eases the stratification of forest by function of species, ages, density, or other useful criteria as well as the classification of forest stands by function or location with respect to topographic features (valleys, hill tops, slopes, aspect, etc). The scale may allow the derivation of mathematical relations between tree crown and standing timber volume, the estimation of tree heights, and other variables of interest.

3.63 The spectral resolution of traditional aerial photos covers the visible region and, sometimes, the infrared region. These photos can be produced in grey tones, real colour, or false colour. The possibilities have expanded significantly in recent years as new sensors have been developed and the incorporation of those innovations in forest measurement is evolving at a fast rate.

3.64 Other developments relating to forest measurement include airborne hyperspectral remote sensing, Light Detection and Ranging (LiDAR) and unmanned-airborne-vehicles. LiDAR systems measure the distance between objects on Earth's surface and the sensor. The distance measurement is based on recording the time interval between the emission of a laser pulse and its reflected return signal. The application of this technology in forest measurement has evolved substantially from the early studies in the 1990s. Data from LiDAR systems can be used for segmenting the forest into height and age classes, ecologic succession phases, density, crown characteristics, etc.

3.3.8. Farm and agricultural surveys

3.65 For the measurement of the area of other land with tree cover that is available for wood supply, it is likely that farm and agricultural survey data will be a primary source. Most such surveys will collect data on the size of properties and the composition of the property in terms of land use or land cover, for example in terms of area used for cropping or grazing.

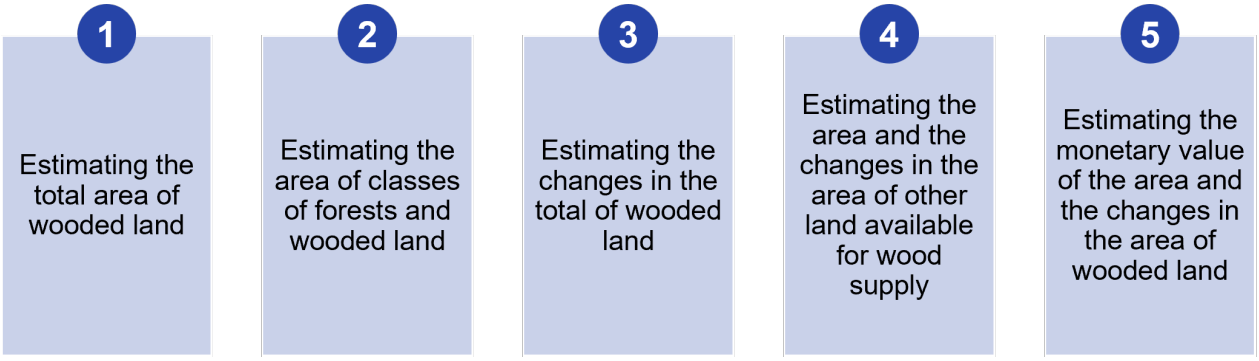
3.66 To limit the potential for double counting between agricultural and forest survey data, it is recommended to incorporate the measurement boundaries applied in the Integrated farm statistics manual (Eurostat, 2020). This manual provides detail on establishing the definitions for the treatment of Christmas trees and short-term rotating coppice, among other land uses.

3.4. Methods for estimating the area and value of wooded land

3.67 At the highest level there are five steps involved in estimating the area and value of wooded land and compiling the asset accounts for wooded land (see Figure 3.1). This section describes these steps and outlines relevant challenges and treatments.

Figure 3.1

Steps for compiling asset accounts for wooded land



3.68 A general comment is that there are a range of methods that may be applied to implement each of the steps, with each method using data sources in different combinations. Most commonly, to compile a full asset account it will be necessary to use multiple methods and data sources because (a) there are several different entries across a range of classes of wooded land; and (b) not all data sources are available with the same frequency. The primary role in compiling accounts is therefore the co-ordination of data generated from multiple methods and data sources to ensure complete coverage and a consistent time series. The guidance provided here aims to support compilers in this co-ordination role

recognising that individual judgements will be required in different contexts, especially as data sources change and methods develop.

3.4.1. Estimating the area of wooded land

3.69 The starting point for compiling the asset account for the area of wooded land is establishing an estimate of the total area of forest and the total area of other wooded land at a selected point in time (reference period). The estimate may be based on a single data source or a combination of data sources where data are confronted, and best estimates confirmed.

3.70 The most common approaches are (i) the use of the total area of forest and other wooded land from national forest inventories usually compiled every 5 or 10 years; and (ii) land use data using cadastral information usually maintained on an ongoing basis. Depending on the country one or the other of these sources may be considered the most accurate in providing a total area.

3.71 Where NFI data are used as the primary source, it will be appropriate to confirm the estimates against information from national cadastres where available; and vice versa. It will also be beneficial to compare estimates from these data sources with data from remote sensing, for example Corine Land Cover data, recognising that remotely sensed data may not necessarily be able to directly measure the target concept since cleared or newly restocked areas, which should be included in the area of wooded land, are likely to excluded from measures of forest land cover.

3.72 By way of example, if a particular location is identified as forest in the national cadastre but information from either the NFI or remote sensing data suggests this is incorrect, then there may be a reasonable basis to make an adjustment to the national cadastre data. The extent to which these adjustments can or should be made will depend on the level of resources available to undertake the data confrontation and the relative magnitude of any differences. This type of comparison is undertaken in Germany where changes in forest area between NFI benchmarks are estimated using a combination of remote sensing and cadastral data that are used as inputs to the German Greenhouse Gas Reporting. More generally, however, the relative accuracy of different sources will vary from country to country, and hence no prescription can be provided on reconciliation methods.

3.73 It will be essential to confirm the coverage of any data source with respect to (i) including wooded land for all of the country; and (ii) including all classes of wooded land, i.e. forest available for wood supply, forest not available for wood supply and other wooded land. Note that measurement of other land available for wood supply is discussed separately below. Where either of these coverage issues is not satisfied, estimates of the missing areas will need to be made, usually using information from an alternative source.

3.74 From an accounting perspective, it is not essential that the estimate of the total area of wooded land is estimated from a single source. For the purposes of comparability over time

and across countries, it is more important that the coverage is as complete as possible. Where two different data sources are combined to provide a complete coverage, the documentation should be precise in terms of specifying which parts of the total are covered by which data sources.

3.75 In concept the estimates for the opening and closing area should relate to the beginning and end of the calendar year. It is likely that whichever data set is used, there is not a direct match to these dates. This will be particularly the case with NFI data which is commonly compiled on an ongoing basis as sampling takes place.

3.76 Where the source data is determined to pertain to a given year as whole – e.g. 2022 – rather than specifically the beginning or end of the year, it is appropriate to make a choice as to whether that data should be attributed as the opening or closing area. Where no clear choice is evident then by default the annual value should be treated as the opening area. This choice should then be built into the longer time series. Thus, if a subsequent NFI pertains to 2027, then this value should be attributed as the opening area of 2027. This results in the entries showing a five-year change as evident in the source data.

3.77 It is not recommended that adjustments be made to convert the estimated total area to an opening or closing value, for example using estimated net increment for a number of months within the year.

3.78 When integrating multiple data sources or when confronting/validating different data sources care should be taken to consider any difference in the time of recording of the source data relative to the reference period.

3.79 To create an annual time series of opening and closing area estimates, it may be necessary to interpolate and extrapolate benchmark estimates such as from a 5 or 10 yearly NFI. Interpolation between two benchmarks can be undertaken in several ways. The simplest method is to assume a linear change such that the observations for the intervening years are equal to the difference between the benchmark estimates divided by the number of years difference between the estimates. This approach is not recommended unless no other auxiliary data are available.

3.80 Instead, it is recommended that either of the following two approaches be applied both of which use auxiliary data. In the first approach, data from an alternative, but not superior, data source may provide an annual time series of the area of wooded land that can be used to plot values between the two benchmark values. For example, if the area of forests has been established on the basis of data from a national forest inventory but this data is only available every 5 years (e.g. 2010, 2015 and 2020), then annual data from a national cadastre or from remote sensing might be used for interpolation.

3.81 Table 3.6 demonstrates this approach to extrapolation in a stylised example. In this example, the relevant area concerns the opening and closing area of forests. Benchmark values for the opening area of forests in 2015 and 2020 are estimated using NFI data for those years. It is assumed that the data relate to the opening area. The auxiliary data are

from national cadastre data updated annually to provide an estimate of the total forest area. From this source, data for all years from 2015 to 2020 are used. Again, it is assumed that the data for each year relate to the opening area. It is not essential that the timing of the data from NFI and the national cadastre relate to the same point within the year. It is sufficient that the time series of cadastre data concerns consistent 12-month changes.

3.82 The method involves estimating the ratio between the NFI and cadastre data in 2015 and 2020 and then completing a linear interpolation of that ratio to provide estimates of the ratio for 2016, 2017, 2018 and 2019. The annualised ratios are then multiplied by the corresponding cadastre value to provide an estimated area for those intervening years that (a) is consistent with the levels in the NFI benchmarks; and (b) coherent with the movements in the cadastre data.

3.83 This approach can also be used to provide extrapolated estimates beyond the latest NFI benchmark by using the latest derived ratio (in this example for 2020) by the cadastre data for years following the latest benchmark. Thus, in this example the opening estimate for 2021 would be obtained using the cadastre data for 2021 and the ratio for 2020.

Table 3.6

Stylised interpolation using annual indicator series

	2015	2016	2017	2018	2019	2020	2021
Benchmarks	2500					2800	
Indicator series	2400	2450	2600	2650	2650	2750	2800
Ratio	1.042					1.018	
Interpolated ratio	1.042	1.037	1.032	1.028	1.023	1.018	1.018
Final series	2500	2541	2684	2723	2711	2800	2851

3.84 In the second approach, data on net changes in the area of wooded land, e.g. data on afforestation and deforestation, may be used to build a time series of change between the two benchmark estimates. To apply this approach the starting point is the benchmark NFI data in 2015 which is assumed to provide the opening area for that year. Then, the estimated net change for 2015 is added to provide the opening area of 2016 and so on until an estimate is obtained for the opening of 2020. It is to be expected that this derived estimate will be different from the 2020 benchmark NFI. In which case a ratio of the difference between the benchmark and the derived opening value can be derived and assuming that the ratio is equal to 1.00 in 2015, through linear interpolation ratios for the intervening years can be

derived. Opening area values for the years between the benchmarks can be estimated multiplying the initially derived opening values (based on net changes) by the ratio for each year.

3.85 This approach can also be used to provide extrapolated estimates beyond the latest NFI benchmark by using the latest derived ratio (in this example for 2020) by the derived opening value for the year following the benchmark using net change data. These calculations are demonstrated in the table below.

Table 3.7

Stylised interpolation using annual change indicator series

	2015	2016	2017	2018	2019	2020	2021
Benchmarks	2500					2800	
Net change series		40	120	-30	50	70	50
Indicator series	2500	2540	2660	2630	2680	2750	2800
Ratio	1.000					1.018	
Interpolated ratio	1.000	1.004	1.007	1.011	1.015	1.018	1.018
Final series	2500	2549	2679	2659	2719	2800	2851

3.86 When applying either of the recommended approaches, it is important that experts with knowledge of changes in the area of wooded land are consulted to ensure that notable events that might have affected the time series are taken into account. For example, if changes in regulation at specific points in time had led to increases or decreases in rates of deforestation, then the pattern of change between two benchmark estimates should be much more distinctive than a straight line.

3.87 This approach can be applied for each individual time series, i.e. for each class of wooded land. Ideally, a tailored indicator would be identified for each time series, utilising auxiliary data that best reflects the movement between the benchmark estimates. However, it is also possible to use a single ratio to adjust all classes of wooded land. Whatever level of detail at which the interpolation or extrapolation is applied, it is fundamental that for each year the asset account is coherent, i.e. the classes sum to relevant aggregates. Thus, a second stage of interpolation may be required once each individual time series has been estimated.

3.88 Establishing robust estimates of the total area of wooded land should also take into consideration the changes in other classes of land – e.g. cropland, grassland, urban areas

– that will be occurring but which all will be constrained in aggregate by the overall area of the country which is likely to be unchanged. Using either cadastral or remote sensing data should support analysis of this type.

3.89 An ongoing validation check should be the share of the total land area that is wooded land. Unless there is a sound reason, it would be expected that this share would be expected to be relatively stable over time, or trending steadily up or down.

3.90 It is evident that all countries in Europe apply slightly different definitions of forests and other wooded land. A study by FISE (2021) identifies that all countries use a definition that is generally aligned and consistent with the FAO FRA and legal module definitions, but differences are applied concerning the thresholds applied for area, tree height and minimum crown cover.

3.91 Where differences exist countries may make adjustments to their national data. In cases where adjustments are made to align more closely with the definition of the FAO FRA, similar adjustments should be applied for EFA purposes, recognising the need to maintain strict alignment with the definitions of the legal module. For example, any adjustments to the area of other land with tree cover must be limited to those areas available for wood supply. Making these adjustments should take into consideration the extent to which they make a material difference to the area of wooded land and timber stock and the extent to which any differences are changing over time.

3.92 More generally in terms of reconciliation across data sources it is necessary to compare all relevant data sources and assess the relevant differences. It would be appropriate to start this process with a focus on the area of forests since this is likely to be the most common data point across the different sources. Once an assessment has been completed for the area of forests, further assessments can be undertaken to the extent that there are several different data sources and that there is sufficient materiality in making an assessment. Thus, if the area of other wooded land is relatively small, then extensive assessment and reconciliation of alternative data sources may not be a productive use of resources.

3.93 Ideally, an output from an assessment process is that data from different sources can be reconciled, i.e. with appropriate adjustments for scope, coverage, definition, methods and timing it would be possible to explain all differences between data sources. Such a reconciliation process and the development of associated bridge tables can be very useful in fully understanding different data sources and clarifying which data sources are most appropriate for use in compiling accounts. In addition, such work can be very useful in providing good explanations and interpretations to users of data.

3.94 The types of questions that need to be considered in a reconciliation process for the total area of wooded land largely concern the scope of different data sources. Relevant questions might include:

- Does the data source cover all areas of a country?

- Are there areas called forest within a land use survey that do not satisfy the definition of forest when considered from a remote sensing data source?
- Are there areas outside the area defined by a cadastre that should be considered part of wooded land?

3.95 These and other types of questions may be best considered at sub-national level through consideration of scope and coverage within administrative regions and, ideally, through the use of maps that can be overlayed to show differences in coverage.

3.4.2. Estimating the classes of wooded land

3.96 Once the total area of wooded land has been estimated at the opening and closing points of the reference period, the next step is to estimate the different classes and sub-classes within this aggregate namely the areas of:

- Forests
- Forest available for wood supply
- Forest not available for wood supply
- Other wooded land
- Other wooded land available for wood supply

3.97 The area of forests and other wooded land, in line with the definitions presented above, can be determined on the basis of specific biophysical criteria and may be identified directly from the data sources used to estimate the total area of land. The critical challenge in this step is applying the distinction between FAWS and FNAWS.

3.98 A review of methods applied by different countries identifies a variation in approach, but all appear consistent with the definitions of FAWS and FNAWS presented above. Thus, from an accounting perspective, all of these methods can be considered valid provided they are consistently applied in any given country. However, where there is a desire for comparability of results across countries, as would be expected in the EU, it will be necessary for a clearer understanding of the effects of different approaches on the aggregates and changes in the aggregates to be considered.

3.99 In summary, all countries allocate between FAWS and FNAWS using a combination of economic, legal and environmental considerations. These considerations / criteria include:

a. The degree of human intervention (for example, following criteria from FAO).

b. Whether the forest are has protected status and the degree of protection.

c. The relevant tree species (some species are protected from harvest).

d. Social restrictions include restriction to protect aesthetic, historical, cultural, spiritual, or recreational values, as well as areas where the owner has made the decision to cease wood harvesting in order to focus on other goods and services (e.g. leisure, landscape, aesthetic value (Alberdi et al, 2016).

e. Economic restrictions are considered as those affecting the economic value of wood utilisation (profitability). These include accessibility, slope and soil condition. Short-term market fluctuations should not be considered (Alberdi et al, 2016).

f. Whether the forest is considered cultivated for national accounts compilation purposes.

g. Whether the forest is maintained to assure the supply of ecosystem services, such as water flow regulation services and landscape mitigation services.

3.100 In some cases, these considerations/criteria are applied at the level of individual plots as part of NFI processes and then results are scaled to provide aggregate results. In other cases, the allocation is made at a national level. In yet other cases a spatial assessment of the criteria can be applied, for example by identifying the distinction between FAWS and FNAWS through overlaying data on protected areas, species, erosion, and slope.

3.101 In applying these criteria, there may be more or less judgement made in their application. For example, it would be possible to apply a convention that if some commercial utilization of the timber on the wooded land was possible, even if not currently acted upon, then the treatment should be FAWS. Depending on the context, this may be interpreted as meaning that even if accessibility of the timber was challenging (given current technology and knowledge), then as long as it may be possible to harvest the treatment as FAWS would be appropriate.

3.102 In addition to the allocation between FAWS and FNAWS, and although not required for entry in the accounts, it is likely to be beneficial for the compilation of asset values to breakdown the total area of wooded land by type of species. Since different species can obtain different prices in timber markets, understanding the different mix of species can help to establish a more robust measure of total value. Also relevant in this regard will be understanding the age profile of different forest areas and the likely harvesting time frames. These factors will be relevant in the application of methods for the valuation of standing timber discussed in Chapter 4.

3.4.3. Estimating changes in the area of wooded land

3.103 Measures of afforestation and deforestation, the two key elements in the change in the area of wooded land, require information on the location of the stock of wooded land and hence an understanding of where there have been increases and where there have been

decreases in area. For this purpose, national forest inventories may be able to identify those areas which have changed but they will not be able to do so on an annual basis. Information from administrative sources such as cadastral registers may be able to identify which land parcels that were formerly forest have changed and vice versa but, equally this may not be a standard output since it will require a comparison over time of individual land parcels.

3.104 Another source will be remote sensing data which can provide maps of forest and other wooded land at regular intervals. Provided there is a good understanding of the differences in total area generated by different data sources, remote sensing information may provide a solid basis for deriving estimates of total increases and decreases in the area of wooded land.

3.105 Statistical reclassifications, as defined above, will occur in a limited number of contexts and primarily for this account in relation to the re-classification of land from FAWS to FNAWS. The previous section described the different ways in which this distinction may be applied. For entries in the account, it is not necessary to know the location of the changes since only a net change needs to be recorded. At the same time, ideally, the location of changes in FAWS and FNAWS should be estimated to give a greater understanding of these changes alongside measures of afforestation and deforestation.

3.106 Where observed data for these changes cannot be collected, it is appropriate to consider applying expert opinion to estimate the size of changes in the area of wooded land. This will be preferable to placing all changes together without explanation and recording this as the balancing item.

3.4.4. Estimating the area and changes in the area of other land available for wood supply

3.107 Generally, the area of other land available for wood supply will be estimated using separate sources and added to the total area of wooded land estimated using the earlier steps. Based on the definition of this class the focus of measurement should be on areas of agricultural land with tree cover. Relevant data will commonly be available in agricultural surveys and censuses. A particular focus should be on identifying areas of agroforestry, short-rotation forestry and short-rotation coppice. It will be necessary to exclude agricultural tree covered areas such as orchards and Christmas trees which are not managed for wood supply.

3.4.5. Estimating the monetary value of the stock of wooded land

3.108 The principles of monetary valuation applied for this asset account align with those applied in the ESA and SNA. For the value of land at the opening and closing of the accounting period, this means that land should be valued at the current price paid by a new owner including written down costs of ownership transfer. Since such transaction-based values do

not generally occur on the opening and closing dates (i.e. 1 January and 31 December) and since not all wooded land is transacted each year, it is necessary to use indirect methods to place values on all areas of wooded land. The two main options are (a) to use information from transactions during the accounting period for some areas of wooded land and use these data to generate a value for the total area; or (b) to estimate the resource rent attributable to the land and derive an estimate of the net present value of the future streams of rent.

3.109 Under both options, it will generally be the case that the prices obtained (i.e. either transaction prices or estimates of resource rent prices) do not relate directly to the beginning or end of the accounting period specifically and are instead generally an average over the accounting period. In this case, it will be appropriate to average the prices from two consecutive accounting periods to estimate the price that would be relevant at the end of the first period/beginning of the second period. For example, a simple average of the prices obtained for period 1 and 2 could be used to estimate the price at the end of period 1 / beginning of period 2. Note that for entries related to changes in the area of land, the average prices for the period should be applied.

3.110 Particular note is made of the need to separate the value of the timber stock which should be recorded in other reporting tables. Since any transaction values will commonly also include a value of the timber stock, a deduction will be required.

3.111 There are three primary pathways for valuing wooded land in practice. The first, "**direct method**", commences with data on transactions in bare wooded land which provide information on the average price per hectare of wooded land. The average price is then multiplied by the total area of wooded land to provide an estimate of the total value. Ideally, the transactions and associated prices would be available at a level of detail that accounts for the size and location of areas transacted as well as other characteristics of the wooded land, e.g. species or its availability for wood supply. Provided that the total area of wooded land can also be separated into relevant classes then the appropriate price per hectare can be applied to different classes of wooded land.

3.112 This method can also be implemented using prices of forest land per hectare determined through administrative processes or collected via surveys of relevant agencies (for example taxation offices) which are then scaled to provide total values for wooded land. Where such prices are obtained irregularly, it is appropriate to update the prices for the effects of inflation using a forestry related price index. Prices for agricultural land may also provide important information in some contexts as this reflects a potential alternative use for the land. To provide national level data, surveys may also be undertaken to bring together estimates of land values in different regions within a country.

3.113 The second, "**residual method**", commences with data on transactions in forest estates, i.e. including both the value of land and the value of timber stock. Again, the average price per hectare is obtained from the transactions data and multiplied by the total area of wooded land. However, in order to identify the value of wooded land it is necessary to deduct the

current value of timber stock. The residual value provides an estimate of the value of wooded land. The valuation of the timber stock can be undertaken in several ways. Most commonly these values are based on estimates of the stumpage prices for timber. Further details on the definition and estimation of these prices are provided in Chapter 4.

3.114 A variation on the residual method is to use information on the transaction prices of forest estates and run regression analysis that identifies the key characteristics driving differences in price. Past research (e.g. Bergen et al, 1998) indicates that key characteristics are the area of the estate, the stock of timber and the timber species. Given that the area of the estate is one characteristic, this also provides a means to isolate the value of land as a contribution to the overall value. This approach is also known as hedonic pricing or the Lancaster approach.

3.115 The third method, the "**Faustmann method**", can be applied when there is insufficient data about transactions in forest land. The method is applied for FAWS areas (not yet stocked) under the assumption that these areas will be used for forestry in the future. In this method the conceptual framing used is that the value of the land inherently reflects the entire future flows of the net income from using land for timber production, where the net income reflects the total revenue from timber production less all production expenses including silvicultural expenses, harvesting expenses and costs of produced capital. In considering the entire future flows, in concept the Faustmann method includes all future rotations. Box 3.1 provides additional detail on the Faustmann method including the formula used to measure the land expectation value.

Box 3.1 Details of the Faustmann method

The Faustmann method is used to dynamically calculate the future value of forest production for an infinite series of rotations. The starting point of this assessment approach is the unstocked forest ground. The dynamic evaluation method is made necessary as, with long average production periods of 90-180 years under Central European conditions, expenses and income from forestry production occur with a strong time lag. In this regard, the Faustmann as a "perpetual annuity" of forest production is a forward-looking, dynamic method of forest land valuation which is a scientifically established practice to calculate the land expectation value.

The method is applied for FAWS areas (not yet stocked) under the assumption that these areas will be used for forestry in the future. In this method the conceptual framing used is that the value of the land inherently reflects the entire future flows of the net income from using land for timber production, where the net income reflects the total revenue from timber production less all production expenses including silvicultural expenses, harvesting expenses and costs of produced capital. In considering the entire future flows, in concept the Faustmann formula includes all future rotations. For this purpose, the Faustmann formula is:

$$LEV = \frac{A_u + D_a\,(1+i)^{u-a} + \ldots + Dq(1+i)^{u-q} - v(1+i)^u}{(1+i)^u - 1} - \frac{v}{i}$$

Where:

LEV = land expectation value

Au = timber income from final felling

D = thinning proceeds free of harvesting costs

C = regeneration costs

v = annual fixed costs

u = rotation period

a, q = thinning age

i = interest rate

As opposed to the formula used for the net income method for estimating the value of the timber stock (as described in Chapter 4), the asset life here is extended considerably and the measure of net income incorporates additional costs. The asset life might be made infinite or suitably long – e.g. 200 years. Ideally, this approach would be applied separately for different tree species.

In the Faustmann formula the expectation value of the forest land strongly depends on the interest (discount) rate, since it is raised to the power of the production time in the denominator. Therefore, with a high interest rate, the land value is lower. The land expectation value increases with the amount of revenues from thinnings, timber harvesting and subsidiary uses, and decreases with increasing cultural and administrative costs. If the production factors labour and capital are overpriced it is possible that they exceed the production factor soil, leading to a negative net yield. Also, a particular challenge is dealing with volatile prices for timber which can lead to large fluctuations in the value of timber stock over the years.

As the current profitability of forestry raw wood production with the main tree species in Germany is very low - with internal rates of return for oak, pine and beech of around 0.4% and spruce of around 1.7%, according to recent calculations (Staupendahl et al, 2020) –- and fixed costs are high, the Faustmann formula therefore regularly arrives at negative ground values, especially for the low-yielding tree species. Positive market prices for pure forest land would therefore be an expression of "option prices" for e.g., the possibility of converting forest into building land. However, in Germany for example, according to the German Forest Act, changes in the type of use of forest to other types of use are subject to very strict conditions and consequently rather rare.

Considering the development in regard to climate change, extreme weather events and other calamities, and the following decrease in timber value, respectively the change to more climate-adapted but low-yielding tree species, negative values depict realistic events.

To demonstrate the application of the Faustmann method, the land expectation value for forest production with the high-yielding tree species spruce is shown as an example. Using the Faustmann method, there is no starting price per hectare of land. Assuming the interest (discount) rate is 1.5%, the annual administration costs are 150€/ha, the regeneration costs are 2.000 €/ha, the price per m^3 of harvested timber is €60 and the harvesting costs are €20 per m^3. Further, assuming the rotation period is 90 years, there are two thinnings at age 40 and 70 with a respective amount per hectare harvested of 60m^3 and a final felling amount of 600 m^3, then the land expectation value using the Faustmann Formula is:

$$LEV = \frac{36000€ + 3600€ * (1+1.5\%)^{90-40} + 3600€ * (1+1.5\%)^{90-70} - 2000€ * (1+1.5\%)^{90}}{(1+1.5)^{90}-1} - \frac{150€}{1.5\%}$$

LEV = 4901 €

Source: Correspondence with Thünen Institute, Germany, 2024.

3.116 The summary table below provides an overview of the various methods used in different European countries to determine the value of wooded land.

Table 3.8

Overview of valuation methods used for wooded land in selected European countries

	Valuation methods				
	Direct methods		Residual methods		
Country	Transactions in bare land	Administratively determined values of wooded land	Transactions in forest estates (i.e., timber plus land) and deducting the value of timber stock (using methods from Ch4)	Transactions in forest estates followed by use of regressions to identify the share of value attributable to land (also known as Hedonic or Lancaster method)	NPV of forest land over long term (i.e. for all rotations), also known as the Faustmann method
Belgium (BE) - Flanders	-	-	X	-	-
Bulgaria (BG)	-	X	-	-	-
Czechia (CZ)	-	X	-	-	-
Germany (DE)	-	-	-	-	X
Estonia (EE)	X	-	X	-	-
France (FR)	-	-	-	X	-
Lithuania (LT)	-	X	-	-	-
Netherlands (NL)	-	X	-	-	-
Austria (AT)	-	-	X	-	-
Poland (PL)	-	X	-	-	-
Slovenia (SI)	-	-	X	-	-
Finland (FI)	-	-	-	X	-

3.117 In theory, in well-functioning markets these methods would all generate the same estimate of the value of land but there are two main reasons as to why this will not be the case. First, in most countries there are not sufficient transactions in forest estates or bare wooded land to provide a rich enough information set to assume that all other wooded land (that is not transacted) would have the same average price. Of course, where there are sufficient transactions then this concern does not apply.

3.118 Second, the value of timber stock which must be deducted from the value of the total forest estate must be estimated, and its measurement can be affected by various assumptions which are detailed in Chapter 4. To the extent that the assumptions used in the timber stock valuation methods are not consistent with the assumptions inherent in the revealed transactions prices, then there will be inconsistencies.

3.119 A particular challenge is dealing with volatile prices for timber which can lead to large fluctuations in the value of timber stock. Generally, methods based on transaction prices will provide relative stable time series and hence, under the residual method, when deducting a (potentially) volatile series from a relatively stable series the resulting residual values can be negative. While mathematically plausible, the derivation of negative values for wooded land should generally not be considered an economically meaningful result and rather it is most likely the result of the methods applied. The appropriate estimation response is to consider the longer-term trends and look to apply longer term moving averages to the values of timber stock. Such adjustments should demonstrate that the value of wooded land itself remains positive (an example for Finland published in the Eurostat-OECD Compilation guide on land estimation (2015) demonstrates this point – see page 131).

3.120 Estimating the monetary value of the changes in the stock should, ideally, be based on information about the specific locations of changes due to afforestation or deforestation. Since these may be places in which transactions in wooded land or forests estates may be taking place, then identifying relevant transactions may be more tractable although challenging.

3.121 In practice, the appropriate approach will be to use average prices per hectare across the year and apply these prices to the changes in area due to afforestation and deforestation taking into account where possible the different classes of forest that are changing.

3.122 Estimates of revaluation of the stock concern changes in the value of timber stock from opening to closing values that are due solely to changes in prices. In concept, the relevant changes in prices concern the average prices per hectare of land. The entry for revaluation should be derived as the change in the stock price over the accounting period (i.e. closing price less opening price) multiplied by the average area of forest land at the opening and closing of the period. This entry may be positive or negative depending on the direction of the price movement.

3.4.6. Stylised example for the valuation of forest land

3.123 The following stylised example is provided to support understanding of the calculations involved in the application of the most commonly applied valuation methods described in the previous section for the valuation of the stock of forest land. The example is simple in that it considers only one forest area containing a single tree species characterised in terms of tree age. While it is simple, it can be readily extended to encompass more complex situations and considering alternative characterisations of the stock, for example in terms of tree diameter classes. The logic of the extensions and the potential assumptions are described at the end of the example.

3.124 The key features of the forest area in this stylised example are:

- Total area of 100ha
- Age profile of trees is such that:
  - 20ha are 1 year old.
  - 15ha are 5 years old.
  - 30ha are 10 years old.
  - 25ha are 15 years old.
  - 10ha are 20 years old.
- Trees are harvested at maturity at 20 years of age.

3.125 Under the direct method, prices per hectare of bare wooded land are collected directly from (i) information about transactions in bare wooded land; or (ii) administrative valuations. The assumed price per hectare of bare wooded land in this example is €4,000. It is further assumed that this price is reasonably representative of the 100ha in the stylised example then the direct method provides a value of wooded land (V_{WL}) as follows,

$$V_{WL} = €4,000 \times 100ha = €400,000.$$

3.126 Using the residual method, in the first stage prices per hectare from transactions data are also applied but these relate to transactions in forest estates – i.e. including the value of the trees. The assumed price per hectare of forest estates in this example is €8,000. Again, it is assumed that this price is reasonably representative of the 100ha in the stylised example. Thus, the value of forested estate (V_{FE}) as follows,

$$V_{FE} = €8,000 \times 100ha = €800,000.$$

3.127 To obtain the value of wooded land, it is then necessary to deduct the value of the stock of timber. This value is calculated using the methods described in Chapter 4. Using the results

of the consumption value method described in Chapter 4 (which applies the same area and age profile as described above) the value of the timber stock (V_{TS}) is equal to €136,580. Thus, the value of wooded land obtained through the residual method is

$$V_{WL} = V_{FE} – V_{TS} = €800,000 – €136,580 = €663,420$$

3.128 These methods can be applied to a larger number of forest estates either by undertaking separate calculations for each forest estate or by using average prices for harvested timber or transaction values in forest or bare wooded land and average of other valuation factors and assuming they are applicable across all forest estates. Other valuation factors will include rates of harvest per hectare, type of species, and harvesting costs. The same methods can also be applied to other wooded land recognising that the prices and other valuation factors will be different since the density of trees will be much lower.

4

Chapter 4. Asset accounts for timber stocks

4.1. Introduction

4.1 In Europe, the volume and value of timber stocks is an important topic of interest. There are a range of economic activities, primarily forestry, whose production relies directly on the availability of timber and hence understanding the dynamics of those activities requires an understanding of the changing nature of the stock underpinning them.

4.2 The Asset accounts for timber stocks present the core data for developing robust and coherent analysis on a number of these issues. The data presented in these accounts will support analysis of the volume of supply of timber and provide measures of the monetary value, and changes in value of a country's stock of timber.

4.2. Account structure

4.3 This section presents the asset accounts for timber stocks covering the volume of timber on wooded land and the monetary value of timber stocks as proposed in the Regulation (EU) 691/2011 Annex VII. The focus in this section is on describing the structure of the accounts and providing definitions for all entries for each of the accounts.

4.2.1. Asset account for the volume of timber on wooded land

4.4 The structure of the Asset account for the volume of timber on wooded land is shown in Table 4.1 which reproduces EFA Table A2a. The entries in the columns follow the standard asset account structure involving an opening stock, changes in stock and a closing stock. The entries across the columns will satisfy the accounting identity that the opening stock value plus change in stocks (additions less reductions) must equal the closing stock.

Table 4.1

EFA Table A2a – Timber on Wooded land, Volume of timber stocks, in 1000m³ over bark

Assets (stocks and flows) Code	Description	Opening stock (December t-1)	Net increment	Removals	Irretrievable losses	Statistical re-classification (+/-)	Balancing item (+/-)	Closing stock (December t)
1	**Forest**							
1.1	Forest available for wood supply							
1.2	Forest not available for wood supply							
2	**Other wooded land**							
2.1	Of which available for wood supply							
3	**Other land with tree cover available for wood supply**							

Note: Entries in dark grey cells (codes 1, 1.1, 1.2, and 2) are mandatory items for reporting. Entries in white cells are voluntary items for reporting. Net increment, irretrievable losses, statistical reclassification and balancing items are grouped and required as other changes (between opening and closing stocks) in the Regulation for forest not available for wood supply and other wooded land.
Source: EFA Questionnaire.

4.5 The entries in the asset account for the volume of timber on wooded land should be expressed in 1000m^3 over bark. The entries in a single account should relate to a single reference year, for example 2022. The opening stock is ideally measured at the beginning of the accounting year recognising that this is equivalent to the value of the closing stock measured at the end of the previous accounting year. A time series of accounts can be compiled with each account concerning a separate reference year.

4.6 The volume of timber on wooded land refers to all timber stocks on wooded land and other land with tree cover available for wood supply within the reference country.[5] The entries for timber stocks are recorded following different classes namely: Forest (1), Forest available for wood supply (1.1), Forest not available for wood supply (1.2), Other wooded land (2), Other wooded land available for wood supply (2.1) and Other land with tree cover available for wood supply (3). The definitions of these classes, including the distinction between AWS and NAWS, follow the Regulation (EU) 691/2011 Annex VII on Forest accounts, and are presented in Chapter 3 (3.7-3.25).

4.7 The definitions of timber stocks and changes in timber stocks that are included in the asset account are also established in the Regulation (EU) 691/2011 Annex VII on Forest Accounts and are presented below. They are based on the definitions of growing stock and deadwood from the FAO Forest Resource Assessment 2025 (FAO FRA 2025) and, as relevant, other environmental accounting related standards including the SEEA Central Framework (SEEA CF) 2012.

4.8 The entry for the ***opening stocks*** should refer to the volume of timber stocks as at 31 December of the previous reference year. For example, when reporting for the reference year 2022, the opening stock should refer to 31 December 2021. The entry for the ***closing stocks*** should refer to the volume of timber stocks as at 31 December of the current reference year. For example, when reporting for the reference year 2022, the closing stock should refer to 31 December 2022.

4.9 In applying these reference dates over time, it will be the case that the closing stock for a given reference year will be equal to the opening stock of the following reference year. Conceptually, the closing and opening entries of consecutive accounting periods pertain to a single point in time. Thus, estimates for 31 December and 1 January are equivalent and conceptually there can be no changes recorded between the close of one accounting period and the opening of the next.

4.10 The opening and closing stocks of timber are defined following the definition of the SEEA CF as "*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*

[5] The country of reference refers to the country for which the measurement is done. Countries with overseas and other territories with a special legal status need to indicate the precise national area their data refers to.

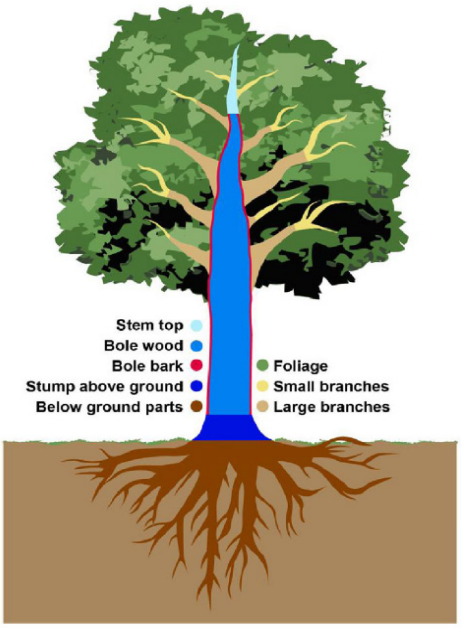
or fuel". This includes the growing stock of timber plus deadwood.[6] Consequently, timber stocks include trees felled and still in the forest, and stocks of trees lost due to storms (windthrow) that are considered available for use (i.e. retrievable).

4.11 The components included in scope of the growing stock are stem wood, stem bark (also referred to as bole wood and bole bark), stump above ground and large branches (see Figure 4.1). Thus, the critical elements in measuring the volume of timber stock are the stem top diameter and the branch diameter. The thresholds for measuring minimum diameter at breast height (DBH), tops of stem and branches vary across countries (see Table 4.2). This variation reflects the variety of species, growing conditions and forestry management and harvesting practices that take place in different parts of the world.

4.12 For EFA purposes, a threshold DBH of zero is applied. A zero DBH threshold has been a recommended practice in the EFA questionnaire for many years and reflects the variation in DBH thresholds used across countries and that most/all size classes of wood are now used, including very small size classes. Paragraph 4.44 notes methods for estimating the gap between national DBH thresholds and zero DBH.

Figure 4.1

Tree parts defined for European NFIs



Source: Gschwantner et al (2019) (based on Gschwantner et al (2009), and Lanz et al (2010)).

[6] The growing stock is the component of the timber stock comprising all living trees regardless of diameter, tops of stems and large branches. Deadwood comprises dead trees lying on the ground that can still be used for timber or fuel and non-living standing woody biomass.

Table 4.2

Threshold values applied for volume estimation in selected European countries

Countries	Stem top diameter (cm)	Branch diameter (cm)	Diameter at breast height (cm)	Stump height (cm)
Belgium (BE)	7	7	6.4	10
Czechia (CZ)	7	7	7	felling height
Denmark (DK)	0	0	0	-
Germany (DE)	7	7	7	-
Estonia (EE)	0	-	0	felling height
Ireland (IE)	7	7	7	h*0.01
Spain (ES)	7.5	-	7.5	-
France (FR)	7	-	7.5	-
Latvia (LV)	0	-	2.1	h*0.01
Lithuania (LT)	0	-	0 & 2.1	-
Hungary (HU)	5	5	7	15
Austria (AT)	0	-	5	felling height
Portugal (PT)	2.5 & 7.5	7.5	5 & 7.5	30
Romania (RO)	0	0	5.6	d_{stump}*1/3
Slovenia (SI)	7	7	10	d_{stump}*1/3
Slovakia (SK)	7	7	7	felling height
Finland (FI)	0	-	0	felling height
Sweden (SE)	0	-	0	h*0.01
Norway (NO)	0	-	5	h*0.01
Switzerland (CH)	-	-	12	-
Serbia (RS)	3	3	5	30

Source: Gschwantner et al (2019) (based on Gschwantner et al (2009), and Lanz et al (2010)), modified.

4.13 Four types of changes in the volume of timber on wooded land are included in the account: net annual increment of timber, removals, irretrievable losses and statistical re-classification.

4.14 The entry ***net annual increment of timber (net increment)*** *is calculated as "the average annual volume growth of live trees less the average annual mortality*" (Regulation (EU) 691/2011 Annex VII). It is noted that gross annual increment is the total annual volume growth of live trees within scope of the measure of opening and closing timber stocks. Also, it is noted that annual mortality should be calculated excluding the effects of irretrievable losses, such as due to forest fires, which should be separately recorded. The concept of natural losses is therefore broader than annual mortality.

4.15 Note that there is no increment of dead trees to be recorded. The volume of timber in dead trees is included in the opening stock. Subsequently, any increases in the volume of dead trees must be offset by a decline in the volume of living trees and hence the net increment recorded in the accounts needs to only concern living trees.

4.16 The entry ***removals*** *is defined as 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 unsold roundwood stored at the forest roadside. It also includes natural losses that are recovered, removals during the year of wood felled in an earlier period, removals of non-stem wood (such as stumps and branches), and removal of trees killed or damaged by natural causes (known as natural losses), e.g. fire, wind, insects, and diseases. It does not include non-woody biomass or any wood that is left in the forest and not removed during the year, e.g. stumps, branches, tree tops and felling residues (harvesting waste)* (Regulation (EU) 691/2011 Annex VII, based on the Joint Forest Sector Questionnaire T&D 2020).

4.17 The scope of removals as covering the removal of "all trees, living or dead" is essential to ensure alignment with the concept of the stock of timber which also includes living and dead trees. Further, the removals of non-stem wood refer to the volume of non-stem timber that is included in the timber stock. In line with Figure 4.1, this will reflect stump above ground and large branches. The volume of removals in any given period is not equivalent to the volume of trees felled since removals may relate to trees felled in earlier periods.

4.18 Two further specifications are made in relation to the measurement of removals. First, removals for the purposes of EFA should be measured over bark (i.e. including bark). This is different from the definition applied in the JFSQ which excludes bark (under bark). Second, the measurement of removals recorded in EFA Tables A2a and A2b refers to all removals irrespective of the classification of the economic unit undertaking the removal. In EFA Table B1, removals relate to the activity of units classified only to the forestry and logging industry (NACE 02).

4.19 The entry ***irretrievable losses*** is defined as *felling residues and all fellings from windthrow that cannot be removed from the forest, and timber lost through forest fires* (Regulation (EU) 691/2011 Annex VII).

4.20 The entry ***statistical re-classification*** *refers to all changes to the volume of timber that are due to changes in the use or status of wooded land, for example, changes from land available for wood supply to not available for wood supply* (Regulation (EU) 691/2011 Annex VII). If there is no information to otherwise inform the time of recording, statistical reclassifications are assumed to occur at the beginning of the accounting period such that actual changes, for example due to afforestation, are recorded against the new class. The entries for the statistical re-classification of wooded land are discussed further in Chapter 3.

4.21 The entry ***balancing item*** should be used to balance out discrepancies between opening and closing stocks after recording the flows explicitly defined in this account (increases, decreases and statistical re-classification) and observed based on the source data.

Recording entries under this item is intended to ensure that the accounting identity for asset accounts is applied. In addition to balancing out discrepancies, this entry may incorporate other reasons for change in the volume of timber stocks that are not captured in other entries. This entry should not be used to record the net change in stocks between opening and closing stocks.

4.22 The entries for the volume of timber for forest, including FAWS and FNAWS, and other wooded land are priority items for reporting. The entries for the volume of timber for other wooded land available for wood supply and other land with tree cover available for wood supply have a lower priority for reporting.

4.2.2. Asset account for the monetary value of timber on wooded land

4.23 The monetary value of timber on wooded land to be recorded in this asset account refers to the value of the stock of timber. This is often referred to as the value of standing timber. This value excludes the value of the land on which the timber grows, or any other biological resources situated on the land.

4.24 The structure of the asset account for the monetary value of timber on wooded land is shown in Table 4.3 which reproduces EFA Table A2b. The entries in the columns and the rows follow the same definitions as for the asset account for the volume of timber on wooded land as presented in Section 4.2.1 (above) with the exception of the additional entry in the columns concerning revaluation. ***Revaluation*** *refers to changes in the value of standing timber due to changes in prices of timber between the opening and closing of the accounting period*. The timber stock is valued at prices relating to the beginning or end of the accounting period (opening and closing stocks). Changes in the value of the timber stock arise due to either changes in prices or changes in volume (quantity and/or quality). Changes in volume of timber over the accounting period (e.g. net increment, removals) are valued using average prices over the accounting period. In some cases, the value of changes in volume fully accounts for the change in the value of the stock between the beginning and end of the accounting period. However, if over the course of the accounting period prices of timber have increased or decreased, then there will be some changes in the value of the stock that cannot be explained by changes related to the volume of timber. The entry for revaluation accounts for these general changes in prices that cannot be linked to specific volume flows. The entry for revaluation will be positive if prices have increased and negative if prices have decreased.

4.25 As for the asset account for the volume of timber, the entries across the columns will satisfy the accounting identity that the opening stock value plus change in stocks (additions less reductions) must equal the closing stock.

Table 4.3

EFA Table A2b – Timber on Wooded land, Monetary value of timber stock, in million national currency

Assets Code	(stocks and flows) Description	Opening stock (December t-1)	Net increment	Removals	Irretrievable losses	Revaluation (+/-)	Statistical re-classification (+/-)	Balancing item (+/-)	Closing stock (December t)
1	**Forest**								
1.1	Forest available for wood supply								
1.2	Forest not available for wood supply								
2	**Other wooded land**								
2.1	Of which available for wood supply								
3	**Other land with tree cover available for wood supply**								

Note: Entries in dark grey cells (codes 1, 1.1, 1.2, and 2) are mandatory items for reporting. Entries in white cells are voluntary items for reporting. Net increment, irretrievable losses, statistical reclassification and balancing items are grouped and required as other changes (between opening and closing stocks) in the Regulation for forest not available for wood supply and other wooded land.
Source: EFA Questionnaire.

4.26 The entries in a single account should relate to a single reference year, for example 2022. A time series of accounts can be compiled with each account concerning a separate reference year. The scope should encompass all wooded land within the reference country and other land with tree cover available for wood supply. The entries should be expressed in millions of national currency.

4.27 While there will not be commercial quantities of wood harvested from FNAWS, there may be some household auto-consumption and other small quantities of wood harvested, for example as a result of implementing safety and health related measures, that generate values to be recorded.

4.3. Data sources

4.28 This section describes the main data sources that are applied in compiling the asset account entries for the volume and value of timber stocks. The availability and quality of these data sources will vary from country to country and hence the data source or combination of data sources that will provide the best estimates for a given country cannot be determined a priori. Also, it is likely that data sources will change in availability and quality over time. Usually, these changes are not within the control of the account's compiler. Consequently, focus must remain on measuring, as well as possible, the agreed concepts and utilising all data that are available.

4.29 Further, it should be recognised that the descriptions of the primary data sources for measuring wooded land listed here are general descriptions. Each country will collect and transform data using different thresholds, methods, sampling sizes, etc. It is assumed, for accounting purposes, that the choices made by the compilers of source data are doing so taking account of the relevant country circumstances, including especially the environmental and economic significance of forests and the availability of resources for data collection and processing. Nonetheless, to facilitate comparisons across countries and as noted in paragraph 4.12, a zero DBH threshold should be applied for EFA purposes. Paragraph 4.44 notes methods for estimating the gap between national DBH thresholds and a zero DBH.

4.30 It is not the role of this Handbook to prescribe methods for the collection of data via any of these data sources – e.g. concerning the size of survey samples, or sampling techniques used in an NFI. At the same time, it will be beneficial for the quality of the accounts, if account compilers are familiar with the methods used and engage directly with source data managers to understand measurement challenges and appropriately interpret the published data.

4.31 The data sources listed in this section build on the list of data sources provided in Chapter 3 concerning measurement of the area and value of wooded land. For many entries, those data sources will also be relevant in the compilation of estimates for the volume and value of timber stocks. The data sources described in Chapter 3 were: national forest inventories,

cadastres, spaceborne remote sensing, forest management data, land use survey data, air borne remote sensing and farm and agricultural surveys.

4.32 The summary table below provides an overview of the data sources used in different European countries for the measurement of timber stocks.

Table 4.4

Overview of data sources for measuring timber stocks in selected European countries

	Data sources					
Country	**National Forest Inventory**	**Forest management data**	**Spaceborne remote sensing**	**Forestry production and income statistics from the national accounts**	**Economic surveys of forest industry***	**Forest research and related databases****
Czechia (CZ)	X	X	-	-	X	-
Germany (DE)	X	-	-	-	X	X
Estonia (EE)	X	-	-	X	-	-
Spain (ES)	X	X	-	-	-	-
France (FR)	X	-	-	X	X	X
Croatia (HR)	-	X	-	-	-	-
Poland (PL)	X	-	-	-	X	X
Portugal (PT)	X	-	X	X	-	-
Slovenia (SI)	-	X	-	X	-	-
Norway (NO)	X	-	-	X	-	X
Switzerland (CH)	X	-	-	-	X	-

* Economic surveys include price statistics
** Forest research includes timber growth models and fire event data

4.3.1. Forestry production and income statistics from the national accounts

4.33 Various forest products are part of the intermediate consumption of many economic activities and many products are part of the final consumption by households. These flows are conceptually within the scope of the national accounts and hence a country's national accounts can constitute an important data source for information on flows of forest goods to the different economic sectors.

4.34 However, it may commonly be the case that data in the national accounts are not compiled at a sufficient level of detail to support extended analysis of the forest sector. Further, focus of the published national accounts will be on data in monetary terms only. This being the case, it will be necessary to supplement data in the national accounts with more detailed information from other sources. It will be relevant to utilise the aggregate national accounts data to ensure that the detailed forestry data are framed consistently within a whole economy setting. In addition, it will be relevant to engage with national accounts compilers to determine whether more detailed forestry statistics can be incorporated in compilation processes to improve the quality and coherence of all forest data.

4.3.2. Economic surveys of forest industry

4.35 The data used in the compilation of national accounts will usually be sourced from economic survey of the forest industry. These collections can provide details on production volumes, revenue, harvesting costs and payments to government. Separate collections may also be undertaken to collect data on prices in the forest industry.

4.36 The economic surveys just described will generally be conducted by national statistical institute or government forestry agencies. Industry based collections may also be conducted in some countries and may provide similar types of information. Irrespective of the organization conducting the surveys it will be important to understand the coverage of the data collection relative to the total area of wooded land and the various classes of timber stocks.

4.3.3. Forest research and related databases

4.37 A key feature of measuring the volume and value of timber stocks is understanding the dynamics of the growth of trees and being able to both document past patterns and establish reasonable expectations of future trends. Generally, these patterns and trends will vary by country and by species. Information most relevant for the compilation of accounts includes models of timber growth covering increment and mortality rates; and information on areas of wooded land affected by fires.

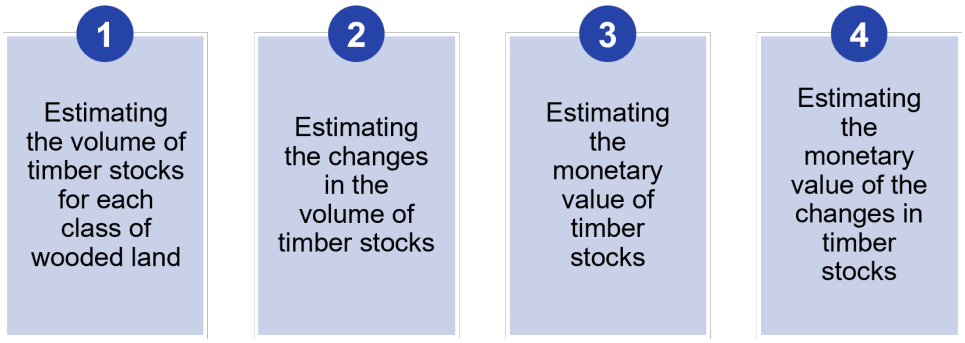
4.38 In the absence of robust data covering all areas of wooded land in a country, it may be necessary to work with experts in forestry to establish reasonable assumptions for the compilation of accounts, especially in the valuation of timber stocks where projections of future flows of timber may be required.

4.4. Methods for estimating the volume and value of timber stocks

4.39 At the highest level there are four steps involved in estimating the volume and value of timber stocks and compiling the asset accounts for timber stocks (see Figure 4.2). This section describes these steps and outlines relevant challenges and treatments.

Figure 4.2

Steps for compiling asset accounts for timber stocks



4.40 A general comment is that there are a range of methods that may be applied to implement each of the steps, with each method using data sources in different combinations. Most commonly, to compile a full asset account it will be necessary to use multiple methods and data sources (a) because there are a number of different entries for timber stocks across a range of classes of wooded land; and (b) because not all data sources are available with the same frequency. The primary role in compiling accounts is therefore the co-ordination of data generated from multiple methods and data sources to ensure complete coverage and a consistent time series. The guidance provided here aims to support compilers in this co-ordination role recognising that individual judgements will be required in different contexts, especially as data sources change and methods develop.

4.4.1. Estimating the volume of timber stocks for each class of wooded land

4.41 Estimating the opening and closing volumes of timber stocks commences with estimates of the area of wooded land from EFA Table A1a – Asset accounts for wooded land. It is central to the coherence of the accounts that there is a meaningful relationship between estimates for the area of wooded land and the volume of timber stocks. The general estimation procedure is to estimate for each class of wooded land the volume of timber per hectare and then to multiple this rate by the total area for that class. The following paragraphs outline considerations in applying this general procedure.

4.42 Conceptually, a useful starting point for framing measurement is to consider that the area and the volume of timber can be measured for every land parcel of wooded land, or plantation coupe, within the scope of the total area of wooded land. In which case the total timber stock for any given class of wooded land will simply be the sum of the measured timber stock in each parcel, where the volume is measured in line with the definition of the stock above and using appropriate measurement standards.

4.43 On the understanding that this level of data is not available, then assumptions about the volume of timber per hectare in each class of wooded land need to be made. Assuming that the volume of timber per hectare is the same across all classes of wooded land would imply no stratification of wooded land classes was required and all that would be required is a single estimate of the volume per hectare. This would not be a reasonable assumption. Rather, it is expected that the per hectare volume will differ among parcels of wooded land based on factors such as the species of tree, the age of the trees, soil type and climatic factors (rainfall, temperature).

4.44 Estimates of timber volume per hectare will also be influenced by the thresholds applied for the inclusion of components of trees in the calculations as discussed in paragraphs 4.11-4.12. A key threshold concerns the diameter at breast height (DBH). Table 4.2 shows variation across countries in the DBH threshold. As noted in paragraph 4.12, for EFA purposes a threshold of zero is applied. Where countries use a different threshold, for example 7cm or 10cm, it will be necessary to estimate for the volume of timber below the threshold. Methods for undertaking this estimation have been developed (see Gschwantner et al (2019)).

4.45 Based on expert forestry knowledge, countries should estimate appropriate volume per hectare rates for each class of wooded land. This may require information below the level of the classes shown in EFA Table A2a. At a minimum, it is recommended to differentiate the class of forests available for wood supply (FAWS) by species, i.e. each species should have a distinct volume per hectare rate.

4.46 One approach to establishing a rich level of detail is via the sample plots from an NFI data collection process. Where detailed data on the volume of the timber stock, dominant tree species, age, and other factors can be measured for each plot (or stand) such data can underpin a detailed measurement approach. An example of a detailed approach to the organization of data on timber volumes is presented in Table 4.5 for Lithuania.

Table 4.5

Lithuania's table gathering data on timber volumes, increment, and areas of stands with dominant tree species

Stands	All stands		Mature stands		Increment, m^3		Average tax indicators						
	Area, ha	Volume, thousand m^3	Area, ha	Volume, thousand m^3	Volume change	Gross annual	Age	Bonitet (stand quality)	Stocking level	Volume, m^3/ha		Volume increment, m^3/ha	
										All stands	Mature stands	Volume change	Gross annual
Pinus sylvestris													
Picea abies													
Other conifers													
Quercus robur													
Quercus rubra													
Fraxinus excelsior													
Other hardwood broadleaves													
Betula pendula													
Alnus glutinosa													
Populus tremula													
Alnus incana													
Other softwood broadleaves													
Total													

4.47 It must be recognised that the accounts do not require reporting at this level of detail and the critical step will be aggregation from sampled plots to national level estimates. In the aggregation process it will be necessary to incorporate any adjustments made to NFI data at aggregate levels, for example following reconciliation with cadastral data when estimating the total area of wooded land, such that coherence across the accounts is ensured.

4.48 If data on the area of wooded land by dominant tree species within FAWS is not available, it is appropriate to make an informed assumption of the ratio of area relevant for each species and apply the relevant volume per hectare rate to derive the estimate volume of timber stock. The following table shows, for forests only, the types of calculations that can be undertaken. Note that this table is presented for the whole timber stock, but it may be most directly applied for the estimation of the volume of the growing stock only with estimates of the volume of deadwood made separately.

Table 4.6

Calculations for volume of timber stock for forests

		Year 1	Year 2	Year 3
Forest	Total volume			
FAWS	Total volume			
Dominant Tree Species 1	Area			
	Volume per hectare			
	Total volume			
Dominant Tree Species 2	Area			
	Volume per hectare			
	Total volume			
FNAWS	Area			
	Volume per hectare			
	Total volume			

4.49 The data source for the volume of timber per hectare should apply the same definitions for classes of wooded land as applied in the measurement of the area of each class. Where the area of wooded land is based on data from an NFI this is likely to be the case, but more care may be needed when using cadastre or similar spatial boundary type data sources for determining the area since there may not be an immediate alignment across all locations in a country.

4.50 Where different data sources are being used for volumes per hectare and area of wooded land, it will be necessary to ensure alignment in the timing of the information. Ideally, data from both sources would relate to the same reference period. It is likely that volumes per hectare will change more slowly, especially at the level of species, and hence some lack of alignment in timing may be acceptable. However, it is important the volume of timber stock for a given point in time, for example, the opening stock of 2023, is based on the area of wooded land estimated for that point in time and recorded in EFA Table A1a. This will support coherence across the accounts.

4.51 Although the intent is to measure the stock of timber at the opening and closing of the accounting period, it will commonly be the case that the data available do not correspond to those specific points in time. Indeed, collections such as National Forest Inventories may be undertaken over several months within a calendar year. In these cases, it is recommended to attribute the values to the opening or closing period based on the shortest time. Thus, for example, if an NFI collection was undertaken in the second half of the year (July-Nov) then data for a given year – e.g., 2020 – may be considered as referring to the closing stock. Presuming there is a reasonable consistency in the timing of data collection over time, this same assumption should be applied for other calendar years – e.g., data for 2019 would also be assumed to relate to the closing stock of 2019. This approach will best support the development of meaningful time series.

4.52 In developing a time series of the volume of timber, the same considerations as described in Chapter 3 concerning the area of wooded land apply. Building on the previous paragraph, the core feature of estimation should be a meaningful time series of the change in area of each class of wooded land. In measuring the volume of timber, regular benchmarking of rates of the volume of timber per hectare is necessary. Where it is not expected that, at the level of species, these rates will change significantly, a time series of volumes per hectare could be established using linear interpolation and extrapolation. However, these rates may be subject to significant changes, for example due to extreme weather events and associated pest infestations, and compilers should involve forestry management experts in the compilation process to ensure that assumptions made are appropriate.

4.53 The same general approach described in the paragraphs above is applicable across all classes of wooded land. It would be expected where forests not available for wood supply are relatively mature, then the associated volume of timber stock per hectare will be relatively higher than for FAWS. In contrast, it would be expected that the volume of timber per hectare for other wooded land would be considerably lower than for forests. For other land with tree cover available for wood supply, the volume per hectare may be relatively

high considering that these areas are often part of more intensive land management practices.

4.4.2. Estimating the changes in the volume of timber stocks

4.54 There are five entries related to recording changes in the volume of timber stocks in EFA Table A2a: net increment, removals, irretrievable losses, statistical reclassifications, and balancing item. Estimation of each of these entries is considered in turn.

4.55 The measurement of net increment will reflect ecological realities and standard approaches to its measurement are well practiced in forestry management. As for measures of the volume of timber per hectare, rates of net increment per hectare will differ among parcels of wooded land based on factors such as the species of tree, the age of the trees, soil type and climatic factors (rainfall, temperature). To support coherence within the account, it is recommended that the estimation and application of net increment rates be undertaken at the same level of detail as for measurement of the volume of timber stock. That is, for all classes of wooded land and at the level of species for FAWS.

4.56 The entry in the account for net increment will equal the net increment per hectare multiplied by the area of the class of wooded land. Since the net increment will take place progressively through the year, the area used in this calculation should be the average area of the opening and closing stock for each class of wooded land.

4.57 A common source for estimates of net increment is NFI, and data from an NFI will commonly be used to derive tree growth models (e.g. see Trotsiuk, Hartig and Forrester (2020), and Pretzsch, Forrester and Rötzer (2015)), that incorporate likely patterns of gross increment and mortality. Tree growth models will take into consideration a range of factors such as those listed above. Where NFI data is not available, information from forestry management reports or expert opinion may be applied. This may include academic research on tree growth models and related topics. Rates of net increment for a species would not be expected to change significantly from year to year, but regular benchmarking is recommended.

4.58 An important area of data reconciliation will be with data compiled for entries in the national accounts. For cultivated timber resources, most commonly plantation forests, the required estimate of production is the net increment of the stock of timber – i.e. production is recorded progressively as cultivation/management takes place from planting to harvest. While there will not be a complete alignment between the areas of FAWS and cultivated timber resources, it would be expected that, within a country, the estimates of net increment would be well aligned.

4.59 Removals will reflect the patterns of harvest and relevant data should be gathered from standard forest production statistics. Measuring aggregate removals across all classes of wooded land may be more readily accomplished. However, provided there is some level of

spatial granularity in the removals data, it should be possible to make a reasonable allocation of removals data to different classes of wooded land. Of benefit would be information of the volume harvest by species to support connection to data on the volume of timber stock and the net increment for FAWS.

4.60 In terms of reconciling measures of removals with other entries in the accounts, it will be important to understand the timing of removals of harvested timber from wooded land. In particular, it is noted that the felling of timber in a given accounting period does not imply that it has been removed and timber that has been felled but not removed should be included in the measure of the timber stock. If the timing of felling and removals remains largely stable over time, the effect of the difference on accounting entries should be limited and any minor issues will be picked up in the balancing item. However, if there are one-off events that leave an excess of timber not removed (compared to normal) then it will be necessary to ensure that this excess is included in the closing stock estimates. This effect would then need to be unwound in the following accounting period.

4.61 Also, to ensure alignment with the definitions applied in the EFA, if the source data for removals is measured under bark, then an adjustment to add in an estimate of the volume of bark - a bark conversion factor - must be applied (for an in-depth discussion on conversion factors, see UNECE/FAO, 2010). A common factor applied is 10% but this will vary and should be confirmed with forestry experts. Comparison should also be made to estimates reported in the JFSQ where reporting both under and over bark may be available.

4.62 In some cases, removals may be estimated using a residual approach by measuring total changes in inventories of timber stock between two points in time and then deducting net increment over that time. If this approach is applied, it will also be necessary to deduct felling residues to estimate removals.

4.63 Another approach is to consider the flows of wood products and ensure consistency of estimates of removals and fellings with estimates of the total use of roundwood including international trade and changes in inventories (see Thünen Institute and Jochem et al, 2015).

4.64 There are inherent connections between the accounts that allow these different measurement approaches to be developed. Ideally there will be a complete reconciliation possible from all directions but generally differences in measurement scope across the range of different variables will make a full reconciliation difficult to attain.

4.65 Irretrievable losses other than felling residues will arise in a limited number of circumstances and hence entries in the account for such losses should not be a regular occurrence although with changing climate patterns they may arise more frequently. Where possible, the estimation of these changes should involve direct engagement with forest management experts, particularly in terms of differentiating the area and volume of stock affected by an event (e.g. storm, fire) and the proportion of the stock that will not be able to be removed for further sale. Once the loss of the stock has been estimated, a reconciliation will be needed

with the estimate of the closing stock of timber to ensure that, all else being equal, the closing stock is lower by the amount of the irretrievable losses. Since irretrievable losses do not lead to a reduced area of wooded land and will not affect directly the average rates of the volume of stock per hectare, there may need to be a direct adjustment for a given closing stock to ensure coherence in the accounts.

4.66 Statistical reclassifications will relate primarily to changes in the designation of wooded land from available for wood supply to not available for wood supply. The changes that are made in this respect should reflect the related entries in the asset account for wooded land. The requirement in the accounts for timber stocks is to apply appropriate measures of the volume of timber per hectare. Note, that since the physical characteristics of the timber are unchanged, the offsetting entries for the reclassification should be based on the volume of timber per hectare of the original designation since this is the volume of timber that has been reclassified. Unless there is evidence to the contrary, it is reasonable to assume that the reclassification takes place at the start of the accounting period. Consequently, any net increment, removals and other changes that occur during the accounting period for the area that has changed classification should be recorded against the new class.

4.67 The role of the balancing is explained in Section 4.2.1 above and not further considered here. Its calculation is inherent in the compilation of the account.

4.4.3. Estimating the monetary value of timber stocks

4.68 The principles of monetary valuation applied for this asset account align with those applied in the ESA and SNA. The valuation of the timber stock at the opening and closing of the accounting period will generally require the use of indirect valuation methods. There are a number of methods that have been developed for the purposes of valuing the current stock of timber. – the stumpage value method (see 4.75), the consumption value method (see 4.76), the net income method (see 4.77) and the age constant method (see 4.78). Each of these methods is described below following a discussion of how to estimate the various components that are used in applying each method.

4.69 To consider how these methods can be applied in valuing the current stock of timber, it is useful to distinguish between that part of the timber stock that is ready to harvest and that part of the timber stock that is not ready for harvest (work-in-progress). For trees that are ready to harvest, the general assumption is that they will be harvested in the current accounting period and hence the value will be equal to what the unharvested timber can be sold for in the current period. The relevant price for undertaking this valuation is the current stumpage price, i.e. “the value of, or price paid for, timber as it stands uncut in the woods” (IEEAF, 2002, 3.130). The estimation of stumpage prices is considered further below.

4.70 For trees that are a work in progress, conceptually, there are three things to consider when valuing the stock. First, the volume of the stock will be less than the volume at harvest and the value must be calculated based on the current volume. Second, the revenue to be

earned from harvesting may not occur in the current accounting period but at some point in the future. Thus, depending on the method applied, it will be necessary to make assumptions about the relationship between the mature stumpage price and the price of the current timber stock, which is still growing. Third, since the trees are still growing there will be some costs incurred to bring the trees to maturity, for example, costs of thinning and other management costs. Depending on the method, these costs may need to be deducted in estimating the relevant price recognising that the costs will vary depending on the age of the tree and the time to maturity, and indeed for trees that are close to harvest these costs may be relatively small.

4.71 Stumpage prices may be estimated from actual transactions in standing timber or by adjusting roadside pickup prices (wood in the rough or raw wood prices) for harvesting costs and any non-felling costs associated with moving timber to the roadside. Harvesting costs should include all costs of harvesting including compensation of employees and the user cost of produced assets (i.e. consumption of fixed capital and a return to produced assets) (SEEA CF, 5.141-144). By way of example, the detailed approach applied in Switzerland is described in Box 4.1. Where a roadside pickup price is used, it is recommended to ensure that the costs of harvesting are deducted since, if this is not done, the estimates will systematically overstate the value of the timber stock.

4.72 Depending on the data source, roadside pick-up prices may not be available following the same classes as for the data on the volume of timber. For example, roadside pick-up prices may be available by assortment (i.e. for different uses of timber such as for sawlogs, pulpwood, etc) rather than in terms of classes such as diameter and tree species which are used to classify data on the stock of timber. As a result, where roadside pick-up prices need to be used for valuation of the stock because stumpage prices are not available, it will be necessary to use assumptions about the links between assortments and the expected patterns of future fellings and uses. For example, a long term (e.g. 15 year) average of assortments might be assumed as the way in which the current timber stock will be used in the future.

4.73 It is important to note that a stumpage price is a different concept from a resource rent price. A stumpage price is an output price related to a finished, unharvested tree. A resource rent price reflects the overall return to the economic owner of a resource per unit of output. Estimating a resource rent price therefore requires deducting all relevant costs from the measure of output, including the user costs of produced capital. For a forest resource as a whole, the costs will include silvicultural and other establishment costs.

4.74 Note that if, in calculating the resource rent, the output from a forest resource is priced using roadside pick-up prices, then harvesting costs will need to be deducted. However, if a stumpage price is used to value output, then harvesting costs should not be deducted in estimating the resource rent. Note that the stumpage price and the resource rent price will be equal if there are no establishment or on-going management costs (e.g. thinning).

Box 4.1: Example of calculation of stumpage prices: Switzerland

In Switzerland, stumpage prices are not directly monitored by price statistics, as sales of standing timber between forestry and logging units are not a common practice, and the few observed transactions in the forestry accounting network are not representative for the valuation of the whole stock and flows of standing timber. Stumpage prices are therefore indirectly calculated for each (main) species and diameter-category of each NFI plot as follows:

- Prices on national level per species and quality category (diameter and destination logs /industry/energy); those prices are compiled yearly.
- Prices for wood in the rough (roadside pick-up price) are adjusted to adapt reference volume from wood in the rough to standing timber (harvest losses, bark, to get the price for wood in the rough corresponding to the corresponding volume of standing wood over bark, gross (meaning harvesting costs still included))
- For each NFI plot, an optimal harvesting process (out of about 18 processes) is chosen in situ by the local forest warden: the parameters average labour hours and machinery hours per m^3 is defined by plot, and the harvesting costs per m^3 (divided in labour and machinery) specific to each plot is defined. This attribution and cost estimation is done for a base year, and then in inflated/deflated (labour cost index, machinery cost index) to compile yearly costs per m^3.
- For each plot and each standing timber category (species, quality): stumpage price = the price for wood in the rough (roadside pick-up price) minus harvesting costs; per year; per standing wood over bark volume equivalent.

Source: Correspondence with the Federal Statistical Office of Switzerland, 2024.

4.75 **Stumpage value method**: In this method, the current average stumpage price is multiplied by the current volume of the timber stock. It is applied in the same way for both ready to harvest and work in progress stocks of timber. Since average stumpage prices will vary by species it is recommended that this method be applied at the species level.

4.76 **Consumption value method**: In this method, as for the stumpage value method, the current volume of the timber stock is split into different age or diameter classes and different stumpage prices are applied for different classes on the assumption that the timber is harvested in the current period. The stumpage prices will therefore generally be higher for older and larger trees, although the relationship will not be linear and there may be optimum sizes for trees with respect to price. The total value is then the addition across all classes of the volume of timber stock multiplied by the relevant current stumpage price for each class.

4.77 **Net income method:** (also referred to as the net cost method or the net present value method): In this method, the current timber stock is distributed into age classes (e.g. 20 years) and for each age class a harvesting age is determined. It is then assumed that the current stumpage price applies at the future expected harvest date and for each age class a discounted stumpage price is estimated by multiplying the current stumpage price by the

discount factor relevant for each age class. Thus, younger trees with a longer time to maturity will have a lower price. Trees close to maturity will have a price that is relatively close to the current stumpage price. The value of the current timber stock is then equal to the volume of the stock in each age class multiplied by the associated discounted stumpage price.

4.78 **Age constant method**: In this method, the expected felling value for each age class is estimated as per the net income method and then multiplied by an age factor.

4.79 A key factor in applying the net income method is the selection of an appropriate discount factor. SEEA CF Annex A5.2 has an extensive discussion on discount rates. The broad intent in applying a discount rate is to recognise that producers and owners of resources will have a preference for receiving income now rather than in the future. Thus, to recognise that some income from timber production will occur in the future, the future income is "discounted". This is generally done by applying an interest rate which can also be interpreted as the amount of interest that a resource holder would expect to earn if they had not chosen to invest in forestry.

4.80 While the core logic of discounting has a strong economic rationale, the choice of discount rate can have a significant impact on the total value of the timber stock. For the purposes of the EFA, it is recommended that a discount rate be applied that is consistent with the general approach to valuation in the SEEA and the SNA, i.e., consistent with valuation at market prices. This suggests the choice of an individual discount rate that reflects the return needed by those undertaking an activity to justify investment in that activity. Consequently, for valuing stocks of timber, it is recommended to use a market discount rate consistent with that applied in forest sector valuations or as used in the national accounts. The precise choice of discount rate must take into considerations in each country and no single discount rate is prescribed in the Handbook.

4.81 There may be a concern that the use of a market-based discount rate that considers industry specific factors will underestimate the value of the timber stock. This concern arises because generally, market-based discount rates are higher than social discount rates and, all else being equal, a higher discount rate will lead to a lower total value. While it is the case that social discount rates may be applicable in the valuation of forests when taking into account all of the benefits they provide society, i.e. other than timber, for the valuation of timber resources specifically, a market-based discount rate is considered the appropriate choice given that the associated timber products are openly traded with revealed and observed prices.

4.82 Estimates of the future income and associated prices, the calculation of discount factors and the expected asset life (i.e. harvesting age) will be linked and various combinations of assumptions are possible depending on the level of detail at which the net income method is applied. At the most detailed, land parcel / coupe level, the future flows of net income should be measured in relation to expected incomes for that location and over the period of time remaining until harvest. At more aggregate levels, average incomes will be used, and

assumptions will be required concerning the average time remaining until harvest which will be a function of the average age of the timber stock and the expected rotation time. All of these factors may be expected to vary according to the class of wooded land and the species being harvested. It is therefore recommended that estimates of the value of timber stock be conducted at the same level of detail as underlying the measurement of the volume of the timber stock.

4.83 The primary difficulty in applying the net income method lies in the extent to which information is available on the age structure of the trees, how these trees will mature into the future, the associated expected harvesting age and the extent to which the current stumpage price provides a good estimate of the future stumpage price.

4.84 The following table summarizes the use of different valuation methods by a selection of European countries. Some countries have applied multiple methods.

Table 4.7

Timber stock valuation methods in selected European countries

Country	Net income*	Age constant	Stumpage value	Consumption value
Belgium (BE)	-	-	X	-
Czechia (CZ)	-	X	X	-
Germany (DE)	-	-	X	-
Estonia (EE)	-	-	X	-
Spain (ES)	-	-	X	-
France (FR)	-	-	X	-
Croatia (HR)	-	-	-	-
Italy (IT)	-	-	X	-
Austria (AT)	-	-	X	-
Poland (PL)	-	X	-	-
Slovenia (SI)	-	-	X	-
Slovakia (SK)	-	-	X	-
Finland (FI)	-	-	X	-
Sweden (SE)	-	-	X	-
Norway (NO)	X	-	X	-
Switzerland (CH)	-	-	X	X

* Net income method covers net cost method

4.85 In applying any of these methods, a more robust measure of the total value will be obtained when it is possible to differentiate the total timber stock into different age classes and dominant tree species – as per Table 4.5. With this level of detail, it will be possible to use forest management expertise to appropriately estimate expected age and size of trees at harvest and hence derive more robust indicators of, for example, average harvesting age. Further, if the data are available by region or location within a country, it will be possible to incorporate knowledge of variations in, for example, growing conditions (e.g. climate, rainfall) and harvesting costs (e.g. distance from sawmills) for trees of the same age and species.

4.86 The stumpage value and consumption value methods may seem simpler and hence require less compilation effort. However, in practice, the primary differences between these methods and the net income method concern the need to make assumptions about future prices and expected harvesting age and the need to select a discount rate. Making these assumptions and choices need not imply much additional compilation work after initial research is undertaken and it is likely that the net income method can be applied in a cost-effective way through the incorporation of expert knowledge of forest management practice in a country. At the same time, the use of assumptions and discount rates may be considered less optimal in terms of transparency of methods and links to observable data.

4.87 These methods can be applied to all classes of wooded land. In cases of uncultivated forests that are available for wood supply, the same methods will apply but it would be expected that the parameters (e.g. timber stock per hectare, species, age of trees at harvest, harvest costs) used will vary. For example, it might be expected that the volume of removals per hectare is lower compared to cultivated forests and the costs of harvest may be higher and hence the net income will be lower (all else being equal). It is further noted that where the wooded land is available for wood supply, the approach to recording entries in the asset accounts for timber stocks is not affected by whether the production process is cultivated or uncultivated. The distinction with respect to cultivation only affects entries in the production account in terms of the time of recording of output.

4.88 For wooded land not available for wood supply, including FNAWS, since there is little if any harvest of timber, then there are also limited expected future flows of net income to be recorded that would imply a value for the current timber stock. It is therefore assumed that the monetary value of timber stock in these areas is zero.

4.89 In addition to the methods described here, there is also the potential to apply a hedonic approach based on transaction values of forest estates and isolating the contribution of the timber stock to those values. The discussion in Chapter 3 on using this method to value forest land is relevant.

4.4.4. Estimating the monetary value of the changes in timber stocks

4.90 The valuation of flows (including net increment and removals) should be valued at the observed or estimated current period stumpage prices. For removals, the price will generally be the stumpage price of the mature trees that are removed. However, the valuation of net increment will depend on the method used to value the opening and closing stocks of timber. Under the stumpage value method, net increment is valued using the average stumpage price of trees removed. Under the consumption value method, the relevant age or diameter class stumpage price is used. Under the net income method, the age-appropriate discounted stumpage price is used. Thus, depending on the method different prices may apply for valuing increases in the stock and decreases in the stock which, in turn, will impact on estimates of work in progress (changes in inventories) as required in the compilation of economic accounts.

4.91 The stumpage prices used to value the changes in stock should relate to the actual prices observed. This will vary depending on the species and other factors. In cases of extreme events, the prices that reflect the actual removals will likely be different from expected, for example because the timber removed is used for firewood rather than logs. In all cases the actual prices should be used.

4.92 Note with respect to extreme events, the irretrievable losses that arise during an accounting period will relate to timber that had a value as part of the opening stock. To the extent that, over the course of the accounting period, some of that opening stock becomes irretrievable, then the loss in value will be equal to the value of the timber that becomes irretrievable that was included at the beginning of the accounting period. This loss in value would be expected to vary from year to year depending on the events of each year.

4.93 It is generally assumed that the pattern of flows is evenly distributed over the accounting period and hence average stumpage prices over a year are appropriate for the valuation of the flows.

4.94 Estimates of revaluation of the stock concern changes in the value of stock from opening to closing values that are due solely to changes in prices. Following SEEA CF Annex A5.1, the entry for revaluation should be derived as the change in the stock price over the accounting period (i.e. closing price less opening price) multiplied by the average of the sum of the volume of timber stocks at opening and closing of the period. This entry may be positive or negative depending on the direction of the price movement.

4.4.5. Stylised example for the valuation of timber stocks

4.95 The following stylised example is provided to support understanding of the calculations involved in the application of the methods described above for the valuation of timber stocks. The example is simple in that it considers only one forest area containing a single tree species. While it is simple, it can be readily extended to encompass alternative and more complex situations.

4.96 Building on the stylised example described in Chapter 3, the key features of the forest area in this stylised example are:

- Total area of 100ha
- Age profile of trees is such that
  - 20ha are 1 year old.
  - 15ha are 5 years old.
  - 30ha are 10 years old.
  - 25ha are 15 years old.
  - 10ha are 20 years old.
- Trees are harvested at maturity at 20 years of age.
- The cubic metres per hectare harvested at maturity is 80m^3 with linear growth assumed (NB: The quantity harvested could also be expressed in tonnes per hectare).

4.97 Using the stumpage value method requires an estimate of the current volume of the timber stock and the current stumpage price. The current volume of the timber stock can be calculated based on the current age profile, the expected volume at harvest and the pattern of growth over the life of the trees. Given the assumption of linear growth, the total harvest volume of 80m^3/ha and the age of 20 years at harvest, the assumed volume of timber increase per hectare per year (net increment) is 4m^3/ha. The calculations for the stylised example are shown in the table below. With an assumed stumpage price of €45/m^3 the total value is 3880 x 45 = €174,600.

Table 4.8

Stylised example for the valuation of timber stocks using the stumpage value method

Age group	Age of trees	# Hectares	Growth (m^3 / ha / yr)	Current volume	Stumpage price	Value
#1	1	20	4	80	45	3,600
#2	5	15	4	300	45	13,500
#3	10	30	4	1200	45	54,000
#4	15	25	4	1500	45	67,500
#5	20	10	4	800	45	36,000
TOTAL				**3880**		**174,600**

4.98 **Using the consumption value method**, the same calculations of the timber volume as for the stumpage value method are involved but rather than applying the same stumpage price (SP) per cubic metre for each age class, the price is adjusted based on the size and age of the trees. In this example, the following age price profile is applied: Age 1: SP = 1; Age 5: SP = 15; Age 10: SP = 30; Age 15: SP = 40; Age 20: SP = 45. Under these assumptions the total value is estimated as €136,580.

Table 4.9

Stylised example for the valuation of timber stocks using the consumption value method

Age group	Age of trees	# Hectares	Growth (m^3 / ha / yr)	Current volume	Age price profile	Value
#1	1	20	4	80	1	80
#2	5	15	4	300	15	4,500
#3	10	30	4	1200	30	36,000
#4	15	25	4	1500	40	60,000
#5	20	10	4	800	45	36,000
TOTAL						**136,580**

4.99 **Using the net income method,** the same calculations of the timber volume as for the stumpage value method are involved but rather than applying the same stumpage price per tonne for each age class, the price is adjusted based on the age of the trees using a discounted stumpage price. Assuming a discount rate of 3% and discounting over the time remaining to harvest for each age class, discount factors are derived and then applied to the mature stumpage price of €45. The resulting discounted stumpage prices for each age class are shown in the table below. These prices are multiplied by the current volumes of each age class to derive the total value, €145,123.

Table 4.10

Stylised example for the valuation of timber stocks using the net income method

Age group	Age of trees	# Hectares	Growth (m^3 / ha / yr)	Current volume	Discount factor	Discounted stumpage price	Value
#1	1	20	4	80	0.57	25.66	2,053
#2	5	15	4	300	0.64	28.88	8,664
#3	10	30	4	1200	0.74	33.48	40,176
#4	15	25	4	1500	0.86	38.82	58,230
#5	20	10	4	800	1	45	36,000
TOTAL							**145,123**

4.100 **Using the age constant method** the calculations are the same as for the net income method, except that rather than applying a discount factor an expert determined age factor is used to derive a price for each age class.

5

Chapter 5. Economic accounts for the forestry and logging industry

5.1. Introduction

5.1 Economic accounts for the forestry and logging industry are tools that support the assessment of economic activity of the industry within the national economy. The primary purpose of these economic accounts is to record and analyse the core data concerning forestry products (outputs of goods and services), and the production, intermediate consumption, income, capital formation and employment of the forestry and logging industry.

5.2 The economic accounts for the forestry and logging industry present the data for developing robust and coherent analysis on various economic matters of the industry, including economic contribution of forestry, production processes etc. The data presented in these accounts will support the derivation and validation of most forestry related economic indicators, recognising that substantive efforts in distinguishing and measuring the stocks and flows of timber are required to support this as described in Chapters 3 and 4.

5.3 The concepts, rules, and definitions of the economic accounts for the forestry and logging industry described in this chapter reflect the reporting requirements of the Regulation (EU) 691/2011 Annex VII on forest accounts. In turn, the regulation is underpinned by the international statistical standards, the System of Environmental-Economic Accounting 2012 - Central Framework (SEEA CF) and the SEEA Ecosystem Accounting (SEEA EA) and follows the European System of National and Regional Accounts – ESA 2010 (Eurostat, 2013), which supports consistency and comparability in the application and presentation of data amongst European Member States. The ESA 2010 is broadly consistent with the System of National Accounts 2008 – SNA (UNSD, 2009), the internationally harmonised statistical standard and reference methodology for the compilation of national accounts.

5.4 The economic and accounting definitions are also consistent with those of NACE Rev. 2. Statistical classification of economic activities in the European Community (Eurostat,

2008)[7], and the CPA Ver 2.1 Statistical classification of products by activity (2015). These classifications provide a detailed description of the economic transactions of forest-related industries and corresponding units.

5.5 The methodological principles employed in the compilation of the Economic accounts for the forestry and logging industry are based on guidelines originally presented in the Manual on the Economic Accounts for Agriculture and Forestry – EAA/EAF 97 (Eurostat, 2000), and as incorporated in the methods and nomenclatures of the European Framework for the Integrated Environmental and Economic Accounting for Forests – IEEAF (Eurostat, 2002).

5.6 The chapter is structured to describe the range of accounting entries (Section 5.2), the various data sources (Section 5.3) and relevant methods and measurement issues (Section 5.4).

5.2. Account structure and accounting entries

5.7 This section describes the entries for the economic accounts for the forestry and logging industry including entries for both mandatory and voluntary reporting. The focus is on describing the structure of the accounts and providing definitions for all of the entries in each of the accounts. There are two reporting tables discussed in this chapter: EFA Table B1 – Economic aggregates of the forestry and logging industry; and EFA Table B2 – Output of the forest and logging industry by type. EFA Table B1 is a large table (see Table 5.1). To support the discussion, an overview of the table is provided first (Section 5.2.1), followed by a detailed explanation of the way in which different activities within the forestry and logging industry are presented from an accounting perspective (Section 5.2.2). The following six separate sections (Sections 5.2.3–5.2.8) provide more detailed content on different parts of Table 5.1 covering output, intermediate consumption, gross value added, factor income and net operating surplus, gross fixed capital formation and changes in inventories, and labour input. EFA Table B2 is discussed in Section 5.2.9.

5.2.1. Overview of the economic aggregates account of the forestry and logging industry

5.8 The structure of the economic aggregates account of the forestry and logging industry is shown in EFA Table B1. The coverage of the account concerns economic units that are classified to the forestry and logging industry following the classification of NACE Rev. 2.1. The forest and logging industry is defined as all kind-of-activity units (KAU) which perform activities classified under NACE section A (agriculture, forestry and fishing), division 02

[7] Note, that NACE Rev. 2.1 was adopted in October 2022 for use in European Statistics from 2025 onwards.

(forestry and logging) (as specified by the Regulation (EU) No 691/2011), and covers the following activities:

02 Forestry and logging

02.1 Silviculture and other forestry activities

02.2 Logging

02.3 Gathering of wild growing non-wood products

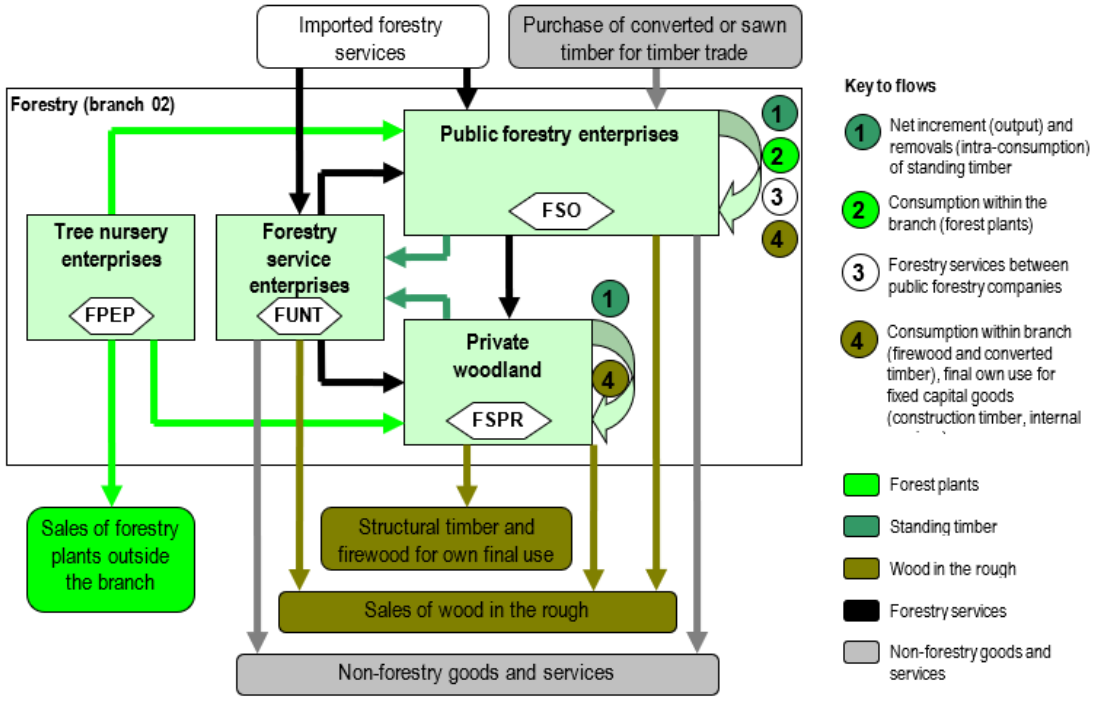
02.4 Support services to forestry[8]

5.9 As the scope is on the activities of a specific set of economic units, the measurement required for EFA Table B1 Economic aggregates of the forestry and logging industry will include data for secondary (i.e. not primary) activities undertaken by KAU classified to the forestry and logging industry. The scope excludes any secondary production of forestry and logging activities of other KAU (i.e. non-NACE 02) but, as appropriate, where these secondary activities can be separately identified then separate KAU should be established and coded to NACE 02. Creating separate KAU for forestry and logging activities should consider whether separate reporting of these activities can be undertaken by the relevant economic unit and the extent to which the forestry and logging activities is using the same or common inputs to production (e.g. whether there is common use of labour and equipment across different activities).

5.10 As a result of using this scope of economic units, the estimates of output and associated measures of production (e.g. removals, changes in inventories) have a different scope compared to related estimates in other EFA tables that consider all timber stocks. An example of how forestry units may be mapped is shown in Box 5.1 for Switzerland.

[8] Note, that NACE Rev. 2 and 2.1 give the same breakdown of the division 02 (forestry and logging).

Box 5.1: The operating model of Swiss forestry and logging branch



Source: The Federal Statistical Office of Switzerland (Office fédéral de la statistique (OFS), 2021).

5.11 The entries in the account should be expressed in million national currency (million NAC) and all entries in the account should relate to a single reference year, for example 2022 (1 January – 31 December). The entries related to total labour input (i.e., employment) in the forestry and logging industry should be expressed in thousand (national) annual work units (AWU) (for which one AWU corresponds to work performed by one person on a full-time basis), as defined under the Regulation (EC) No 138/2004 of the European Parliament and of the Council.

5.12 The amendment of the Regulation (EU) 691/2011 lists the following characteristics, using the ESA definitions, to be reported:

- output;
- of which: output for own final use

- intermediate consumption;
- gross value added;
- consumption of fixed capital;
- other taxes on production;
- other subsidies on production;
- compensation of employees;
- gross fixed capital formation and acquisitions less disposals of non-financial non-produced assets;
- changes in inventories;
- capital transfers.

5.13 All of these characteristics are incorporated in the structure of EFA Table B1 Economic aggregates of the forestry and logging industry across 10 primary groups namely: (1) output, (2) intermediate consumption, (3) gross value added, (4) factor income, (5) net operating surplus and mixed income, (6) gross fixed capital formation, (7) net fixed capital formation, (8) changes in inventories, (9) capital transfers, and (10) labour input for employees and self-employed persons.

Table 5.1

EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

Products and economic aggregates (current transactions)

Code	Description	Million NAC
1	**Total output (at basic prices) [P.1]**	
1.0	Of which output for own final use [P.12]	
1.1	Goods characteristic of the forestry and logging activity	
1.1.1	Trees, tree plants and forest tree seeds	
1.1.1.1	Live forest tree plants (02.10.11) and tree seeds (02.10.12)	
1.1.1.2	Forest trees (02.10.30)	
1.1.2	Wood in the rough (02.20.1)	
1.1.2.1	Logs	
1.1.2.2	Fuel wood (02.20.14 and 02.20.15)	

Code	Description	Million NAC
1.1.4	Non-wood products (02.30)	
1.2	Services characteristic of the forestry and logging activity	
1.3	Other products from connected secondary activities in the local KAU	
1.4	Other products	
2	**Total intermediate consumption [P.2]**	
2.1	Goods input	
2.1.1	Trees, tree plants and forest tree seeds	
2.1.2	Energy, lubricants	
2.1.3	Fertilisers and soil improvers	
2.1.4	Plant protection products and pesticides	
2.2	Services input	
2.2.1	Services characteristic of the forestry and logging activity	
2.2.2	Regular maintenance and repair of equipment	
2.2.3	Maintenance of buildings	
2.2.4	Financial services (FISIM) [P.119]	
2.3	Other goods and services used as inputs	
3	**Gross value added (at basic prices) [B.1g]**	
3.1	Consumption of fixed capital [P.51c]	
3.2	Net value added (at basic prices) [B.1n]	
3.2.1	Other taxes on production [D.29]	
3.2.2	Other subsidies on production [D.39]	
4	**Factor income**	
4.1	Compensation of employees [D.1]	
5	**Net operating surplus [B.2n] and Mixed income [B.3n]**	
5.1	Net property income [D.4]	
5.2	Net entrepreneurial income [B.4n]	
6	**Gross fixed capital formation (excluding deductible VAT) [P.51g]**	
6.1	Buildings, structures and land improvements	
6.2	Machinery and equipment	
6.3	Plant resources yielding repeat products	

Code	Description	Million NAC
6.4	Other GFCF	
7	**Net fixed capital formation (excluding deductible VAT) [P.51n]**	
8	**Changes in inventories [P.52]**	
8.1	Work-in-progress on cultivated biological assets [AN.1221]	
8.2	Other changes in inventories	
9	Capital transfers (net) [D.9]	

Code	Description	Thousand AWU
10	**Total labour input [L] (in 1000 harmonized AWU)**	
	Total labour input in 1000 **national** AWU	
	Number of working hours per year in national AWU	
10.1	Of which self-employed (in 1000 harmonized AWU)	
	Self-employed in 1000 **national** AWU	
	Number of working hours per year in national AWU for self-employed	

Note: Entries in dark grey cells are mandatory items for reporting. Entries in white cells are voluntary items for reporting.
Source: EFA Questionnaire.

5.2.2. A general framing of forestry and logging activities

5.14 The primary focus of forestry and logging activity is the production of timber that is harvested from areas of forest and other wooded land. This activity has two key features concerning the recording of output following national accounts principles. The first key feature is that forestry activity, i.e. the growing of timber stocks, can be highly managed, i.e. cultivated production, or very lightly managed, i.e. natural production. Cultivated production involves ongoing and active management of the growth of the timber resources, whereas natural production involves limited or no involvement in the growth of the timber resources.

5.15 The second key feature is that the production process for a given stock of timber takes a long period of time – usually at least 30 years, and often longer, depending on the growing context (climate, rainfall, species, etc). In cultivated production contexts, there is a requirement following national accounts principles to provide estimates of the amount of production in each year, and hence consideration must be given as to how to best record the long-term nature of the production process. In contrast, in natural production contexts production is recorded at the time trees are harvested.

5.16 The starting point for measuring the output of forestry and logging is the general definition of output, where ***output*** *is the total of products created during the accounting period* (ESA 2010, 3.14). In measuring output, it is necessary to make a distinction between the amount that is produced/created in a given accounting period and the amount that is sold or otherwise transferred. At the extreme, if goods are produced in one accounting period and sold in a second accounting period, all of the output is recorded as occurring in the first accounting period and none in the second.

5.17 To consider these aspects in the context of forestry and logging activity requires a careful and structured approach. Thus, it is necessary to consider, in turn, the four primary combinations of production context and activity, namely:

- forestry activity in natural production contexts;
- forestry activity in cultivated production contexts;
- logging activity in natural production contexts;
- logging activity in cultivated production contexts.

5.18 For the purposes of a full exposition of all possible accounting entries, a distinction between forestry activity and logging activity is made since these are both distinct activities recognised within NACE 02, and each has a different primary output. For forestry activity the primary output is forest trees and for logging activity the primary output is wood in the rough.

5.19 The discussion in the following assumes that there are two distinct KAU involved each classified to one of the activities. However, in practice, there are other structures and combination of economic units which need to be considered. For example, one KAU coded to NACE 02 may undertake both activities. To support understanding of the relevant accounting entries, common alternative economic structures are considered after the explanation of the basic model involving two distinct KAU. It is important to note that, irrespective of the ownership and production arrangements, a distinction should be made between the two products forest trees and wood in the rough.

5.20 It is common for natural and cultivated production contexts to be associated directly with the type of forest – i.e. by classifying forests as either natural or cultivated. For example, in Europe it is common for cultivated production contexts to be associated with forests available for wood supply (FAWS). In concept however, the production context should apply not to the forest per se but rather to whether the growth of the timber resources is cultivated or not. Thus, it is the case that timber growth in some FAWS is largely unmanaged and hence this production should be considered natural rather than cultivated. Indeed, there will often be non-cultivated/natural outputs, e.g. wild berries, gathered from the same forests from which cultivated timber resources are harvested but this does not imply that the other outputs are cultivated.

5.21 In line with the SNA and the ESA, the **output of forestry activity in natural production contexts** is zero since no output is estimated for the growth of timber stocks in natural production contexts.

5.22 The **output of forestry activity in cultivated production contexts** concerns the growth of timber stocks over an accounting period. Thus, in cultivated production contexts, output is recorded progressively as the timber stock grows. Generally, this is measured as the net increment of the timber stock. However, a more complete recording requires consideration of a range of accounting entries, including for example how to account for the progressive removal of wood from the timber stock as it is harvested. These entries are described in the following paragraphs.

5.23 To document the relevant accounting entries a simple, stylised example concerning a cultivated production context is used. Table 5.2 below provides a summary of the entries in physical terms. The example involves a 100ha forest of a single tree species with entries recorded over three accounting periods. At the opening of the first accounting period the timber stock is 300 units. During the first accounting period, trees are planted and harvested and the closing stock is equal to 315 units. The closing stock reflects *additions* measured as gross increment (80) less *natural losses* (5) (e.g. due to pests, disease) and *removals* due to logging (60).

5.24 Output of forest trees for forestry activity is equal to the net increment, i.e. gross increment less natural losses (80 – 5 = 75). This also provides the estimate of total supply since there are no imports. In order to balance estimates of supply and use of the product forest trees, an entry for intermediate consumption of forest trees by the logging activity is also made. It is equal to the withdrawals from the timber stock, i.e. 60. Total use is equal to intermediate consumption plus change in inventories (60 + 15 = 75).

5.25 Similar entries for supply and use of forest trees are made in periods 2 and 3 with differences in the level of output depending on the net increment and differences in the composition of use depending on the net increment and the volume of removals. Note, that in this stylised example no output related to sales of standing timber has been incorporated, but entries for these sales made is needed, as discussed in later sections.

5.26 The **output of logging activity in both cultivated and natural production contexts** is measured in relation to the removals of wood in the rough. The measure of output in a given accounting period will equal the total removals in that period plus the change in inventories of wood in the rough, i.e. the closing stock less the opening stock of wood in the rough.

5.27 Building on the stylised example introduced above and as reflected in Table 5.2, output of wood in the rough relates to the removals from the timber stock excluding felling residues. This shows values of 50, 110 and 70 in periods 1, 2 and 3 respectively. Note that in physical terms, the entry for wood in the rough is smaller than for forest trees due to felling residues. In this example the felling residues are equal to 10, 20 and 15 in the three periods.

5.28 Finally, it is assumed in this example that all output of wood in the rough produced in each period is sold to other industries, in this example to wood processing industries. Consequently, there is no change in inventories of wood in the rough held by the logging industry to account for (i.e. the additions and withdrawals of wood in the rough within the accounting period are the same).

5.29 It would be possible to extend this example to show entries for inventories of finished goods for wood in the rough with opening and closing stocks of wood in the rough that are present either in or near the harvest site (commonly referred to as being “at the roadside”). Note that inventories of wood in the rough are not included as part of the timber stock as recorded in the asset accounts described in Chapter 4.

5.30 In addition to the principal outputs of forest trees and wood in the rough, forestry and logging activity also produces a range of other products, including non-wood forest products, that are either sold or produced for own use. The total value of output should include these additional products. A longer discussion of the products of forestry and logging activities is presented in the following section.

Table 5.2

Entries concerning output and change in inventories for stylised example (physical units)

	Period	Supply	Use									Total use
		Output	Intermediate consumption	Changes in inventories								
Product			Logging	Other ind.	Opening stock	Gross increment	Natural losses	Net increment	Removals	Total change	Closing stock	
Forest trees (Forestry)	1	75	60		300	80	5	75	60	15	315	75
	2	100	130		315	110	10	100	130	-30	285	100
	3	100	85		285	110	10	100	85	15	300	100
Wood in the rough (Logging)	1	50		50	-	-	-	-	-	-	-	50
	2	110		110	-	-	-	-	-	-	-	110
	3	70		70	-	-	-	-	-	-	-	70

Table 5.3

Entries concerning output and change in inventories for stylised example (monetary units)

	Period	Supply			Use								Total use
		Output		Intermediate consumption	Changes in inventories								
Product				Logging	Other ind.	Opening stock	Gross increment	Natural losses	Net increment	Removals	Total change	Closing stock	
Forest trees (Forestry)	1	375		300		1500	400	25	375	300	75	1575	375
	2	500		650		1575	550	50	500	650	-150	1425	500
	3	500		425		1425	550	50	500	425	75	1500	500
Wood in the rough (Logging)	1	400			400	-	-	-	-	-	-	-	400
	2	880			880	-	-	-	-	-	-	-	880
	3	560			560	-	-	-	-	-	-	-	560

5.31 By applying prices to each of the entries in physical terms, a complementary supply and use table in monetary terms can be presented. Table 5.3 (above) shows the relevant entries. For the product forest trees a stumpage price of €5 per unit has been assumed and for the product wood in the rough a sale price of €8 per unit has been assumed. Prices are assumed constant over the three periods.

5.32 Some additional considerations and notes are needed. First, measures of the total changes in inventories should not be equated with measures of output in terms of net increment. That is, changes in inventories will reflect both the additions to the timber stock through net increment and the reductions in the timber stocks as result of removals. Hence, with respect to the product forest trees, and the associated forestry activity, estimates recorded in the accounts for output and change in inventories will be different.

5.33 Second, natural losses should relate to the losses of the timber stock due to mortality from causes other than felling but excluding the effects of catastrophic losses. In the context of a wider discussion on the measurement of changes in inventories, natural losses can be considered recurrent losses. This treatment is consistent with the general treatment of such flows in the SNA and ESA. However, note that in the case of timber stocks, natural and catastrophic losses are only recorded to the extent that the timber stock is irretrievable. As a result, in many instances since some of the affected timber stock will be able to be recovered and sold (even if at reduced prices), the volume of timber that is lost due to natural or catastrophic events will be less than the area or number of trees affected by those events.

5.34 Logging activity involves the harvesting of timber stocks to produce wood in the rough. The timber stocks harvested may be felled or sourced from trees that are lying on the ground. The trees will generally require the removal of small branches, foliage and other tree parts which will generate felling residues. The production process is considered complete when the product, i.e. wood in the rough, is ready for subsequent transport and processing. It is common for this process to be considered complete when wood in the rough is collected “at the roadside” but depending on the context, wood in the rough may be stored within a forest. Importantly from an accounting perspective, the withdrawal from timber stocks and the addition to the inventory of wood in the rough occurs at the end of the forestry production process. Note that in physical terms, the withdrawal from the stock of standing timber will be greater than the addition to inventory of wood in the rough due to felling residues.

5.35 As noted above, the accounting entries just described refer to a basic economic structure involving two distinct KAU – one forestry and one logging. Since this structure is not always evident in actual production contexts, the following paragraphs consider the effects of common alternative structures.

5.36 **One KAU**: One alternative structure is where a single economic unit undertakes both the growing of trees and the harvesting of timber. Consequently, a transaction will not be evident between a forestry unit and a logging unit and, following standard national accounts practice, the output and intermediate consumption of forest trees, would not normally be recorded. While standard national accounts may not show this transaction it is required for the

compilation of EFA and hence estimation of the transaction from national accounts data will be required. Relevant approaches and considerations are described in Section 5.4 and will depend in part on the actual compilation approach used by the national accounts section.

5.37 **One KAU with logging contracted out**: A variation on the previous structure is where one KAU retains ownership of the timber and hence ultimately sells the wood in the rough but rather than employing staff and investing in produced capital to undertake logging, the KAU hires (contracts out) a specialist logging company to harvest the timber. In relation to the measures of output (forest trees and wood in the rough) the accounting entries are the same as for the One KAU structure and hence estimation of output will be required. However, the accounting entries will be different in relation to the costs of harvest. Thus, under this structure the costs will be allocated to intermediate consumption of the product "logging services" rather than the costs of harvest being split across compensation of employees, gross fixed capital formation and consumption of fixed capital, and intermediate consumption (e.g. of fuel).

5.38 **One KAU selling standing timber**: Another economic structure is where the KAU undertaking the forestry activity (which may be coded to NACE 02 or another activity) sells standing timber to a logging company. If coded to NACE 02 the main output of this KAU remains forest trees, but separate entries should be recorded for the transactions when the standing timber is sold in addition to recording the net increment progressively. The purchase of the standing timber by the logging activity should be recorded as intermediate consumption. Coding to a non-NACE 02 activity might occur when the forestry activity is undertaken by an agricultural unit or a public sector unit, perhaps coded to general government. In effect, the forestry activity is secondary activity for the unit. In many statistical systems, this activity would be out of scope of NACE 02 and hence of national accounts measures of output. Thus, while in concept the output entries are the same as the basic case outlined above, some adjustments will be required for the purposes of EFA reporting. Relevant approaches and considerations are described in Section 5.4 and will depend in part on the actual compilation approach used by the national accounts section.

5.39 Note that in concept the institutional sector of the unit undertaking the activity should not affect the measurement of output and the associated accounting entries. Thus, whether the forestry or logging activity is undertaken by a private or public sector unit, it would be expected that the sales of standing timber or wood in the rough would be undertaken at market prices and hence recorded as part of market output of NACE 02. This would be particularly clear in the case of publicly owned forestry corporations. However, if the unit involved is a general government unit for whom forestry activity is a small share of total output, then it may be that identifying the market output among the wider measure of non-market output for that unit is difficult. Relevant approaches and considerations are described in Section 5.4.

5.2.3. Accounting for output and related entries

5.40 Entries for the output of forestry activities are listed in the table below (Table 5.4) as an extract from EFA Table B1 Economic aggregates of the forestry and logging industry. They are expressed in monetary values that represent the total final output of the forestry sector. The ***output*** is to be valued at basic prices, defined as *the price receivable by the producers from the purchaser for a unit of good or service produced as output minus any tax (i.e., taxes on products) payable on that unit as a consequence of its production or sale, plus any subsidy (i.e., subsidies on products) receivable on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. It also excludes holding gains and losses on financial and non-financial assets* (ESA 2010, 3.44).

Table 5.4

Entries for output from EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

1	Total output (at basic prices) [P.1]
1.0	Of which output for own final use [P.12]
1.1	Goods characteristic of the forestry and logging activity
1.1.1	Trees, tree plants and forest tree seeds
1.1.1.1	Live forest tree plants (02.10.11) and tree seeds (02.10.12)
1.1.1.2	Forest trees (02.10.30)
1.1.2	Wood in the rough (02.20.1)
1.1.2.1	Logs
1.1.2.2	Fuel wood (02.20.14 and 02.20.15)
1.1.4	Non-wood products (02.30)
1.2	Services characteristic of the forestry and logging activity
1.3	Other products from connected secondary activities in the local KAU
1.4	Other products

5.41 The **total output** (code 1) from forestry and logging activities can be broken down in two ways. First, by type of output, i.e. whether the output is for own final use, whether it is market or non-market output and whether the output is by the household sector. This breakdown is presented in EFA Table B2 Output of forest and logging industry by type, which is discussed further in Section 5.2.9. Note, that the entry in EFA Table B1, Economic aggregates of the forestry and logging industry, for output for own final use (code 1.0, ESA code P.12) is equal to the same entry in EFA Table B2 Output of the forest and logging industry by type.

5.42 Second, total output can be broken down by type of product. The different products are described in the following paragraphs.

5.43 **Goods characteristic of the forestry and logging activity** (code 1.1) include a range of items listed across codes 1.1.1 through to 1.1.4. Trees, tree plants and forest tree seeds (1.1.1) include a new category of live forest tree plants and tree seeds (1.1.1.1), introduced by the CPA 2008 and included in the corresponding CPC 2008 category as "Live plants; bulbs, tubers and roots; cuttings and slips; mushroom spawn" (Eurostat, 2021; CPA 2008 – CPC Version 2 Correspondence Table).

5.44 **Forest trees** (1.1.1.2) constitute the most significant part of the output in forestry and logging industry. The product ***forest trees*** *is measured as the net increment of timber in cultivated forests* (Regulation (EU) 691/2011). As noted above, the measurement of net increment ensures that in measuring output, cultivated timber is recorded as being produced continuously over the entire period of production (as work-in-progress), and not only when it is harvested (ESA 2010, 3.54). Non-cultivated timber is recorded only when it is removed (Eurostat, 2021) and is therefore not recorded under the item Forest trees (1.1.1.2), but under the item Wood in the rough (1.1.2).

5.45 The value of net increment is typically estimated using stumpage prices for standing timber, which is the value of, or price paid for, timber as it stands uncut in the woods. Stumpage prices should be established based on different categories of standing timber, such as: (1) age classes, (2) species, (3) locations, and (4) uses of standing timber (IEEAF, 2002, 3.130). Chapter 4 provides a longer discussion on the estimation of stumpage prices in the context of valuing the stock of timber resources.

5.46 In a number of production contexts, the value of the net increment (often when trees are mature and about to be harvested) is revealed through sales of standing timber where a unit that undertakes solely forestry activity, sells standing (i.e. unharvested) timber to a separate unit who takes ownership of the timber and subsequently undertakes logging activity. Such sales of standing timber relate directly to the product forest trees and hence should be included in the measure of output of forest trees. As for the recording of net increment, sales of standing timber as an output of the forestry unit are immediately offset in the recording of intermediate consumption of forest trees by the logging unit. Thus, for NACE 02 as a whole, there is no impact on the total value added. Note also that this transaction in standing timber leads to no change in the total volume of the timber stock and no change in the inventories of forest trees are required. Ideally, this component of the value of output of forest trees should be estimated separately from the net increment.

5.47 ***Wood in the rough*** *(1.1.2) (or roundwood), including sales of timber from uncultivated forests, comprises the following items (a) fuel wood and (b) logs* (Regulation (EU) 691/2011). It includes all wood obtained from removals from forests and other wooded land in both cultivated and natural production contexts. It includes wood from planned harvesting operations and wood recovered from incidental fellings. It does not include the felled wood left in forests in the form of felling residues. Measures of wood in the rough for a single year

must adjust for changes in inventories at the beginning and end of the year. These inventories will largely comprise unsold wood in the rough stored at the forest roadside. Wood in the rough production acts as an interface between the forestry and the wood processing sector: it provides income for forest owners, serves as a resource for the wood processing sector and its added value, and contributes to the economy, especially in rural areas (Forest Europe, 2020).

5.48 Output of wood in the rough is recorded in EFA Table B1 Economic aggregates of the forestry and logging industry, when it is produced by KAUs with a principal activity in the forestry and logging industry. If KAUs with a principal activity in other industries carry out this production (i.e., agriculture, pulp production, etc.), then the output of wood in the rough is reported in EFA Table B3 Monetary supply of wood in the rough (Eurostat, 2021).

5.49 In valuing the output of wood in the rough, roadside pickup prices should be used. Roadside pickup prices, also referred to as the wood in the rough or raw wood prices, is the price paid for the logged timber at the roadside, ready for subsequent transport and processing. The roadside pickup price is not always invoiced, as timber is frequently sold standing and the purchaser takes control of the felling and transport of timber to the roadside. In these cases, the price used should include the agreed price plus the price for felling and delivery to the roadside, as these supplementary services, irrespective of the provider, are considered forestry services (EEA/EAF 97, 2.31.7; IEEAF, 2002, 3.129).

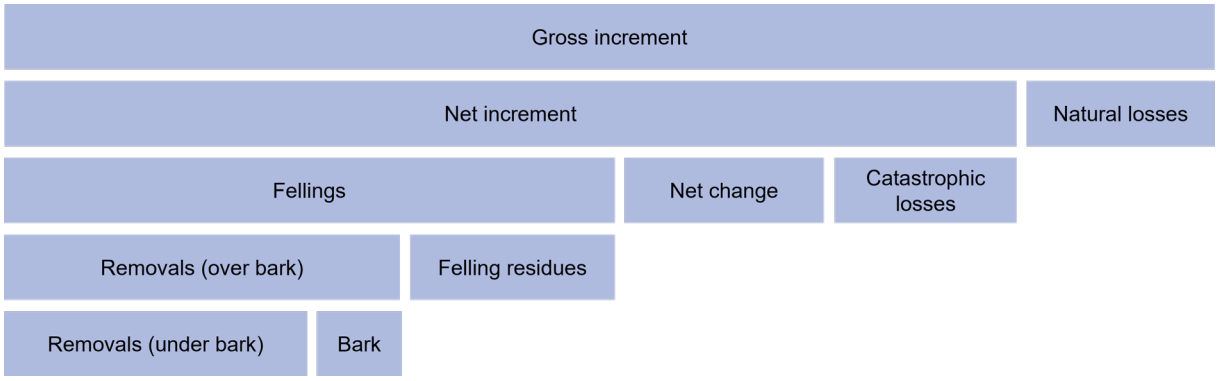
5.50 As noted above, wood in the rough comprises (a) **logs** (1.1.2.1) and (b) **fuel wood** (1.1.2.2). ***Logs*** *are industrial roundwood, used for further processing. It is the sum of logs of coniferous wood (product 02.20.11), logs of non-coniferous wood except tropical wood (product 02.20.12), and logs of tropical wood (product 02.20.13)* (Regulation (EU) 691/2011). Logs can be further classified according to their level of transformation as basic, primary, or secondary products. These breakdowns are not recorded in the EFA. For further information on these products see JFSQ for relevant definitions and other details.

5.51 ***Fuel wood*** *comprises wood intended to be used for energy purposes either directly or indirectly, in logs, billets, twigs, faggots, or similar forms* (Eurostat, 2021, based on CPA 2008 – CPC Version 2 Correspondence Table). Fuel wood uses include cooking, heating, and power production. It includes wood harvested from main stems, branches and other parts of trees (where these are harvested for fuel), round or split, and wood that will be used for the production of charcoal (e.g. in pit kilns and portable ovens), wood pellets.

5.52 Figure 5.1 illustrates the relationships among the production measures of forestry and logging activity. Note that the figure does not take into consideration the effects of changes in inventories of wood in the rough which, in any given accounting period, will affect the relationship between removals and fellings.

Figure 5.1

The sequence of timber flows



Source: Adapted from SEEA AFF (2020) (based on Päivinen et al (1999)).

5.53 ***Non-wood products*** *(1.1.4) incorporate a range of products listed under the CPA code 02.3 / 02.30 "wild growing non-wood products".* NACE Rev. 2 provides an additional level of detail to the grouping of products, distinguishing between **gathering (i.e., extraction)** and **growing (i.e., production)** activities. Because of this distinction, the product range included in NACE is more diverse than the one presented by the CPA and should be used as the basis for measurement. The description of NACE group 02.3 and its products is following:

> 02.3 Gathering of wild growing non-wood products
>
> 02.30 Gathering of wild growing non-wood products
>
> This class includes:
>
> – gathering of wild growing materials:
>
> ○ mushrooms, truffles
>
> ○ berries
>
> ○ nuts
>
> ○ balata and other rubber-like gums
>
> ○ cork
>
> ○ lac and resins
>
> ○ balsams
>
> ○ vegetable hair

- eelgrass
- acorns, horse chestnuts
- mosses and lichens

This class excludes:

- managed production of any of these products (except growing of cork trees), see division 01
- growing of mushrooms or truffles, see 01.13
- growing of berries or nuts, see 01.25
- gathering of firewood, see 02.20
- production of wood chips, see 16.10

5.54 As such, NACE group 02.3 includes the **gathering** of mushrooms, truffles, berries, and nuts (corresponds to CPA code 02.30.4 wild growing edible products), but excludes the **growing** of the same products, which instead are recorded as products of agriculture (NACE 01), under the group 01.13 and 01.25 (corresponds to CPA code 01.13.8 mushrooms and truffles, and 01.25 other tree and bush fruits and nuts, without the reference towards the growing activity). The value of the whole harvest, whether marketed or for own final use, should be recorded, and the wholesale price paid to pickers is the preferred method for both (IEEAF, 2002, 4.174-4.177).

5.55 ***Services characteristic of the forestry and logging activity*** *(1.2) include forest trees nursery services, support services to forestry, and any other services provided by a KAU of the forestry industry* (Regulation (EU) 691/2011). This includes services related to planting and thinning, forest inventories, fire protection, and logging (e.g., felling, debarking, and skidding) supplied as products. Transportation of timber from the forest to the roadside, or to timber storage, if it is a separate service provided by a KAU specialised in logging, is recorded in the support services to forestry (Eurostat, 2021). Equally, the same services are recorded as intermediate consumption of the users of these services. Note, that only supply of these services from a KAU with a principal activity in the forestry and logging activity is recorded here (Eurostat, 2021). To ensure a complete coverage of output, non-market output may be included here, e.g. in relation to fire prevention services, but only in cases where the output is produced by a KAU coded to NACE 02 (See Section 5.2.9 for a longer discussion on recording non-market output.).

5.56 The ownership of the cultivated forest is not relevant for reporting in EFA Table B1 Economic aggregates of the forestry and logging industry. It is relevant however to know if the KAU that cultivates the forest, has forestry activity as the only or the principal activity. If this is the case, the “natural” growth of the trees will be included in EFA Table B1. Other secondary activities in this unit are included in EFA Table B1, in the row “Other products from connected

secondary activities in the local KAU". However, if forestry is not the principal activity of the local KAU, the output should be included in EFA Table B3 Monetary supply of wood in the rough by all industries, in the column "Other industries, if any" (51.1) (Eurostat, 2021).

5.57 **Other products from connected secondary activities in the local KAU** (1.3) produced by the forestry and logging industry include the following products (note that non-market output may be recorded under this product in line with the advice in Section 5.2.9):

- the growing of mushrooms and truffles (CPA 01.13.8), and other berries and fruit of genus vaccinium n.e.c. (CPA 01.25.19)
- the production of natural rubber (CPA 01.29.10)
- the production of other wood in the rough including split poles and pickets (CPA 16.10.39)
- the production of wood charcoal (CPA 20.14.72)
- the supply of nature reserve services including wildlife preservation services (CPA 91.04.12)

5.58 **Other products** (1.4) produced by the forestry and logging industry include any other products produced by KAU classified to NACE 02 other than those listed above. Examples include the production of peat.

5.59 In many cases it will not be possible to meaningfully distinguish between products coded to either 1.3 or 1.4. Consequently, reporting for the legal module only requires an aggregate value to be reported.

5.2.4. Intermediate consumption and related entries

5.60 ***Total intermediate consumption*** *(2) is defined* as *goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services are either transformed or used up by the production process* (ESA 2010, 3.88). While the time of recording of the output of forestry and logging differs between cultivated and natural production process, intermediate consumption is always recorded in the accounting period in which it takes place. It is expected that with cultivated production there will be ongoing intermediate consumption related to activities, such as thinning, that take place as the trees grow. With natural production there should be little intermediate consumption until the time of harvest.

Table 5.5

Entries for Intermediate consumption from EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

2	Total intermediate consumption [P.2]
2.1	Goods input
2.1.1	Trees, tree plants and forest tree seeds
2.1.2	Energy, lubricants
2.1.3	Fertilisers and soil improvers
2.1.4	Plant protection products and pesticides
2.2	Services input
2.2.1	Services characteristic of the forestry and logging activity
2.2.2	Regular maintenance and repair of equipment
2.2.3	Maintenance of buildings
2.2.4	Financial services (FISIM) [P.119]
2.3	Other goods and services used as inputs

5.61 As shown in Table 5.5, intermediate consumption includes goods such as trees, tree plants and forest tree seeds (2.1.1), energy and lubricants (2.1.2) (including electricity, motor spirit (gasoline), natural gas in liquified or gaseous state, lubricating petroleum oils and heavy preparations n.e.c. and other similar products), fertilizers and soil improvers (2.1.3) and plant protection products and pesticides (2.1.4), services including services characteristic of forestry and logging industry (2.2.1), regular maintenance and repair of equipment (2.2.2), maintenance of buildings (2.2.3) and financial services (FISIM, 2.2.4, ESA code P.119) and other goods and services used as inputs (2.3) but not accounted for in any of the variables of intermediate consumption such as materials, small tools and rental costs of fixed assets (e.g., an operational leasing of machines, cars, software). (Regulation (EU) 691/2011; EFA questionnaire).

5.62 Special note is made concerning the intermediate consumption of trees, tree plants and forest tree seeds (2.1.1). As described in sections 5.2.2 and 5.2.3 above, a complete recording of output and intermediate consumption for NACE 02 requires that the total output of forest trees by the forestry activity, comprising net increment and sales of standing timber, is appropriately recorded as the intermediate consumption of the logging activity. The timing of recording is the critical issue. Measures of sales of standing timber should be recorded as both output and intermediate consumption in the accounting period in which the transaction takes place. As described above, measures of net increment are recorded progressively as the timber stock grows. The associated measures of intermediate

consumption should be recorded in the period in which the removals occur. The intermediate consumption should be valued using the stumpage price consistent with the valuation of changes in the value of work in progress.

5.63 All of the other products used for intermediate consumption should be recorded and valued at the purchasers' prices for similar goods and services at the time of their insertion into the production process (ESA 2010, 3.91), i.e., at the time they are actually consumed and not when they are purchased or taken to storage (EEA/EAF, 1997) and should be reported in million national currency. The price includes taxes less subsidies on products (but excluding deductible taxes like VAT on the products).

5.64 Intermediate consumption excludes payments for licences for using natural resources (e.g., land) that are treated and recorded later in the questionnaire as rents (i.e., as a payment of property income) (ESA 2010; Eurostat, 2021). Also excluded from intermediate consumption is net property income payable – i.e. property income payable less property income receivable. Property income receivable is all income received by forestry and logging producers as interest, distributed dividends and other income of corporations, reinvested earnings on foreign direct investment, other investment earnings and rent from land or subsoil assets. Property income payable is all income paid by forestry and logging producers as interest on loans (taken out in connection with their economic activity) and rent paid on land or subsoil assets (ESA 2010; Eurostat, 2021)

5.2.5. Value added and related entries

Table 5.6

Entries for Value Added from EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

3	Gross value added (at basic prices) [B.1g]
3.1	Consumption of fixed capital [P.51c]
3.2	**Net value added (at basic prices) [B.1n]**
3.2.1	Other taxes on production [D.29]
3.2.2	Other subsidies on production [D.39]

5.65 ***Value Added (VA)*** is a key item to measure the economic contribution of each individual producer, sector, or industry within the country to total economic activity measured using gross domestic product (GDP). Value added is the balancing item of the production account, i.e., the difference between the value of output and the value of intermediate consumption. Value added can be measured on a **gross** or a **net** basis. ***Gross value added (GVA)*** *(ESA code B.1g) is defined as output valued at basic prices less intermediate consumption valued*

at purchasers' prices (ESA 2010, 9.31). ***Net value added (NVA)*** *(ESA code B.1n)* is equal to GVA less consumption of fixed capital (ESA 2010, 3.145).

5.66 ***Consumption of fixed*** **capital** (3.1; ESA code P.51c) i*s the decline in value of fixed assets owned, as a result of normal wear and tear and obsolescence.* The estimate of decline in value includes a provision for losses of fixed assets as a result of accidental damage which can be insured against. Consumption of fixed capital covers anticipated terminal costs. Such terminal costs are recorded as consumption of fixed capital at the end of the service life, when the terminal costs are recorded as gross fixed capital formation (ESA 2010, 3.139). Consumption of fixed capital is calculated for all fixed assets, including major improvements to land, and costs of ownership transfers associated with non-produced assets, including land. Conceptually, consumption of fixed capital is estimated on the basis of the value of the stock of fixed assets and the expected average economic life of the different categories of those goods (ESA 2010, 3.140-3.141). In practice, a range of assumptions are applied to estimate consumption of fixed capital as explained in Section 5.4.

5.67 ***Other taxes on production*** *(3.2.1.; ESA code D.29) consist of all taxes that enterprises incur as a result of engaging in production, independent of the quantity or value of the goods and services produced or sold.* These may be payable on the land, fixed assets or labour employed in the production process or on certain activities or transactions (ESA 2010, 4.22). ***Other subsidies on production*** *(3.2.2.; ESA code D.39) consist of subsidies except subsidies on products which resident producer units may receive as a consequence of engaging in production* (ESA 2010, 4.36). Taxes and subsidies on production are recorded at the time when the activities, transactions or other events giving rise to a fiscal obligation take place. Similarly, subsidies are recorded at the time when the transaction or other event (production, sale, import etc.) to which they relate takes place.

5.2.6. Factor incomes and related entries

Table 5.7

Entries for Factor income from EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

4	Factor income
4.1	Compensation of employees [D.1]
5	**Net operating surplus [B.2n] and Mixed income [B.3n]**
5.1	Net property income [D.4] (10)
5.2	**Net entrepreneurial income [B.4n]**

5.68 In general terms, value added represents both the additional value generated by an economic unit (output less intermediate consumption) and the total returns to the two factors of production – i.e. labour and capital. The returns to labour are measured in the accounts as compensation of employees and the returns to capital as operating surplus. Thus, factor income of forest enterprises measures the remuneration of all factors of production (land, capital, labour) generated by forestry activities. It represents the value generated by an economic unit engaged in forest production activities (Forest Europe, 2020). The following paragraphs give more precision to the national accounting entries and calculations.

5.69 ***Total factor income*** *(4) (also known as value added at factor cost) is equal to value added less other taxes on production plus other subsidies on production.* ***Compensation of employees*** *(4.1; ESA code D.1) is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during an accounting period.* The employee compensation is made up of gross wages and salaries, and employers' social contributions (actual and imputed pension and non-pension contributions) (ESA 2010, 4.02).

5.70 ***Net operating surplus*** *(5; ESA code B.2n)* ***and mixed income*** *(5; ESA code B.3n) measure the return from capital, including produced assets and land, and non-salaried labour.* It is derived as total factor income (net of consumption of fixed capital) less compensation of employees. The distinction between operating surplus and mixed income concerns the institutional sector of the economic units involved in production. If the economic unit is classified as a corporation (private or public) the return to capital is recorded as operating surplus. If the economic unit is classified as unincorporated (and hence included in the household sector), the return to capital is recorded as mixed income since it includes both a return to capital and a return to the owners of the economic unit who provide inputs of labour that are not fully reflected in measures of compensation of employees.

5.71 ***Property income*** *(5.1; ESA code D.4) accrues when the owners of financial assets and natural resources put them at the disposal of other institutional units.* The income payable for the use of financial assets is called investment income, while that payable for the use of a natural resource is called rent. Property income is the sum of investment income and rent (ESA 2010, 4.41). Net property income is the difference between property income receivable and property income payable by units classified to forestry.

5.72 ***Entrepreneurial income*** *(5.2; ESA code B.4n) is calculated by deducting from operating surplus any interest, investment income disbursements and rent payable and adding property incomes receivable but before the payment of dividends, the withdrawals of income from quasi-corporations and reinvested earnings* (SNA 2008, 7.23). Entrepreneurial income will not be equal to operating surplus less net property income due to the fact that the payment of dividends is not deducted. Entrepreneurial incomes can only be calculated for corporations rather than industries as a whole, but it can generally be evaluated for the forestry industry as it is possible to determine the part of interest and rents linked exclusively to forestry activity.

5.2.7. Gross fixed capital formation and other capital related entries

5.73 In general terms, capital formation concerns the accounting entries about the investments in stocks of produced assets held and used by producers as part of production processes. At the highest level, gross capital formation is separated into two types – (i) gross fixed capital formation and (ii) changes in inventories. Each of these types of capital formation are examined in turn.

Table 5.8

Entries for capital formation from EFA Table B1 – Economic aggregates of the forestry and logging industry, in million national currency

6	Gross fixed capital formation (excluding deductible VAT) [P.51g]
6.1	Buildings, structures and land improvements
6.2	Machinery and equipment
6.3	Plant resources yielding repeat products
6.4	Other GFCF
7	**Net fixed capital formation (excluding deductible VAT) [P.51n]**
8	**Changes in inventories [P.52]**
8.1	Work-in-progress on cultivated biological assets [AN.1221] (11)
8.2	Other changes in inventories
9	**Capital transfers (net) [D.9]**

5.74 ***Gross fixed capital formation (GFCF)*** *(6; ESA code P.51g) consists of resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are produced assets used in production for more than one year* (ESA 2010, 3.124). GFCF represents the difference between investments and disposals of fixed assets. Investments include new or existing fixed assets: purchased, acquired through barter, or received as capital transfers in kind; fixed assets produced and retained for producers' own use, including own account production of fixed assets not yet completed or fully matured. Disposals include existing fixed assets sold, surrendered in barter, or surrendered as capital transfers in kind) (ESA 2010, 3.125). GFCF is generally measured in relation to specific types of fixed assets.

5.75 In the forestry and logging industry, the primary types of GFCF include buildings and structures, major improvements to land, machinery and equipment, and plant resources (cultivated biological resources) yielding repeat products. Other types of fixed assets may include costs of ownership transfer on non-produced assets (land, contracts, and leases)

and research and development (ESA 2010, 3.127). GFCF excludes transactions included in intermediate consumption, transactions recorded as changes in inventories (e.g. trees grown for timber which are recorded as work-in-progress), and catastrophic losses of fixed assets (e.g. destruction of cultivated biological resources due to outbreaks of disease not normally covered by insurance, or damage due to abnormal flooding, wind damage or forest fires) (ESA 2010, 3.130).

5.76 GFCF is valued at purchasers' prices including installation charges and other costs of ownership transfer. When produced on own account, it is valued at the basic prices of similar fixed assets, and if such prices are unavailable, at the costs of production plus a mark-up (except for non-market producers) for net operating surplus or mixed income (ESA 2010, 3.135). GFCF is recorded when the ownership of the fixed assets is transferred to the institutional unit that intends to use them in production, with two exceptions: (1) assets acquired through financial leasing are recorded as if the user became the owner when the goods became available to him for use; (2) own-account GFCF is recorded at the time of production of the assets concerned (ESA 2010, 3,134).

5.77 ***Plant resources yielding repeat products*** *(6.3; ESA code AN.1152) are cultivated biological resources, whose natural growth and regeneration are under the direct control, responsibility, and management of institutional units* (SNA 2008, 10.88). Plant resources yielding repeat products include trees (including vines and shrubs) cultivated for fruits and nuts, for sap and resin and for bark and leaf products. Trees grown for timber that yield a finished product once only when they are ultimately felled are not fixed assets (SNA 2008, 10.95). They are recorded separately as part of work-in-progress. It is not expected that the forestry and logging industry will have a significant investment in plant resources yielding repeat products.

5.78 At the same time, there may be cases of GFCF of cultivated biological resources to be recorded for cork oak and forest trees for repeat production of fuel wood (e.g., eucalypt), as well as fruit trees and other trees typical of agriculture if carried out by KAU classified in NACE 02. When carried out for own use (i.e. by the economic unit who will subsequently harvest the repeat products), GFCF will include the increase in the value of the "plant resources yielding repeat products" up to their maturity, i.e., annual growth of the plant resources yielding repeat products up to the point when the plant reaches its highest potential with regard to the quantity or quality of the repeat products it yields. This will vary depending on the plant species, e.g., it differs between fruit trees, cork or eucalyptus trees. (Eurostat, 2021)

5.79 ***Changes in inventories*** *(8; ESA code P.52) arise for producers when (a) they complete production, but the goods remain unsold at the end of an accounting period – these inventories are referred to as finished products; or (b) the production process is incomplete at the end of the accounting period – these inventories are referred to as work-in-progress.* In both cases, the entry for changes in inventories is equal to the value of the inventories at the end of the period less the value of the inventories at the beginning of the period. Alternatively, the change in inventories can be derived as additions to inventories less

withdrawals from inventories less recurrent (natural) losses. Note, that adjustments may be needed for losses of timber stock due to catastrophic events (see below), these must be excluded from measures of changes in inventories as these are not considered recurrent (natural) losses.

5.80 For the forestry and logging industry, the most significant entry for changes in inventories concerns ***work-in-progress on cultivated biological assets*** *(8.1; ESA code AN.1221).* As described in the discussion on the measurement of the output of forestry (Section 5.2.2), in situations where the production process is considered cultivated, e.g. for plantation forests, production is recorded progressively as the stock of timber grows and, for each accounting period, an estimate of the work-in-progress of the timber stock is recorded. This estimate is used (a) as part of the measure of output; and (b) as part of the measure of changes in inventories. Note however that in measuring output only the net increment component (i.e. gross increment less natural losses) of work-in-progress is included – see Section 5.2.2. To measure the entry for work-in-progress, the net increment must be reduced to the extent of any withdrawals from the timber stock due to felling that occur during the period. Withdrawals from the timber stock will be equal to removals of wood in the rough plus felling residues.

5.81 As just noted, the measurement of the change in work-in-progress of forest trees must also account for some losses of the timber stock. Natural losses relate to the losses of the timber stock due to mortality from causes other than felling. They are considered recurrent losses and hence are deducted in measuring the change in work-in-progress. Catastrophic losses of the timber stock due to significant, extreme events, i.e. the volumes that are irretrievable, are considered exceptional and are excluded from measures of work-in-progress. Depending on the method used to derive measures of work-in-progress, catastrophic losses may need to be deducted. The volume of catastrophic losses is recorded in EFA Table A2a (see Chapter 4) as part of irretrievable losses. Note, that the closing stock of work-in-progress for a given accounting period must reflect a stock level that accounts for the effect of catastrophic losses.

5.82 The entry in EFA Table B1, Economic aggregates of the forestry and logging industry, for the work-in-progress on cultivated biological assets will be similar to but different from the entry in the monetary timber stock asset account (Chapter 4) since EFA Table B1 only includes timber stocks that are under the management of KAU that are classified to NACE 02.

5.83 Work-in-progress of cultivated biological assets will also arise in the context of tree nurseries. Thus, before the trees from such tree nurseries are sold, related expenditure and growth of the trees will be recorded under ‘work-in-progress on cultivated biological assets’ given that the main output of the producers are the immature trees (yet to be sold) (Eurostat, 2021).

5.84 ***Other changes in inventories*** *(8.2)* may relate to inventories of unsold wood in the rough (these changes in inventories are recorded most directly in the supply and use tables for

wood in the rough – see Chapter 6) or inventories of inputs to production such as fuel for machinery and vehicles, and fertilizer.

5.85 Estimates of changes in inventories for a given accounting period may be positive or negative since the value of inventories at the end of the period may be higher or lower than the value at the beginning of the period. However, the absolute value of inventories at the beginning or end of the period must be strictly non-negative.

5.86 ***Capital transfers*** *(9; ESA code D.9)* require the acquisition or disposal of an asset, by at least one of the parties to the transaction. Made in cash or in kind, they result in a commensurate change in the financial, or non-financial, assets shown in the balance sheets of one or both parties to the transaction (ESA 2010, 4.145).

5.2.8. Labour input and related entries

Table 5.9

Entries for labour input from EFA Table B1 – Economic aggregates of the forestry and logging industry, in thousands of annual working units

10	Total labour input [L] (in 1000 harmonized AWU)
	Total labour input in 1000 **national** AWU
	Number of working hours per year in national AWU
10.1	Of which self-employed (in 1000 **harmonized** AWU)
	Self-employed in 1000 **national** AWU
	Number of working hours per year in national AWU for self-employed

5.87 ***Labour inputs*** *(10; 10.1)* are classified on the basis of the same statistical units as used for the analysis of production, namely the local kind-of-activity unit and the institutional unit (ESA 2010, 11.03). The aggregates of the labour input figures are usually annual totals, for which average labour input during the year has to be used, and include allowances made for casual and seasonal work (ESA 2010, 11.04). Employment covers all persons engaged in productive activity that falls within the production boundary of the national accounts. They include both **employees** and **self-employed persons** (ESA 2010, 11.11).

5.88 Labour input is measured in **annual work units (AWU)**. AWU corresponds to the number of hours actually worked in a full-time job (i.e., work performed by one person who is occupied in a forestry and logging KAU on a full-time basis). Full-time equivalence in terms of AWU is the available proxy to estimate employment in the forestry and logging industry. Full-time means the minimum hours required by the relevant national provisions governing contracts of employment. To allow cross-country comparisons and the calculation of the EU

aggregate, EFA uses a harmonized AWU representing 1800 working hours, equivalent to 225 working days, per year (Eurostat, 2021), irrespective of the actual calendar year.

5.2.9. Output of the forest and logging industry by type

5.89 To support EFA Table B1 Economic aggregates of the forestry and logging industry, a separate table, EFA Table B2 is provided to record selected data on the output of the forest and logging industry by type of output. The data are to be recorded in million national currency. EFA Table B2 supports EFA Table B1 by separating the "commercial" or marketed part of the output which in turn facilitates the measurement of output, especially where different prices are applied by type of output. (ESA 2010). The entry for total output (at basic prices) is equivalent to the entry recorded in EFA Table B1. Note, that EFA Table B2 also only include KAUs that are classified to NACE 02.

Table 5.10

EFA Table B2 – Output of the forest and logging industry by type, in million national currency

	Economic aggregates (current transactions)	31	32	33	99	41
Code	Description	Own final use [P.12]	Market	Non-market	Total	*of which:* Households [S.14]
2	Output (at basic prices) [P.1]					

Note: Entries in dark grey cells (own final use and total) are mandatory items for reporting. Entries in white cells are voluntary items for reporting.
Source: EFA Questionnaire.

5.90 In the left part of EFA Table B2, i.e. columns 31, 32 and 33, the total output, as recorded in EFA Table B1 Economic aggregates of the forestry and logging industry, is distributed according to its type:

a. ***Output for own final use*** *(ESA code P.12) covers the total value of goods and services that are retained either for final consumption or for gross fixed capital formation by the same institutional unit* (ESA 2010, 3.20). In the forestry context, it applies, for example, to wood in the rough removed for own final use (e.g., fuel wood), or gathering of non-wood products by households.

b. ***Market output*** *(ESA code P.11) covers in particular the total value of the changes in inventories of finished products and work-in-progress intended for sale at economically significant prices (including natural growth of vegetable products)*.

c. ***Non-market output*** *(ESA code P.13) refers exclusively to services, including protection of forest against fires and recreational services* (Eurostat, 2021, referring to ESA 2010). Since non-market output must be produced by general government (or NPISH) units, an entry for non-market output in EFA Table B2 will only arise when a KAU that is coded to NACE 02 is a general government unit. It is more common that this type of output is undertaken by general government units coded to other industries. In these cases, estimates for non-market output (implicitly involving the creation of a separate KAU) should be made when the level of activity is considered significant and relevant to understanding activity within the forestry and logging industry. As necessary, a reconciliation to national accounts estimates to explain any difference in treatment should be made.

5.91 In the right part of EFA Table B2, i.e. column 41, the total output attributable to the activity of the **household** sector (ESA code S.14), including output by unincorporated enterprises and output produced for own-final use, is recorded.

5.3. Data sources

5.92 The compilation of estimates to complete EFA Table B1 Economic aggregates of the forestry and logging industry, and EFA Table B2 Output of the forest and logging industry by type, will require inputs from a range of data sources. A common data source for many entries may be the national accounts. The use of national accounts data as a core input to the table is highly recommended as it ensures that the estimates of economic activity presented in EFA Table B1 and B2 have coherence with estimates of economic activity for other industries and hence the economic contribution of forestry and logging can be reliably estimated.

5.93 At the same time, many of the entries in EFA Table B1 and B2 may not be readily available from national accounts systems, which tend to focus on higher level industry level aggregates, as distinct from the detailed product level entries required in some parts of the table. As a result, and in order to maintain an internal coherence within the estimates in EFA Table B1 and B2, it is appropriate to consider the data sources and methods that underpin the compilation of national accounts estimates.

5.94 A related aspect of coherence is the maintenance of a strong relationship between estimates in monetary terms (as in EFA Table B1 Economic aggregates of the forestry and logging industry) and estimates in physical terms. Indeed, it may be common for some finer level monetary estimates to be derived based on combining separate data on quantities and prices. This coherence will be particularly relevant in completing the supply and use tables in monetary and physical terms as described in Chapter 6 – Supply and use tables for wood in the rough.

5.95 To provide an overview of relevant data sources, the table below provides an indication of the most relevant data sources for the various entries in EFA Table B1 Economic aggregates of the forestry and logging industry. The remainder of this section provides a short description of these different data sources.

Table 5.11

Relevant data sources for EFA Table B1 – Economic aggregates of the forestry and logging industry

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
Code	**Description**												
1	**Total output (at basic prices) [P.1]**	**X**	-	-	-	**X**	-	-	-	-	-	-	-
1.0	Of which output for own final use [P.12]	**X**	-	-	-	-	-	-	-	-	-	**X**	-
1.1	Goods characteristic of the forestry and logging activity	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-
1.1.1	Trees, tree plants and forest tree seeds	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-
1.1.1.1	Live forest tree plants (02.10.11) and tree seeds (02.10.12)	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-
1.1.1.2	Forest trees (02.10.30)	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-
1.1.2	Wood in the rough (02.20.1)	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-
1.1.2.1	Logs	-	**X**	**X**	**X**	-	**X**	**X**	-	-	-	-	-

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
1.1.2.2	Fuel wood (02.20.14 and 02.20.15)	-	X	X	X	-	X	X	-	-	-	-	-
1.1.4	Non-wood products (02.30)	-	X	X	X	-	X	X	-	-	-	X	-
1.2	Services characteristic of the forestry and logging activity	X	X	X	X	-	-	-	-	-	-	-	-
1.3	Other products from connected secondary activities in the local KAU	-	X	X	X	-	-	-	-	-	-	-	-
1.4	Other products	-	X	X	X	-	-	-	-	-	-	-	-
2	**Total intermediate consumption [P.2]**	X	-	-	X	-	-	-	-	-	-	-	-
2.1	Goods input	-	-	X	X	-	-	-	-	-	-	-	-
2.1.1	Trees, tree plants and forest tree seeds	-	-	X	X	-	-	-	-	-	-	-	-
2.1.2	Energy, lubricants	-	-	X	X	-	-	-	-	-	-	-	-
2.1.3	Fertilisers and soil improvers	-	-	X	X	-	-	-	-	-	-	-	-
2.1.4	Plant protection products and pesticides	-	-	X	X	-	-	-	-	-	-	-	-

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
2.2	Services input	-	-	X	X	-	-	-	-	-	-	-	-
2.2.1	Services characteristic of the forestry and logging activity	-	-	X	X	-	-	-	-	-	-	-	-
2.2.2	Regular maintenance and repair of equipment	-	-	X	X	-	-	-	-	-	-	-	-
2.2.3	Maintenance of buildings	-	-	X	X	-	-	-	-	-	-	-	-
2.2.4	Financial services (FISIM) [P.119]	-	-	X	-	-	-	-	-	-	X	-	-
2.3	Other goods and services used as inputs	-	X	X	X	-	-	-	-	-	-	-	-
3	**Gross value added (at basic prices) [B.1g]**	X	-	X	-	-	-	-	-	-	-	-	-
3.1	Consumption of fixed capital [P.51c]	X	-	X	-	-	-	-	-	-	-	-	-
3.2	**Net value added (at basic prices) [B.1n]**	X	-	X	-	-	-	-	-	-	-	-	-
3.2.1	Other taxes on production [D.29]	-	-	X	-	-	-	-	-	-	-	-	-
3.2.2	Other subsidies on production [D.39]	-	-	X	-	-	-	-	-	-	-	-	-

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
4	**Factor income**	X	-	-	-	-	-	-	X	-	-	-	-
4.1	Compensation of employees [D.1]	X	X	X	X	-	-	-	-	-	-	-	X
5	**Net operating surplus [B.2n] and Mixed income [B.3n]**	X	-	X	-	-	-	-	X	-	-	-	-
5.1	Net property income [D.4]	X	-	-	-	-	-	-	X	X	X	-	-
5.2	Net entrepreneurial income [B.4n]	X	-	-	-	X	-	-	X	-	-	-	-
6	**Gross fixed capital formation (excluding deductible VAT) [P.51g]**	X	X	-	X	X	-	-	-	-	-	-	-
6.1	Buildings, structures and land improvements	X	X	-	X	-	-	-	-	-	-	-	-
6.2	Machinery and equipment	X	X	-	X	-	-	-	-	-	-	-	-
6.3	Plant resources yielding repeat products	X	X	-	X	-	-	-	-	-	-	-	-
6.4	Other GFCF	X	X	-	X	-	-	-	-	-	-	-	-

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
7	**Net fixed capital formation (excluding deductible VAT) [P.51n]**	**X**	-	-	-	-	-	-	-	-	-	-	-
8	**Changes in inventories [P.52]**	**X**	-	-	-	-	-	-	-	-	-	-	-
8.1	Work-in-progress on cultivated biological assets [AN.1221]	**X**	-	**X**	-	-	-	-	-	-	-	-	-
8.2	Other changes in inventories	-	**X**	**X**	-	-	-	-	-	-	-	-	-
9	**Capital transfers (net) [D.9]**	**X**	-	-	-	-	-	-	-	-	-	-	-
10	**Total labour input** [L] **(in 1000 harmonized AWU)**	-	-	-	**X**	-	-	-	-	-	-	**X**	**X**
	Total labour input in 1000 **national** AWU	-	-	-	**X**	-	-	-	-	-	-	**X**	**X**
	Number of working hours per year in national AWU	-	-	-	**X**	-	-	-	-	-	-	**X**	**X**
10.1	Of which self-employed (in 1000 harmonized AWU)	-	-	-	-	-	-	-	-	-	-	**X**	**X**

	Products and economic aggregates (current transactions)	National accounts	Business surveys	Input-output / Supply use tables	Forestry surveys	Forestry annual reports	Forestry production statistics	Forestry price statistics	Business register	Government finance statistics	Finance statistics	Household surveys	Labour force surveys
	Self-employed in 1000 **national** AWU	-	-	-	-	-	-	-	-	-	-	X	X
	Number of working hours per year in national AWU for self-employed	-	-	-	-	-	-	-	-	-	-	X	X

5.96 **National accounts data:** Data from the national accounts will be a primary source for the completion of EFA Tables B1 and B2. Generally, national accounts data sets will provide a reasonable level of detail on the activities of different industries including production, intermediate consumption, compensation of employees, operating surplus and capital formation. Importantly, the data for any given industry is compiled in the context of an economy-wide estimation process and hence the use of national accounts data for the EFA ensures that the data available for describing forestry and logging activities is coherent with that for other industries.

5.97 National accounts data will also provide data on other flows associated with economic activity including interest, transfers, taxes, and subsidies. However, usually such data are not available at a more aggregated economy wide level or for individual institutional sectors such as households and non-financial corporations. Consequently, while the national accounts data set will provide a useful starting point for determining the relevant flows attributable to forestry and logging in these cases, the data set may not provide direct measures required to compile EFA Tables B1 and B2. As well differences in measurement approach may need to be taken into account in using national accounts data for EFA compilation purposes. This is considered further in Section 5.4 below and Annex 5A

5.98 The compilation of national accounts involves the integration of data from a wide range of sources including business surveys, trade data, administrative and tax data, industrial production and prices data, household surveys, labour force surveys, among many other sources. In that respect, it is likely that many of the sources described here are used in some way to underpin the compilation of the national accounts.

5.99 **Supply and use tables / Input-output tables:** Data from supply and use tables (SUT) and input-output tables (IOT) will provide important complementary data to the national accounts data. In most European countries, best practice in the compilation of GDP and associated measures in the national accounts, involves benchmarking to annual SUT and hence using SUT/IOT as a principal data source can provide both coherent and more detailed input data for EFA.

5.100 In essence, SUT and IOT are matrices which show the intersection between the supply of different products by different industries and the use of different products by different industries. Thus, among other things, an SUT or IOT provides for each economic activity estimates of all of the products it produces and all of the products that it uses to undertake that production.

5.101 SUT and IOT can be compiled at different levels of industry and product detail. A generally accepted level of industry detail for national accounts data is 38 divisions, whereas for SUT it would be expected to be at least 64 divisions and commonly more. The degree of detail will depend on the structure of the economy within a country and the availability of resources to collect and process the relevant input data. From the perspective of forestry and logging activities, while EFA Tables B1 and B2 only require data at the NACE Division level (i.e. for all forestry and logging KAUs), it will likely be beneficial to compile data at the NACE Group

level, in particular to help identify the level of output product detail reflected in EFA Table B1 Economic aggregates of the forestry and logging industry. However, such detail is unlikely to be available in national accounts data sets and also may not be available in SUT and IOT data sets.

5.102 **Business surveys:** Data from business surveys are compiled annually and quarterly from surveys conducted across multiple industries. Generally, these surveys will provide inputs to the national accounts but tend to also collect additional details on types of inputs to production and other costs that are relatively common across industries. The surveys are sent to business units and hence generally reflect the information available in financial accounting systems. Since business surveys are usually conducted across multiple industries, the sample sizes may not be large enough and hence the estimates for individual industries, especially small industries, may have high standard errors.

5.103 **Forestry surveys, production statistics, price statistics and annual reports:** Data from surveys and other reporting related directly at forestry will be particularly relevant for ensuring an accurate coverage of key businesses and activities. While these data will not have the benefit of being compiled in a manner that allows for confrontation against data from other industries and other sources (e.g. trade data), because they focus directly on forestry activity there will likely be relevant information to support compilation of EFA accounts. In particular, in order to develop measures of output by product type as required for EFA Table B1 Economic aggregates of the forestry and logging industry, these data sources can be used to derive detailed product specific measures (for example by multiplying production quantity data by relevant prices) and these measures can be used to apportion the aggregate national accounts output number.

5.104 In some countries, these and other forestry specific data sources are used to compile datasets using the framework of the Forest Accountancy Data Network. Data from this framework can often be used as a direct input for compilation of many entries across EFA Table B1.

5.105 Depending on the specific source, a difficulty in applying these data may be that the definition and measurement coverage of the economic units providing the information may not align directly to the NACE KAU requirements. For this reason, care should be taken to ensure that the units within scope of any of these sources are well documented.

5.106 **Business register statistics:** Data from business register statistics will be critical to ensuring appropriate and consistent coverage of data pertaining to the specific scope of EFA Tables B1 and B2, namely NACE 02 KAU. Business registers provide a complete listing of all resident economic units and generally include information on the industry class, the institutional sector and size of the economic unit. Business registers are commonly used to underpin the design and implementation of business surveys which in turn are used as key inputs to the national accounts. High levels of coherence can be obtained through ensuring that the set of economic units within the NACE Division 02, is consistently applied (or adjusted for) across different data sources, providing that there is good maintenance and

assessment of the quality of the register with respect to that division. For example, considering whether all significant units are included.

5.107 **Government finance statistics (GFS):** Data from GFS present information on government transactions of all types including expenditures, taxes and other revenues, transfer payments including subsidies, interest, capital formation, etc. The data sources from financial accounts are maintained by all government agencies. Where forestry and logging activity involves government units, including public non-financial corporations, GFS may provide a direct source of data to support compilation of EFA Table B1 Economic aggregates of the forestry and logging industry. GFS measurement standards are closely aligned with those of the national accounts, although at the level of individual activities (i.e. for forestry and logging) it would be appropriate to engage both GFS experts and national accounts experts to ensure data are well understood. More broadly, GFS data will provide the core source information for measures of taxes, royalties (including resource rents), subsidies and capital transfers as required for the completion of EFA Table B1. Also, there may be individual administrative data sets, such as concerning value-added tax, which both provide inputs to GFS and on their own can provide relevant information.

5.108 **Financial accounts and statistics:** Data from financial accounts and statistics provide information on the balances and transactions in different financial assets and liabilities (loans, deposits, debt securities, etc) with a focus on collecting data from financial institutions (banks, insurance companies, etc). This information, together with counter-party information collected from financial institutions, is the common basis for accounting for flows of interest.

5.109 **Household surveys:** Data from household surveys can be used to provide input to the measurement of a range of variables including household consumption, compensation of employees and other income sources. In the context of forestry and logging activity, these surveys may be relevant in understanding the number of people involved in this activity and the extent of income generated through those involved. A particular type of household survey are labour force surveys which can provide measurement of labour input. Another type of household survey are time use surveys which may be able to provide input to support measurement of household gathering of non-wood forest products.

5.4. Summary of methods

5.110 This section describes the key points and measurement challenges in estimating the entries in EFA Tables B1 and B2. As a general methodological approach, it is recommended that compilers start from data sourced from the national accounts because (a) the entries in the EFA and the national accounts are conceptually aligned; and (b) it limits the potential for inconsistent recording of forestry's economic activity in similar statistical outputs. It is noted that the sequencing of EFA and national accounts compilation can vary across countries and hence the way in which the following steps are implemented should take into account

existing practices in a country. Whatever sequence is applied, close co-ordination in measurement is strongly encouraged.

5.111 From a starting point of directly inputting national accounts data, information from other sources can then be used to complement and supplement the national accounts data to provide a complete recording of EFA Tables B1 and B2. Within this broad approach the following steps are proposed for compiling EFA Table B1 Economic aggregates of the forestry and logging industry.

5.112 **Step 1: Enter key aggregate national accounts data.** Using national accounts data for forestry and logging activity (NACE 02) the following entries should be able to be made directly for EFA Table B1 Economic aggregates of the forestry and logging industry. It will be of high benefit to engage with national accounts compilers to understand their data sources and methods since it is possible that the published data represent an aggregate/combination of finer level detail which can be used in subsequent steps.

1. Total output
2. Total intermediate consumption
3. Gross value added

4.1 Compensation of employees

Depending on the methods used in the national accounts, adjustments to the measures of output and intermediate consumption may be required to align with the intended treatment of these entries described earlier in this section, particularly as it relates to measures of output and intermediate consumption. Annex 5A provides an overview of the methods used in compiling national accounts estimates for NACE 02 and describes the types of adjustment that may be required to align with the definitions and treatments applied in EFA. A general observation is that EFA compilers should work closely with their national accounts colleagues in developing estimates.

5.113 Overall, national accounts data should provide a strong basis for compiling these estimates but there are a number of potential limitations in terms of coverage and level of detail that will need to be considered. Where data from the national accounts are not sufficient, the advice described in step 2 (below) will provide an alternative starting point. Step 2 provides a more “bottom-up” approach to measurement. Whatever starting point is used a reconciliation between the data in EFA Table B1 and those data published in the national accounts for NACE 02 must be undertaken.

5.114 **Step 2: Estimate the output of forestry and logging by product type.** The estimates of the different products within total output can be made using a combination of the following data sources.

- Data directly from SUT/IOT by product where available (data for other products (1.4)

may be obtained as a residual)

- Data from underlying national accounts estimation processes
- Data from business surveys or forest surveys on the production/sales of forestry characteristic services, including tree nurseries, and connected secondary activities
- Data on production in physical terms of wood in the rough (split into logs and fuel wood) and multiplied by relevant prices
- Data on production of net increment of forest trees and multiplied by stumpage prices.

5.115 It will likely be required to combine data from different sources to ensure as complete a coverage of products as possible. The coverage issues are likely to emerge from (a) data sources not covering all products; and (b) data sources not covering all units (e.g. covering only public sector units). To avoid double counting across data sources, it is recommended to build a matrix that tabulates the different products with the different types of units and to record which data sources are being used for relevant cells.

5.116 Where there is no clear data source for a particular product it may be necessary to make more general assumption about the level of production based on, for example, the area of forests or the likely levels of final and intermediate consumption.

5.117 Where multiple data sources are used, the different estimates for the different products should be brought together and reconciled to the total output from Step 1. To support the integration of data from these multiple sources, it will be highly beneficial to obtain data from the business register to document the number, employment, sector and turnover of all economic units coded to NACE 02 and the associated groups. Further, it will likely be beneficial to undertake the compilation process for cultivated and natural production contexts separately such that a clear consistency with the relevant national accounts treatments can be determined.

5.118 Finally, to provide the most robust measurement of output, it is useful to complete a thorough recording of all possible flows of each product such that the change in stocks of each product can be fully understood. An example of a matrix to support such a process is presented in Box 5.2 reflecting the approach applied in Switzerland.

Box 5.2: Swiss description of the reconciliation of measures of output

The compilation steps depend on the available data sources. Principally, it is strongly recommended to begin with the compilation of output in the biggest possible detail, and according to different parameters and pricing concepts (where applicable: quantities, producer prices, taxes on products, subsidies on products, basic prices, trade margins, transport margins, output value to producer price, to basic price, to acquisition price, to prices of the previous year etc.). This approach will support e.g. off-setting operations in the different implementation steps, and insure consistency within B1, B2, B3… and IOT of National Accounts, for example:

Sub-domain of forestry and logging industry, sector of local KAU's	**Product**	**A**	**B**	**C = B - A**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K = C+D+E+F+G +H+I+J**
		Opening stocks	Closing stocks	Changes in inventories	Intra-unit use	Intra-industry sales	Sales outside industry		Processing by unit (separate activity)	Household own final consumption	Own account produced fixed capital goods	Total output
							domestic	abroad				

Although not requested by EFA (Table B1), but for comprehensive economic analysis and consistency controls, Table B1 (especially transactions on goods and services, e.g. P.1, P.2, P.51g, P.51c (and implicitly B.1g, B.1n)) should be compiled to current prices and to prices of the previous year, in order to separate volume (quantities and qualities) with “pure” price effects. This would enable classical labour productivity analysis (and provide components for multifactorial productivity analysis). This aspect could be added as advice for compilation, in order to better embed EFA within NA satellite accounts.

Source: The Federal Statistical Office of Switzerland (Office fédéral de la statistique (OFS).

5.119 **Step 3: Estimate the intermediate consumption of forestry and logging by product type**. The principal source for this information should be the SUT or IOT which will provide product level detail linked to the total intermediate consumption as recorded in Step 1. This will include measures of financial services including FISIM, which is a required component of intermediate consumption in the SUT and IOT. Where the SUT or IOT does not provide sufficient product detail, additional information from forestry surveys or those with expert knowledge of forestry production processes (who may be able to provide indications of the shares of costs) will be required to apportion the relevant higher-level totals.

5.120 Note that specific adjustments to national accounts data may be required to account for intermediate consumption of forest trees, including sales of standing timber, in line with the treatment described in Section 5.2.4.

5.121 **Step 4: Develop estimates of gross fixed capital formation (GFCF) and consumption of fixed capital (CFC)**. It is expected that estimates of GFCF and CFC will be available at the NACE Division 02 level through standard national accounts compilation processes including estimates by the asset types required in Table B1 Economic aggregates of the forestry and logging industry. Most commonly, national accounts compilers use an economy wide perpetual inventory model (PIM) to derive measures of CFC that use long time series of industry level estimates of GFCF by asset type as inputs. Where industry level detail is not available from the national accounts, it will be necessary to develop separate estimates using data from business surveys and making assumptions about rates of depreciation. Note that where forestry specific estimates are made, it will be important to check the estimates against economy wide totals for GFCF for specific products which will be available in both the national accounts and SUT data sets. Net fixed capital formation is derived as GFCF less CFC.

5.122 **Step 5: Estimate entries for other taxes on production and other subsidies on production**. This should be done using data from SUT for the forestry and logging industry but also in close co-ordination with experts in Government Finance Statistics (GFS) and compilers in national accounts. The consistent treatment of value-added tax across different products is likely to be an important area of focus.

5.123 **Step 6: Derive estimates for Net value added**. Factor income and Net operating surplus/mixed income. This should be done following the structure of Table B1 Economic aggregates of the forestry and logging industry, and the information compiled in Steps 1-5.

5.124 **Step 7: Estimate net property income and net entrepreneurial income**. This step may be challenging, since data on flows of interest, dividends and rent are not generally compiled by type of industry within the national accounting system. The most likely initial source is data from forestry surveys and annual reports since these flows are relatively standard entries from corporate financial accounts. If this information is not available, estimates of interest and dividends may be able to be derived from information on financial assets and liabilities held by forestry and logging KAU and applying appropriate rates of return/interest rates. Estimates of rent are most likely to involve payments to government units and hence

GFS may provide an appropriate source of information. Also to be considered in this step are estimates of transfers related to premiums and claims for property insurance. Net entrepreneurial income is derived as net operating surplus and mixed income (step 6) less net property income.

5.125 **Step 8: Estimate changes in inventories**. The first component of changes in inventories – work-in-progress on cultivated biological resources – should be derived as part of the measurement of output of forestry activity. Ideally, estimates would be sourced from the national accounts, but this will depend on the methods used to estimate output of forest trees as discussed under step 1. It should be possible to reconcile the estimate of work-in-progress with estimates in the asset account for timber resources in monetary terms.

5.126 The second component – other changes in inventories – involves two parts. The first part is the change in inventories of wood in the rough and the second part is the change in inventories of other products such as fuel. For inventories of wood in the rough, data from forestry surveys may be most relevant.

5.127 For inventories of other products, it will likely require information from business surveys or forestry surveys, since generally, the changes in inventories in the national accounts and SUT are compiled by product type rather than by type of industry. An alternative approach to estimate change in inventories of other products is to examine the different products within the SUT/IOT that are inputs to forestry and logging activities. For each product there will be an economy wide measure of changes in inventories that might be used as a starting point to determine the appropriate allocation for forestry and logging.

5.128 **Step 9: Estimate capital transfers**. The primary data source is likely to be GFS, since capital transfers will often involve payments from government to industry. These are generally large and irregular payments however and hence a starting point will be knowledge of the forestry industry in the country and identifying specific transactions. The accounts of forestry companies may also be a useful source of information.

5.129 **Step 10: Estimate labour input**. Measures of hours worked in total and for self-employed persons should be obtained directly from labour force surveys which is the most common source for information on hours worked. At the same time, it will be important to reconcile estimates of employment from the labour force surveys (which cover all industries), with estimates of employment from business surveys or forest industry surveys, to ensure that the aggregate measures of hours worked are appropriate. A useful data check will also involve the link to compensation of employees by estimating average compensation per employee and average compensation per hour. If the resulting rates of compensation are considered inappropriate or unlikely, further data confrontation and reconciliation work will be required.

5.130 For the compilation of this table, a wide array of data needs to be brought together and while the data may be implicitly present in national accounts data sets, it will generally not be possible to identify readily all of the estimates relevant to forestry and logging in standard

national accounts publications. As a result of the level of detail and complexity in compilation, it may only be possible to compile more detailed estimates on an irregular basis (e.g. every three to five years), or to compile the level of detail with a considerable time lag. Thus, to provide a time series of data for this table, and to provide more recent estimates, it will be generally necessary to use relationships between more detailed data and higher-level aggregates (e.g. total output) for a reference year and then use movements in the higher-level aggregates to provide estimates of the detail assuming a constant relationship or proportion. For example, the estimate of intermediate consumption of fertilizers in a recent period (e.g. 2023) might be derived as the ratio between expenditure on fertilizer and total intermediate consumption in 2019 multiplied by total intermediate consumption in 2023.

5.4.1. Compilation of measures by type of output

5.131 The compilation of estimates for EFA Table B2 Output of the forest and logging industry by type, is likely to be more challenging in terms of the availability of direct data. The estimate for the total output at basic prices (column 99) will be the same as the entry in EFA Table B1 (P.1). Also, the entry for own final use (column 31) will be the same as the entry in EFA Table B1 (P.12). Estimates of own-final use are most likely to relate to the use of wood in the rough (either logs or fuel wood) for construction related or energy related purposes. Data on the quantity of wood in the rough used in this way may be collected via forestry surveys. Alternatively, it may be possible to estimate total removals of wood in the rough and deduct total market sales to obtain an estimate of the quantity that is not sold and hence may be assumed to be output for own final use. The estimate for own final use should also include any removals by households for their own use. Such information may be available from household surveys, but it will be important to ensure alignment with national accounts practices. Note that the estimate of wood in the rough in EFA Table B1 (1.1.2) should include both market output and output for own final use.

5.132 Usually, the entry for market output in EFA Table B2 (column 32) should be estimated as the total output (column 99) less output for own final use. The only exception will be in the cases where there is also non-market output. As defined above, entries for non-market output (column 33) can generally be assumed to be zero unless there are KAU coded to NACE 02 which are general government units producing services in support of forestry activity (e.g. forest protection services). The proposed organisation of data from the business register on the characteristics of KAU coded to NACE 02 (see Step 2 above) will be of direct use in making this determination.

5.133 As noted above, it is more common that this type of output is undertaken by general government units coded to other industries. In these cases, estimates for non-market output (implicitly involving the creation of a separate KAU) should be made when the level of activity is considered significant and relevant to understanding activity within the forestry and logging industry.

5.134 The final entry concerns the contribution of the Household sector which will include unincorporated business units as well as removals by individual household for their own use (as described above). Estimating the output of unincorporated businesses will require information on the institutional sector of KAU coded to NACE 02 which may be developed using data from the business register as described in Step 2 above.

5.135 Estimates of household removals for own use are likely to require surveys of households and their sources of energy. Such surveys may be conducted in the context of compiling energy accounts following the SEEA. The purchase of fuel wood by households from suppliers does not need to be recorded here since this is already recorded elsewhere in this table as part of the output of the logging industry in terms of sales of wood in the rough.

5.136 Conceptually, the measures of output by type could be developed for each of the products listed in EFA Table B1 Economic aggregates of the forestry and logging industry. In practice, it is highly unlikely for this work to be undertaken. Rather, the focus should be on considering the most significant products, particularly wood in the rough, and considering the most likely practices surrounding the use of those products by different KAU.

Annex 5A: Aligning measures of output and intermediate consumption for NACE 02 from National Accounts with EFA requirements

As noted in the description of methods Step 1 (above), a logical starting point for the compilation of estimates for the output, intermediate consumption and value added of NACE 02 for EFA purposes is the data compiled and published by the National Accounts for this economic activity. Through the drafting of the Handbook, including through the conduct of a questionnaire of national accounts departments on the methods used for compiling estimates for NACE 02, a number of issues in the direct use of national accounts data for EFA purposes were identified. This annex discusses the issues identified and describes the types of adjustment that may be required to align with the definitions and treatments applied in EFA.

Based on the findings from the questionnaire, it is apparent that countries are generally well aligned in concept between the national accounts and the requirements of EFA. In that respect the following descriptions are intended to support further engagement between compilers and do not represent a critique of any set of methods.

An initial observation is that the compilation of national accounts estimates for NACE 02 may be undertaken initially by the national accounts department or estimates might be compiled as part of work on EFA and then utilized directly in the national accounts. As well, it is possible that there is a more integrated approach with (i) initial estimates from EFA compilers being used in the national accounts; (ii) these estimates balanced within the economy wide setting of the national accounts (e.g. as part of compiling supply and use tables); and (iii) final estimates for output, intermediate consumption and value added for NACE 02 from national accounts being used in EFA. Because of the intended conceptual alignment between national accounts and EFA all of these approaches to compilation are possible. The general advice is that there is a high level of engagement and co-ordination between the compilers responsible for both national accounts and EFA.

There are five primary issues to consider in alignment of national accounts NACE 02 estimates with the EFA requirements.

1. **Scope of economic units in NACE 02**. Ideally for EFA purposes, the measures for NACE 02 will cover the economic activity for (i) all economic units coded to NACE 02 (i.e. their primary activity is in NACE 02); and (ii) secondary production of NACE 02 activities by economic units coded to other industries. For the purposes, of incorporating economic activity related to secondary production, EFA recommends establishing Kind of Activity Units (KAU). There are two primary situations in which this might be relevant: agro-forestry and similar activity undertaken by agricultural units; and the growing of forest trees under the management of general government units.

   The extent to which countries make such adjustments in the compilation of their national accounts varies. On one hand, some countries do make adjustments in their measurement of output for NACE 02 to add in forestry output from agriculture. Other countries develop

measures of industry output starting from a product perspective in which case the scope for EFA purposes should be appropriate. On the other hand, a reasonable number of countries do not make adjustments in terms of re-allocating secondary production. This is appropriate in relation to measuring the overall economy. Nonetheless, for EFA purposes, it is recommended that adjustments to incorporate secondary production are made to provide comparable estimates of NACE 02 measures of economic activity.

2. **Output for own final use.** The scope of output in both EFA and national accounts includes output for own final use including timber used by households (e.g. for firewood) and by forestry companies (e.g. for constructing bridges and retaining walls). If such estimates are not compiled as part of the national accounts, estimates should be made for EFA purposes which in turn can be incorporated in national accounts estimates.
3. **Non-market output.** The scope of output in both EFA and national accounts includes non-market output for NACE 02. There is general agreement that this is not considered to be a significant estimate and the presence of non-market activity will vary from country to country. Where non-market activity does exist, estimates should be made for EFA purposes (see paragraphs 5.90, and 5.130-5.131), which in turn can be incorporated in national accounts estimates.
4. **Measurement of forest trees**. An important feature of the measurement of output of NACE 02 following the ESA 2010 is that in cultivated production contexts the output is measured progressively as trees grow. This is generally measured in terms of the net increment of timber and recorded as the product “forest trees”. While there is no requirement that national accounts publish data at this level of detail, in general countries compile data based on net increment for forest trees alongside measures of output of wood in the rough in terms of removals of timber. To ensure the correct measure of value added the output of forest trees is also recorded as intermediate consumption of NACE 02. An important note is that the price applied for each product is different. For forest trees the correct price is the stumpage price while for wood in the rough the correct price is the roadside pickup price. If this approach is not applied in the national accounts estimates, adjustments will be required for EFA purposes.

   A final note is that, in some countries, estimates of the output of forest trees also includes sales of standing timber. Where these take place they will increase the output of the forestry activity and increase the intermediate consumption of the logging industry and thus have no overall effect on value added of NACE 02. As a result, these sales may not be explicitly recognised in national accounts estimates but where they take place, they should be separately estimated for EFA purposes.
5. **Changes in inventories/work-in-progress.** Both EFA and national accounts require estimates of the work in progress of forest trees associated with recording the output of forest trees on a progressive basis. Work in progress on forest trees can be measured either as net increment less removals less felling residues or as closing stock less opening stock plus catastrophic losses (irretrievable losses excluding felling residues). Both of these methods are applied by countries. Where neither of these methods are applied adjustments will be required for EFA purposes.

The compilation methods for EFA and national accounts will also need to consider the way in which estimates for the most recent periods are made since the primary data sources may not be available with sufficient timeliness to compile accounts at the required level of detail using the data sources and methods used for earlier periods in the time series. In this case the extrapolation of the time series will be required for both EFA and national accounts purposes although for national accounts a lower level of detail may be required for more recent years. A range of extrapolation techniques may be applied, including using assumptions of constant proportions – e.g. of removals by species. In compiling estimates for EFA, it will be relevant to engage with national accounts compilers on the data sources and methods being used for aggregate measurement of NACE 02 to ensure that more detailed data in the EFA accounts are coherent with the aggregate perspective from the national accounts.

6

Chapter 6. Supply and use tables for wood in the rough

6.1. Introduction

6.1 This chapter describes accounting in physical and monetary units for the transformation of wood from the output of forestry and logging to the final products, thus building the links between the supply and use of wood, the forest land and timber resources accounts, and the economic accounts. As the account structure and classifications are the same for physical and monetary flows, the links between the two categories of data are direct and the tables provide an integrated and balanced approach for checking consistency and completeness of the data. Further, the tables provide an important accounting mechanism to ensure that there is coherence between the various sources of data and approaches countries use to estimate GDP reflecting expenditure, output, and income.

6.2 The supply tables describe how wood products become available in an economy during an accounting period (e.g. 2022). Wood products are either produced by domestic industry or imported, with output disaggregated by product (classified using CPA) and by industry (classified using NACE Rev. 2[9]). In the monetary tables, only the product wood in the rough (also referred to as roundwood) is accounted for. In the physical tables there is more product detail, and wood in the rough is broken down according to the type of product, i.e. logs and fuel wood and various sub-categories.

6.3 The use tables describe how these wood products are used within an economy during an accounting period (e.g. 2022). The uses are divided into intermediate consumption of

[9] From 2025 onwards, European statistics will start being produced based on NACE Rev. 2.1. Visit this webpage for more information.

industries (following NACE Rev. 2 classes), and final uses (final consumption, changes in inventories, and exports).

6.4 Section 5.2.2 involves an extended discussion on recording the output of forestry and logging activities, which includes a stylised supply and use table showing entries for the products forest trees and wood in the rough. The supply and use tables described in this chapter have a focus only on wood in the rough but are more complete in their coverage of the relevant entries from a national accounting perspective. Conceptually however, the discussions in Chapter 5 and in this chapter are aligned.

6.5 This chapter considers the measurement of these various components of the monetary and physical supply and use tables for wood products, following the table structures of the EFA questionnaire and as required for reporting as part of the Regulation (EU) 691/2011 Annex VII on forest accounts.

6.2. Account structure

6.6 This section presents the structure of supply and use tables for wood in the rough in physical and monetary terms for voluntary reporting. The coverage of the tables includes all kind of activity units (KAUs) that supply or use wood in the rough (i.e. including those KAUs with a principal activity in the forestry and logging industry, or in any other industry). The coverage is thus broader than the accounts described in Chapter 5, which are limited to only KAUs classified to the forestry and logging industry (NACE Division 02). The focus in this section is on describing the structure of the accounts and providing definitions for all the entries in each of the accounts.

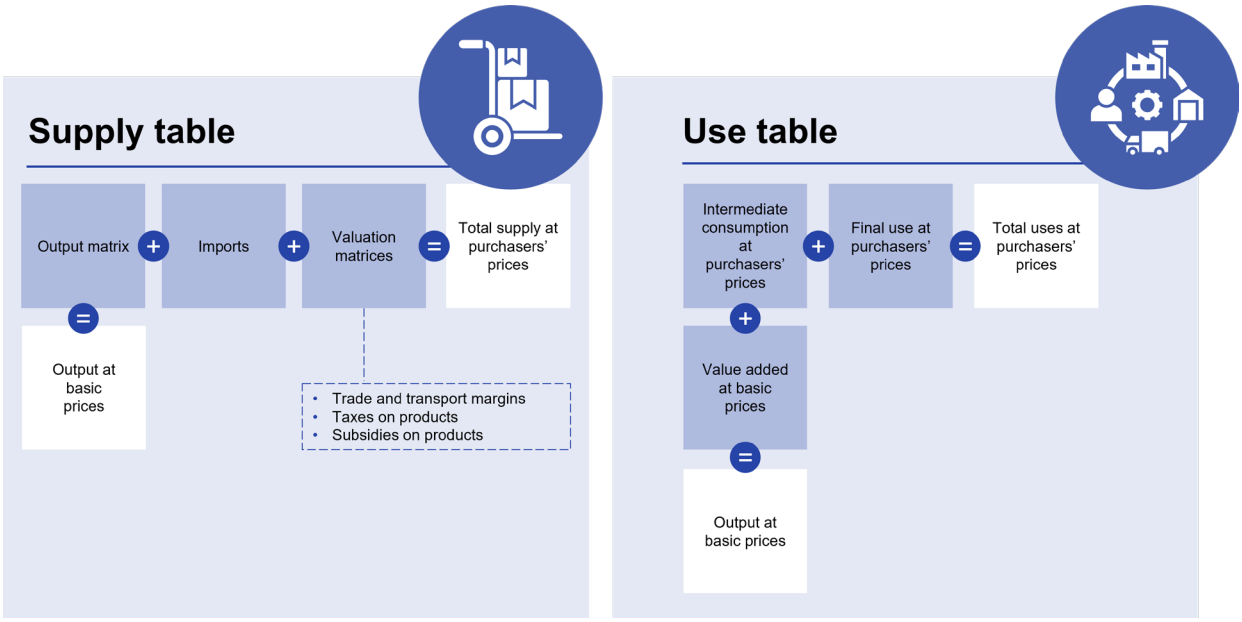
6.7 In general terms, the amount of a product available for use within the economy is supplied either by **domestic production** or by **imports**. The same amount of the product entering an economy in an accounting period must be used for **intermediate consumption, final consumption, capital formation (including changes in inventories) or exports.** The two statements can be combined to give a statement of a product balance:

Output + imports = intermediate consumption + final consumption + capital formation + exports (SNA 2008, 14.4)

6.8 Because the uses of products are valued at purchasers' prices, but production is valued at basic prices, it is necessary to add trade and transport margins, and taxes on products less subsidies on products to the supply side of the identity so both sides are expressed in purchasers' prices. Thus, a fuller articulation of the product balance for any product recognises that the sum of output at basic prices plus imports plus trade and transport margins plus taxes on products less subsidies on products is equal to the sum of intermediate consumption, final consumption, and capital formation, all expressed at purchasers' prices, plus exports (SNA 2008, 14.5). This balance is illustrated in Figure 6.1 below.

Figure 6.1

Supply and Use table inputs



Source: Based on UNSD (2018).

6.2.1. Monetary supply of wood in the rough

6.9 The monetary supply and use table for wood in the rough follows the format of the 'supply and use' table of national accounts, as presented in ESA 2010, Chapter 9 (Eurostat, 2013). The EFA tables are presented separately as Tables B3a (supply) and B3b (use), to clearly distinguish between the supply and use sides of accounting, collecting and recording data from any industry that may be producing or consuming the removals of timber reported in Table A2 (covering timber resources).

6.10 The single product measured in the monetary supply and use tables is **wood in the rough (also referred to as roundwood).** ***Wood in the rough*** *is defined as "all roundwood harvested and removed. It comprises all wood removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses. It includes all wood removed with or without bark, including wood removed in its round form, or split, roughly squared or in other form (for example, branches, roots, stumps, and burls). It is an aggregate comprising fuel wood, including wood for charcoal, and industrial roundwood (wood in the rough)"* (Eurostat, FAO, ITTO, and UNECE, 2021).

6.11 In the timber removal statistics, ***industrial roundwood*** *is the sum of sawlogs and veneer logs; pulpwood, round and split; and other industrial roundwood.* ***Other industrial roundwood*** *is defined as "industrial roundwood (wood in the rough) other than sawlogs, veneer logs and/or pulpwood. It includes roundwood used for poles, piling, posts, fencing,*

pitprops, shingles and shakes, wood wool, tanning, distillation, shiitake mushroom growing and match blocks, etc." (Eurostat, FAO, ITTO, and UNECE, 2021).

6.12 Information on flows of wood in the rough is relevant in understanding the sustainable development of the forest industry since it supports tracking changes in the demand for wood by different industries and sectors and recording the balance of supply between domestic production and imports. Recording these flows supports analysis of profitability and economic viability of forest businesses as well as the changing dependence of economic activity on forest products.

Table 6.1

EFA Table B3a – Monetary supply of wood in the rough by all industries, in million national currency

SUPPLY	Economic aggregates (current transactions)	51.0	51.1	51	61	62	63	64	65
Code	**Description**	Forestry and logging industry (Division 02)	Other Industries (if any)	**Supply of products by industries**	Imports (CIF)	Total supply (at basic prices)	Trade and transport margins	Taxes less subsides on products	**Total supply (at purchasers' prices)**
1.1.3	Wood in the rough (02.20.1)								

Note: All cells in this table are voluntary items for reporting.
Source: EFA Questionnaire.

6.13 EFA Table B3a shows the 'Monetary supply of wood in the rough' by all industries. The columns are structured to show the various components of total supply according to the entries of the supply table of ESA 2010 and the associated codes. In short, total supply is equal to output of resident KAUs plus imports plus margins and taxes on products less subsidies.

6.14 Supply by resident KAUs with a principal activity in the forestry and logging industry (NACE Division 02) are recorded in the column coded 51.0. The entry in this cell, equating to the output of wood in rough by those KAUs should be the same as the entry in Table B1 for the output of wood in the rough (code 1.1.2).

6.15 Where resident KAUs with a principal activity in other industries (i.e. non-NACE 02 activities such as pulp production, agriculture etc.) carry out the production and/or sale of wood in the rough, it is reported in the supply side of EFA Table B3, under **"other industries, if any"** (column 51.1). Put differently, these entries refer to cases where production of wood in the rough is a secondary activity of a non-NACE 02 unit. Ideally, a separate KAU concerning the logging activity would be created but if this is not possible, reporting of the logging activity as secondary activities of non-NACE 02 units is required (Eurostat, 2021).

6.16 **Imports** of goods (61) are valued and reported at **CIF** prices (i.e. they include **cost, insurance, and freight**). The ***CIF price*** *is defined as "the price of a good delivered at the frontier of the importing country, or the price of a service delivered to a resident, before the payment of any import duties or other taxes on imports or trade and transport margins within the country."* (ESA 2010, 3.169). This valuation is standard, regardless of whether any of the CIF elements are provided by domestic enterprises because import duties are typically imposed on the CIF valuation. While transport may be provided by either a resident or non-resident carrier, the cost of transport from the border of the importing economy to the premise of the importer are excluded (SNA 2008, 14.70).

6.17 The monetary output by resident KAUs is recorded at **basic prices** (62), *defined as* "*the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer*." (SNA 2008, 6.51). As such, the value of output at basic prices excludes all taxes on products and includes all subsidies on products. It includes all other taxes on production and excludes all other subsidies on production (SNA 2008, 16.49).

6.18 In some countries the data sources may not permit this valuation to be followed. In this case, output can be valued at **producers' prices**. This approach implies that all taxes on both products and production (possibly excluding any VAT type taxes) will be included in the value of output, and all subsidies on both products and production will be excluded (SNA 2008, 16.49). The producer's prices can be summarised through the following equation:

Producers' prices = basic prices + taxes on products/production excluding invoiced VAT – subsidies on products/production

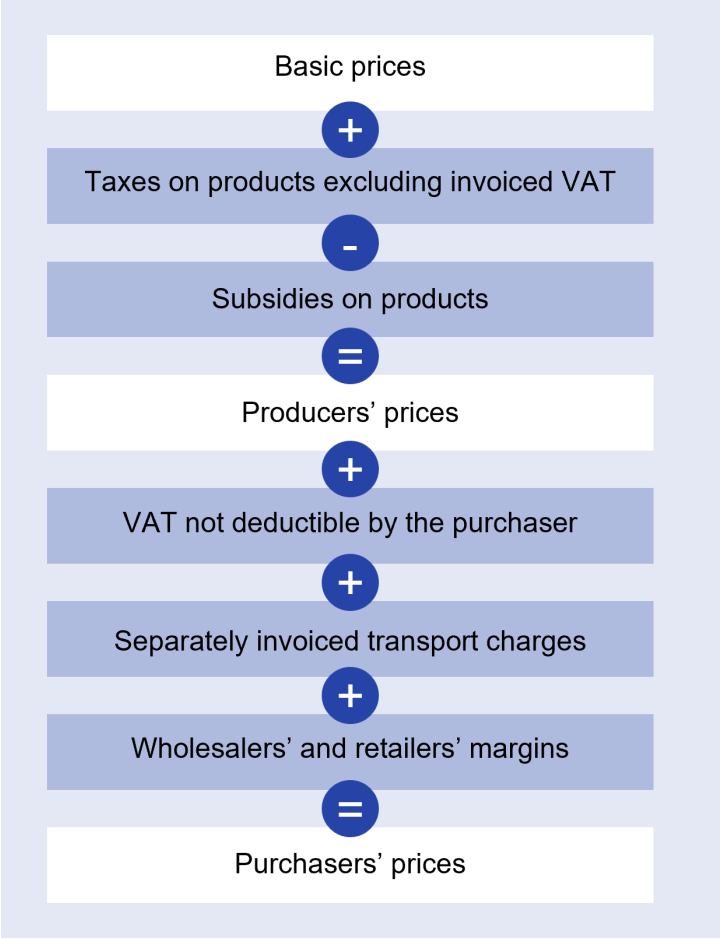
6.19 The value of a given product is perceived differently by the producer and the user, due to the occurrence of taxes and subsidies, transport costs and trade margins. To keep as close as possible to the views of the economic transactors, all uses including these elements are recorded at **purchasers' prices** (SNA 2008, 3.145). The value can be presented through the following equation:

Purchasers' prices = producers' prices + any non-deductible VAT or similar tax payable by the purchaser + transport costs paid separately by the purchaser and not included in the producers' price + trade margins

6.20 The flow from basic prices to producers' prices and then to purchasers' prices is summarised in Figure 6.2.

Figure 6.2

Basic, producers' and purchasers' prices



Source: SNA 2008, Fig 6.1.

6.21 The difference in value recorded for a product between when it is produced and the moment it is used can be considerable. The three factors that need to be considered in converting the values of output and imports to purchasers' prices are: (a) trade margins, (b) transport margins, and (c) taxes less subsidies on products (SNA 2008, 14.49).

6.22 When a purchaser buys directly from the producer, the purchaser's price may exceed the producer's price by: (a) the value of any non-deductible VAT, payable by the purchaser; and (b) the value of any transport charges on a good paid separately by the purchaser and not included in the producer's price. It follows, that the purchaser's price may exceed the basic price by the amount of the two items listed plus the value of any taxes less subsidies on the product (other than VAT) (SNA 2008, 6.65).

6.23 If purchasers buy output not from the producer directly but from a wholesaler or retailer, it is necessary to include their margins in the difference between basic and purchasers' prices also. For certain purposes, including input-output analysis, it may be convenient to consider that the purchase of a product consists of two separate transactions. The first of these is the purchase of the product from the producer and the second is the margin paid to the wholesaler or retailer of the product. The margin represents the difference between the price paid by the final purchaser of a product after it has passed through the wholesale and retail distribution chains and the producer's price received by its original producer (SNA 2008, 6.66-6.67).

6.24 ***Trade margin*** *(63) is defined as "the difference between the actual or imputed price realised on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of"* (SNA 2008, 6.146). Trade margins may be significant and may apply to virtually all goods. When a supply and use table is compiled at purchasers' prices, the distribution margins need to be added to the rows for each group of products. In order to account for the use of wholesalers and retailers' margins, an adjustment column is added to the supply part of the supply and use tables. This column shows the addition to the value of each group of goods to which the margins apply with an offsetting negative entry for the rows corresponding to the margins. Typical entries for transport margins (63) are treated in the same manner. Trade margins are usually produced within the economy but may apply to both domestic production and to imports. Transport margins, on the other hand, may be provided by and to both residents and non-residents (SNA 2008, 14.50-14.52), though it is helpful to consider the case of domestic transport charges first, and see how they are included in the supply and use tables before turning to transport margins on imports (SNA 2008, 14.53).

6.25 ***Taxes less subsidies on production*** *(64) "consist of taxes payable or subsidies receivable on goods or services produced as outputs and other taxes or subsidies on production, such as those payable on the labour, machinery, buildings or other assets used in production".* Taxes on production do not include any income taxes payable by the recipients of incomes accruing from production, whether employers or employees (SNA 2008, 7.5).

6.26 The content of the item taxes less subsidies on production payable out of value added varies according to the way in which output is valued. Value added tax (VAT), or other similar deductible tax, invoiced on output is never treated as part of the price receivable by the producer from the purchaser. Invoiced VAT is always omitted from value of output, whether output is valued at producers' or basic prices. Hence, invoiced VAT is not a charge against value added and is not recorded as a payable in the producer's generation of income account. However, when output is valued at producers' prices, any other tax on products payable on the output is treated as an integral part of the price receivable by the producer from the purchaser. The tax is recorded as being payable by the producer out of value added at producers' prices in the generation of income account, that is, as a component of the item "taxes less subsidies on production". Similarly, any subsidy on products receivable on the output is recorded as being receivable by the producer from government in the generation of income account as a supplement to value added at producers' prices. By convention, it is not recorded under resources but as a component of "taxes less subsidies on production" as if it were a negative tax on output (SNA 2008, 7.6).

6.2.2. Monetary use of wood in the rough

6.27 The recording of the monetary use of wood in the rough involves estimates for intermediate consumption, final consumption, capital formation and exports. These are recorded in columns of EFA Table B3b as shown below applying the codes of the ESA supply and use tables.

6.28 ***Intermediate consumption*** *(51) "consists of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital".* The goods may be either transformed or used up by the production process. Some inputs re-emerge after having been transformed and incorporated into the outputs, for example, timber may be transformed into planks, which in turn may be transformed into furniture. Other inputs are completely consumed or used up, for example fuel wood (SNA 2008, 6.213). In EFA Table B3b, intermediate consumption of wood in the rough is shown as either used by the Forestry and logging industry (51.0) or by other industries (51.1), including wood processing and manufacturing.

6.29 ***Final consumption*** *(71) consists of goods and services used by individual households or the community to satisfy their individual or collective needs or wants* (SNA 2008, 1.52). Final consumption of wood in the rough concerns use by households. This may be purchased directly from relevant KAUs or relate to wood harvested for own use by household units in which case separate valuations of the imputed transactions need to be made. Note that the value of wood harvested for own-use recorded as part of total use should align with the entry in EFA Table B1 "output for own final use" (code 1.0) and also with the entries in EFA Table B2 for "own final use" (P.12) and "of which: Households" (S.14) noting that these entries cover products beyond wood in the rough while at the same time only relate to KAUs classified to NACE Division 02.

Table 6.2

EFA Table B3b – Monetary use of wood in the rough by all industries, in million national currency

USE	Economic aggregates (current transactions)	51.0	51.1	51	71	72	73	74
Code	**Description**	Forestry and logging industry (Division 02) (if any)	Other Industries	**Use of products by industries**	Final consumption	Gross capital formation	Exports (FOB)	**Total use (at purchasers' prices)**
1.1.3.20	Wood in the rough (02.20.1)							

Note: All cells in this table are voluntary items for reporting.
Source: EFA Questionnaire.

6.30 ***Gross capital formation*** *(72) "shows the acquisition less disposal of produced assets for purposes of fixed capital formation, inventories or valuables"* (SNA 2008, 10.24). Gross capital formation is measured by the total value of three components: (a) gross fixed capital formation, (b) changes in inventories and (c) acquisitions less disposals of valuables (SNA 2008, 10.31). Concerning the product wood in the rough, while it may be used as an input to gross fixed capital formation (e.g. construction of houses), it is the finished product of the capital formation process (i.e. the houses) that is capitalized not the wood in the rough itself which is recorded as an input into the construction activity. Also, it is not envisaged that wood in the rough can be considered a valuable in the sense of gaining value over time notwithstanding that wood in the rough may be an input to, for example, artworks that are recorded as valuables. Thus, the focus of the entry for capital formation concerns changes in inventories of wood in the rough. Finally, note that the focus in this account is on the product wood in the rough and not forest trees. Thus, measures of work in progress on forest trees are not included here.

6.31 Most commonly, changes in inventories of wood in the rough are discussed in terms of the quantity and value of wood that is at "the roadside", i.e. the wood has been felled and trimmed ready for collection and subsequent transport and processing. However, inventories of wood in the rough may also be present within a forest or harvesting areas and being located next to a road is not a requirement.

6.32 The estimate of **changes in inventories** for wood in the rough can be derived equivalently as either the closing stock less opening stock of wood in the rough or as the additions less withdrawals less recurrent losses of wood in the rough. The value of changes in inventories of wood in the rough recorded in EFA Table B3b under capital formation should be consistent with the entry in EFA Table B1 for "other changes in inventories" (code 8.2). However, note that the entry in EFA Table B1 also includes inventories of other products (such as fuel and fertilizer). Note also that the scope of inventories of wood in the rough included in EFA Table 3b includes all such inventories irrespective of the classification of the owning economic unit whereas the entry in EFA Table B1 is limited to inventories held by KAUs classified to NACE Division 02 (although it is not expected that this is a significant difference).

6.33 The entry for **exports** (73) covers export of wood in the rough (i.e. products of domestic origin or manufacture shipped out of the country) from free economic zones and re-exports and excludes "in-transit" shipments. Exports are reported in cubic metres of solid volume, and values are normally recorded as free-on-board (FOB) at the point of exit from the exporter's economy. It includes the cost of transport from the exporter's premises to the border of the exporting economy. If estimates of exports are recorded in tonnes, the volumes should be converted to cubic metres of timber using appropriate conversion factors (SNA 2008, 14.70; SEEA AFF, 3.125).

6.34 Entries concerning the use of products are recorded at purchasers' prices. The ***purchaser's price*** *(74) is defined as the amount payable by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the*

time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place (SNA 2008, 3.147).

6.2.3. Physical supply and use of wood in the rough

6.35 Conceptually, the physical supply and use tables of wood in the rough are aligned with the standard monetary supply and use tables from national accounts but are recorded in physical units. Similar to the monetary tables, the physical tables describe the flows of products by industries, imports and exports, and final uses. For any given product, the total supply must equal to the total use. These tables have a greater detail of wood in the rough than EFA Tables B3a and B3b, to support analysis of material flow balances (Eurostat, 2021).

6.36 The physical flow accounts should cover all production of wood in the rough in a country irrespective of the industry classification of the unit (KAU) undertaking the activity and should include the output of households for their own final consumption. This can include the wood in the rough sourced from small-scale farms, crop plantations, such as orchards, and urban tree management. Where possible, this output should be included in the accounts, especially to recognize the increasing use of this wood as a source of bioenergy.

6.37 Because the EFA's focus is on the organization of data about activities and products directly related to the forestry and logging industry, extensions to consider data about flows of wood products along the supply chain are not considered. Thus, the current scope of the tables is such that they do not include any flows involved in the manufacture and distribution of wood products, such as furniture, paper and pulp, and timber used in construction. They also exclude any flows related to non-wood forestry products.

Table 6.3

EFA Table C1a – Physical supply of wood in the rough by all industries, in 1000m³ over bark

SUPPLY	Physical aggregates (current transactions)	51.0	51.1	51	60	99
Code	**Description**	Forestry and logging industry (Division 02)	Other industries (if any)	**Supply of products by industries**	Imports	**Total supply**
1.1.3	Wood in the rough (02.20.1)					
1.1.3.1	Logs					
1.1.3.1.1	Coniferous wood (02.20.11)					
1.1.3.1.2	Non-coniferous wood, except tropical wood (02.20.12)					
1.1.3.1.3	Tropical wood (02.20.13)					
1.1.3.2	Fuel wood					
1.1.3.2.1	Fuel wood of coniferous wood (02.20.14)					
1.1.3.2.2	Fuel wood of non-coniferous wood (02.20.15)					

Note: All cells in this table are voluntary items for reporting.
Source: EFA Questionnaire.

6.38 Wood in the rough for EFA purposes is measured in thousands of cubic metres over bark (i.e. including bark) and is separated into two primary products – logs and fuel wood, with a further breakdown into coniferous wood (for logs and fuel wood), non-coniferous wood (for logs and fuel wood), and tropical wood (for logs only).

6.39 The classification of activities follows NACE Rev. 2, with corresponding breakdowns by products using the comparable CPA product breakdown. The columns for the forestry and logging industry (51.0) and other industries, if any (51.1), conform to those in the monetary supply Table B3a.

6.40 Imports of wood in the rough (60) include products imported for domestic consumption or processing, including imports for re-export. Excluded from the entry are in-transit shipments. Imports are reported in cubic metres of solid volume. When estimates of imports are recorded in tonnes of dry matter, the volumes should be converted to cubic metres of timber using appropriate conversion factors (SEEA AFF, 3.118).

Table 6.4

EFA Table C1b – Physical use of wood in the rough by all industries, in 1000m³ over bark

USE	Physical aggregates (current transactions)	51.0	51.1	51	71	72	99
Code	Description	Forestry and logging industry (Division 02) (if any)	Other industries	Use of products by industries	Final consumption and capital formation	Exports	Total use
1.1.3.20	Wood in the rough (02.20.1)						
1.1.3.1.20	Logs						
1.1.3.1.1.20	Coniferous wood (02.20.11)						
1.1.3.1.2.20	Non-coniferous wood, except tropical wood (02.20.12)						
1.1.3.1.3.20	Tropical wood (02.20.13)						
1.1.3.2.20	Fuel wood						
1.1.3.2.20.1	Fuel wood of coniferous wood (02.20.14)						
1.1.3.2.20.2	Fuel wood of non-coniferous wood (02.20.15)						

Note: All cells in this table are voluntary items for reporting.
Source: EFA Questionnaire.

6.41 The concepts applied in EFA Table C1b for the physical use of wood in the rough correspond to those of the monetary use Table B3b, with an added detail concerning the related products (logs and fuel wood). The columns for forestry and logging industry (51.0) and other industries (51.1) refer to intermediate consumption, aggregated under the column **use of products by industries** (51). The entry for **final consumption and capital formation** (71) combines two separate items of the EFA Table B3b, namely final consumption and capital formation to present a single entry in the physical use table. The entry for **exports** (72) follows the same approach as in the monetary use Table B3b, without the consideration of FOB since the estimates are in physical terms.

6.3. Data and methods for estimating physical and monetary flows of wood in the rough

6.42 A general challenge in the compilation of these supply and use tables is the alignment of information on the source of the timber (e.g. from cultivated or natural forests, or agricultural land) with the total removals and production of wood in the rough. In particular, the supply and use tables require all removals of wood in the rough to be included and not all wood in the rough will come from forests even if forests are the most significant source. To obtain a better understanding of the connections between forestry and logging activity and the underlying timber resources, it is, therefore, recommended that close attention be paid to the scope of the accounts compiled about timber products and the scope of the associated land use accounts for “forestry” and those for timber resources. Where significant quantities of timber products are sourced from land use areas other than forestry, the different sources of timber products must be recorded to ensure consistency of measurement between data on the supply and use of timber products and the data on the stock of timber resources. (SEEA AFF, 3.128).

6.43 As a result of this broader scope of production compared to the measurement of timber stocks, including removals of wood in the rough, as described in Chapter 4, it is necessary to consider a wider range of data sources.

6.44 In the first instance, the physical data may be obtained from industrial / production statistics that cover the total quantity of wood in the rough and other timber products within an economy. These data sources should support the measurement of both the total output of wood in the rough, the intermediate consumption of wood in the rough and the changes in inventories of wood in the rough. However, as these may not be expressed in homogenous units of measurement, the data may need to be converted using coefficients to be expressed in commensurate units.

6.45 Methods for collecting data on wood products are described to support the reporting to the Joint Forest Sector Questionnaire (JFSQ). The definitions of products in the JFSQ, and in particular concerning wood in the rough, align with the EFA, although in the JFSQ wood in the rough is referred to as roundwood.

6.46 The main difference in reporting requirements in physical terms is that EFA requires reporting using volumes over bark (i.e. including bark), whereas JFSQ reports using volumes under bark. Conversion factors may thus be needed to derive estimates for EFA using JFSQ based data. Conversion factors will vary according to different species and may also vary over time. Countries are encouraged to use nationally estimated conversion factors that relate to their individual circumstances. Where national factors are not available, general conversion factors can be applied (For further information, refer to Annex A).

6.47 Measures of imports and exports of wood in the rough can be obtained from international trade statistics. The UNECE/FAO database contains a repository of relevant data but countries are encouraged to initially source data from their national data sources of imports and exports data.

6.48 Data for the measurement of household use of wood in the rough, including own-final use, will commonly involve data from household surveys. Such surveys may relate to capturing all aspects of household expenditure but, more directly household surveys of energy sources are likely to be useful in capturing information on the use of wood in the rough by households. Note that household expenditure on wood products such as particle board or other construction materials, is not included in these tables.

6.49 Three secondary sources of data for physical supply and use tables may be considered including data in economy wide material flow accounts, data in SEEA energy physical supply and use tables and data in monetary supply and use tables. For the first two sources, the compilers of these physical flow accounts will need to source similar entries to those in the EFA tables described here and hence engaging with those compilers to understand their sources and methods may be beneficial. Data from monetary supply and use tables may be relevant for some higher-level estimates to the extent that the monetary flows can be divided by relevant prices to provide an indicator of quantities. Entries in monetary terms may also be useful to estimate and validate the relative importance of different entries in physical terms, for example imports as a share of total supply and intermediate consumption as a share of total use.

6.50 In principle, the entries in the monetary supply and use tables for wood in the rough should be present in the standard national accounts supply and use table. However, it may be that the product wood in the rough is not separately identified in supply and use or input-output tables. Nonetheless, data on the supply and use of wood products more generally in those national accounts tables should provide a broad indication of the potential estimates. For example, the intermediate consumption of wood products by those activities in the early stage of the forest products supply chain (e.g. pulp mills) will relate to the product wood in the rough and not to other NACE 02 outputs such as forest trees.

6.51 Monetary data may also be obtained from the economic accounts for forestry collected by the forest accounting network. However, it should be noted that data from this source may be collected with different coverage from that applied in EFA (e.g. in Germany data are collected from operations that are >200ha). Hence some adjustment (e.g. for smaller

operations) may be required. Further, adjustments may be needed to allow for different local treatments of VAT for forestry.

6.52 Other sources for monetary data include data from forestry surveys that will also provide data as an input to estimating the product data in EFA Table B1 (Chapter 5). To provide a suitably broad coverage of flows, i.e. capturing production of wood in the rough outside NACE 02, a possible approach is to multiply the quantity data from the physical supply and use table by appropriate prices for wood in the rough.

6.53 Monetary data on imports and exports of wood in the rough should be available from international trade statistics and these data will also be inputs to the national accounts monetary supply and use tables.

Chapter 7. Connections to related forest accounting and measurement

7.1. Introduction

7.1 This chapter describes the connections of European Forest Accounts (EFA) to related forest accounting and measurement, highlighting common points and divergences in terms and definitions, measurement scope and compilation methods, and possibilities to bridge data through adjustments and conversion factors to enable harmonisation and alignment of data for national and international reporting purposes.

7.2 In terms of the compilation of EFA, this chapter is intended to support an informed assessment of whether data compiled for different reporting and accounting purposes can be readily applied in an EFA context. More broadly, it should support a discussion on the potential to align better the different reporting and accounting outputs such that a more coherent set of information is available for users and a more streamlined process of statistical compilation can be developed.

7.3 In terms of the use of EFA data, this chapter should support a discussion with users of forestry data and support explanation of differences between different forestry data sets and clarification of which data should be used for which purposes.

7.2. Forest accounts related work

7.4 This section provides an overview of the various accounting frameworks utilised for reporting statistics on forests, in terms of forest area, timber resources, and any connected activities and transactions in physical or monetary terms. It covers connections to the following accounting frameworks:

a. System of National Accounts (SNA) / European System of Accounts (ESA) connections, including consideration of SNA revision developments

b. SEEA Central Framework (SEEA CF) – in particular accounting for land and accounting for timber resources and associated areas of accounting including SEEA based accounting for agriculture, forestry and fisheries (SEEA AFF), SEEA energy and accounting for environmental transactions.

c. SEEA Ecosystem Accounting (SEEA EA) – links to accounting for ecosystem extent and ecosystem services (primarily wood provisioning services)

d. Economy Wide - Material Flow Accounting (EW-MFA)

e. Economic Accounts for Agriculture (EAA)

7.5 For each accounting area, a description is provided of the connection to the EFA entries. The starting position is that conceptual alignment should exist but often differences emerge due to the structure and focus of different accounting outputs. For each accounting area listed above, a summary table is provided noting the key areas of alignment and difference.

7.6 To provide a higher-level sense of the relationship between the EFA tables and the other accounting framework, the following table shows, for each EFA table (listed in the rows) where there is related or similar data in the other accounting frameworks. A key message is that there is no single other accounting framework that encompasses the range of information included in EFA. At the same time, all the data in the EFA are also presented in some way as part of other accounting frameworks.

Table 7.1

Primary connections between EFA and other accounting frameworks

EFA Tables	SNA / ESA	SEEA CF	SEEA EA	EW-MFA	EAA
A1a – Wooded land (physical)	-	Forest asset definitions of stocks and flows (afforestation, deforestation, statistical reclassification)	Forest extent	-	Measures of other land with tree cover available for wood supply (agro-forestry, short-rotation forestry, short-rotation coppice); land use / land cover distinction
A1b – Wooded land (monetary)	Valuation approaches and principles	Valuation approaches and principles	-	-	-
A2a – Timber (physical)	-	Forest asset definitions of flows (timber resources / stocks); Forest available for wood supply / forest not available for wood supply	-	Removals and net increment	Measures of other land with tree cover available for wood supply (agro-forestry, short-rotation forestry, short-rotation coppice); land use / land cover distinction
A2b – Timber (monetary)	Valuation approaches and principles	Valuation approaches and principles	Monetary ecosystem asset account (part)	-	-
B1 – Economic aggregates of the forestry and logging industry	Economic accounting definitions and principles	-	Wood provisioning services	-	Non wood forest products; Christmas trees
B2 – Output of the forestry and logging industry by type	Economic accounting definitions and principles	-	-	-	-

EFA Tables	SNA / ESA	SEEA CF	SEEA EA	EW-MFA	EAA
B3a / B3b – Monetary supply and use of wood in the rough	Economic accounting definitions and principles; supply and use table format	-	-	-	-
C1a / C1b – Physical supply and use of wood in the rough	-	Physical flows, and supply and use table	-	Physical flows, and supply and use table	-

7.2.1. System of National Accounts / European System of Accounts

7.7 The focus of the System of National Accounts (SNA 2008) and the European System of Accounts (ESA 2010) is on recording the production, consumption and accumulation activity of all economic units resident within a given reference country in monetary terms using a sequence of economic accounts.

Table 7.2

Links and deviations between EFA and SNA / ESA

Component	Aligned treatment	Differing treatment	Description
Economic and accounting definitions and treatments	X	-	-
Recording in physical terms	-	X	EFA records the wooded land and timber stocks in physical terms as well
Recording in monetary terms	X	-	The relevant connections to EFA accounts concern Tables A1b (€ of wooded land), A2b (€ of timber stocks), B1 (economic aggregates of the forestry and logging industry), B2 (€ output of the forest and logging industry by type), and B3 (€ supply / use for wood in the rough)
Value of wooded land	X	-	Limited to market value (non-market values generated by wooded land are excluded). Following ESA 2010, the value of wooded land includes the value of the stock of major improvements to the land (a form of gross fixed capital formation) that cannot be physically separated from the land itself, (e.g. drainage channels).
Value of timber stocks	X	-	Limited to market value (non-market values generated by forests are excluded).
Cultivated production context	X	-	Forestry output is measured as net increment of timber
Classification of industries and products	X	-	-

7.8 The economic and accounting definitions and treatments used in the EFA are consistent with the national accounting standards described in the SNA 2008 and the ESA 2010.

7.9 The relevant connections to the EFA accounts concern accounts for the monetary value of wooded land (Table A1b), the monetary value of timber stocks (Table A2b), the economic aggregates of the forestry and logging industry (Table B1 and B2) and the supply and use table in monetary terms for wood in the rough (Table B3).

7.10 For these accounts, the conceptual starting point is the treatment described in the SNA and ESA. Of particular note are the following treatments:

a. The value of wooded land and timber stock is measured at the beginning and end of the accounting period consistent with the concept of an economic asset. One implication is that the value is limited to the market value of the land or timber stock, and hence excludes a range of non-market values that are commonly generated by forests. These non-market values are considered in SEEA EA.

b. The output of forestry in cultivated production contexts is measured in terms of the growth of the trees, in physical terms the net increment of timber. This treatment recognises the ongoing production activity that takes place in cultivated contexts and allows a closer link between the time at which units incur costs of production and the time at which output is measured, especially when production will take place over many years.

7.11 In applying the national accounting treatments and in ensuring coherence with the economic activity of other economic units, classifications of industries and products are applied in the EFA consistent with the SNA. Thus, for industries NACE Rev. 2 (2008) is used and for products the CPA Ver. 2.1 (2015) is used. Note, that with NACE Rev. 2.1 (2022), forestry and logging activities remain coded in NACE 02.

7.12 While there is conceptual alignment in the treatment of stocks and flows there are two specific questions of alignment in practice that emerge in the compilation of EFA. First, in the measurement of economic aggregates, the focus of the EFA is on units that are coded to the industry forestry and logging (NACE 02). Ideally, EFA captures all Kind of Activity Units (KAU) coded to NACE 02 but, depending on the level of detail at which national accounts are compiled, some forestry and logging KAU may be included within a larger enterprise that has a different primary activity and hence the forestry activity may be difficult to identify unless recorded as secondary activity. Provided there is alignment in the treatment of KAU between EFA and national accounts then the resulting measures of output and value added will align. However, if different coding of units is undertaken then consistency would be lost. Overall, this is a practical issue of alignment that requires careful consideration of the treatment and classification of different economic units across different sets of statistical outputs.

7.13 Second, in the measurement of the output of NACE 02, national accountants may not provide detailed estimates by product and, in some cases, may bundle the output of forestry and logging and to treat the output as effectively one product. This makes it difficult to use the national accounts data to effectively record the distinct outputs of forest trees and wood in the rough (as identified in the CPA) and also may limit the potential to record sales of standing timber. Further, by not recording the different products it makes reconciliation to the measures of flows in physical terms difficult, including changes in the volume of the timber stock.

7.14 Given these two practical compilation issues, EFA compilers are encouraged to work closely with their national accounts counterparts in developing and applying relevant data and methods in a coherent manner. Generally speaking, if resources allow, it will always be beneficial to compile accounts at a more granular level and then aggregate to meet the relevant reporting and publication requirements rather than developing different methods at different levels of aggregation. Annex 5A discusses a range of relevant considerations on these issues.

7.15 This section has been drafted considering the current national accounts standards, SNA 2008 and ESA 2010. However, the SNA 2008 is currently undergoing a revision and updating process which is due for finalisation in March 2025. There is one proposed change which impacts directly on some EFA treatments. It concerns recording the output of biological resources, including timber. Currently, as noted above, the output of cultivated biological resources is recorded progressively as the resource grows. At the same time, the output of natural biological resources where there is no or minimal human input, is recorded at the time of harvest. The proposed change is that biological resources' output is to be recorded progressively, irrespective of the production context, i.e. whether natural or cultivated.

7.16 If this change is adopted, there are implications for the EFA accounts in terms of methods to be applied. For example, measures of the output of forest trees would apply to all timber resources not only cultivated ones. However, since currently it seems that the majority of timber in Europe is considered cultivated, the effects of the change on data may be more limited. A wider discussion on the potential implications of a change in the SNA treatment for the EFA is warranted.

7.2.2. SEEA Central Framework

7.17 The System of Environmental-Economic Accounting 2012 – Central Framework (SEEA CF) is the international statistical standard for measuring the environment and its relationship with the economy. It brings together information on a wide range of topics including water, minerals, energy, timber, fish, soil, land, emissions, pollution, solid waste, and environmental activities and transactions, such as concerning environmental protection, resource management and environmental taxes.

Table 7.3

Links and deviations between EFA and SEEA CF

Component	Aligned treatment	Differing treatment	Description
Physical / monetary measures of wooded land	-	X	EFA scope comprises all the land used for timber production, including certain types of "other land with tree cover", specifically agro-forestry, short-rotation forestry, and short-rotation coppices on agricultural land while SEEA CF includes these areas under agricultural land uses.
Timber resources / timber stock definition	X	-	EFA utilises SEEA CF definition of timber resources
Physical measures of timber stocks	-	X	SEEA CF includes all possible sources of timber, including orchards, rubber plantations, along roadsides and train tracks, and in city parks (SEEA CF, 5.349), and hence is broader in scope than EFA Table A2a.
Monetary measures of timber stocks	X	-	Limited to the value of timber stocks that satisfy the SNA definition of an economic asset

7.18 The EFA Table A1a for "Wooded land" (physical terms) is similar to the physical asset account for forest and other wooded land in the SEEA CF (Table 5.15). However, to cover all the land used for timber production, certain types of "Other land with tree cover" are added in EFA. These include agroforestry, short-rotation forestry, and short-rotation coppices on agricultural land (Eurostat, 2021; EFA Questionnaire). For EFA Table A1b, a similar scope adjustment is required noting that the value of forest and other wooded land in the SEEA CF (Table 5.16) is part of an economy-wide land value account.

7.19 In concept, the scope adjustment just noted is not applied to EFA Tables A2a and A2b for "Timber" (physical and monetary). In this case the corresponding SEEA CF accounts concern the asset accounts for timber resources – Table 5.19 for the physical asset account, and Table 5.20 for the monetary asset account. For these tables the SEEA CF includes all possible sources of timber, including orchards and urban areas (SEEA CF, 5.349) and hence is broader in scope than EFA Table A2a. In monetary terms, the SEEA CF, as for the EFA, is limited to the value of timber stocks that satisfy the SNA definition of an economic asset.

7.20 The data for the physical asset account for timber resources is reported in both EFA and SEEA in thousands of cubic meters over bark. However, as data for "Removals" in EFA is

generally derived from the Joint Forest Sector Questionnaire (JFSQ) and thus obtained under bark, it must be converted to over bark data for EFA reporting.

7.21 While the main connection between the EFA accounts and the SEEA CF concerns the asset accounts there are two other connections that are noted. First, SEEA CF Chapter 3 describes the recording of environmental flows in physical terms covering flows of natural inputs, including timber, products and residuals. In the context of forestry, the physical supply and use table format may be used to record flows of timber in physical terms between the environment and the economy. One feature of the SEEA CF approach is that the flows should be recorded in gross terms reflecting the total volume of biomass harvested. This feature allows the recording of felling residues, which in the SEEA CF are a form of natural resource residual. The use of supply and use table formats for recording physical flows related to all stages of timber and wood production may be a useful addition to the range of compilation approaches. All of these flows will be recorded in the EFA Table A2a in terms of changes in the stock of timber.

7.22 Second, the SEEA CF Chapter 4 describes the recording of environmental transactions (such as environmental taxes and subsidies) and activities which have an environmental purpose, i.e. environmental protection (EP) and resource management (RM). From the perspective of EFA it is noted that all these environmental transactions and activities are within scope of the SNA and hence, implicitly will be reflected in the entries in EFA Table B1 showing economic aggregates. Identification of the relevant estimates may be challenging, particularly if it requires understanding the purpose of the transaction, i.e. whether it is for EP or RM.

7.23 The relevance of identifying these transactions within the EFA system is that there are EU reporting requirements concerning the Environmental Goods and Services Sector (EGSS) which includes information on forestry related expenditures under the newly established Classification of Environmental Purposes (CEP) which covers all types of EP and RM. One group of the new CEP concerns the management of forest resources. This class covers reforestation, afforestation and forest-related land management, protection against forest fires, monitoring, measurement and other activities. There are likely to be advantages in compiling both EFA and EGSS estimates through engagement between the different groups of compilers.

7.24 There are a number of statistical documents that represent the application of the SEEA CF accounting rules and treatments. Of particular relevance here are the SEEA for Agriculture, Forestry and Fisheries (SEEA AFF) and SEEA Energy. SEEA AFF applies and expands concepts and methods specific to agriculture, forestry, and fisheries, enabling the analysis of the relationship between the environment and the economic activities related to these sectors. The measurement boundaries for the SEEA AFF accounts relevant for forests and forestry activity are well aligned with the EFA and there should be a good potential to exchange data between the two systems as needed.

7.25 SEEA Energy describes accounts to record the supply and use of energy products and asset accounts for energy resources. A fully populated physical supply and use table for energy will provide useful information on the flows of timber associated with its use for energy, including own consumption of household. These data and methods may be useful in deriving estimates to compile EFA accounts B1, B2, B3 and C1.

7.2.3. SEEA Ecosystem Accounting

7.26 The most recent addition to the scope of the SEEA is Ecosystem Accounting (SEEA EA). SEEA EA was adopted in March 2021 to provide a framework for recording a wider range of information about ecosystems and the services they provide than is possible using the standard asset and production boundary of the SEEA CF and the SNA. In summary, ecosystem accounts are founded on consideration of the capacity of the environment to deliver ecosystem services. It is the interactions between different environmental assets within a given area that generates ecosystem services. To the extent that meaningful groupings of land areas can be defined, these areas may be used to provide a measurement basis for ecosystem accounting in a similar way to which statistical units, such as establishments, provide a basis for measurement in economic statistics. (SEEA CF, 5.316-5.317).

7.27 There are substantive programs of work underway around the world on the implementation of ecosystem accounting. This is particularly the case in Europe where a wide range research and implementation programs have been underway for over 10 years. From a statistical perspective, this is advancing towards standardised reporting via a legal module.

Table 7.4

Links and deviations between EFA and SEEA EA

Component	Aligned treatment	Differing treatment	Description
Area of wooded land	-	X	EFA account is based on the concept of land use; SEEA EA ecosystem extent account is based on the concept of ecosystems, which is more similar to the concept of land cover. Thus, estimates of area from both accounts are likely similar, but not equivalent.
Output of forestry and logging activities, and associated flows of net increment and removals of timber	X	-	EFA aligns in physical and monetary terms with SEEA EA measurement of wood provisioning service, with net increment reflecting the contribution of forests and other ecosystem types to timber production. A similar connection can be drawn between the harvesting of non-wood forest products and the related ecosystem service.

Component	Aligned treatment	Differing treatment	Description
Value of timber stocks	X	-	Related to SEEA EA estimates in the monetary ecosystem asset account concerning the net present value of wood provisioning services.
Sources for wood provisioning service	-	X	In SEEA EA, these can come from any ecosystem type including urban ecosystems. In the methods for ecosystem accounting for European reporting the supply of wood provisioning services is limited to supply by FAWS.

7.28 From the perspective of EFA there are a few connections that can be highlighted, recognising that the ecosystem perspective that is applied in the SEEA EA is not applied in the EFA. The key connections are:

a. EFA accounts for the area of forest and wooded land will provide an estimate of the total area and changes in area for those land type. In ecosystem accounting the associated concept is ecosystem extent referring to the size of ecosystems of different types. While it would be expected that there is a close link between these measures, the EFA account is based on the concept of land use whereas the ecosystem extent account is based on the concept of ecosystems, which in this case is likely to be more similar to the concept of land cover. In short, it would be expected that the estimates of area from both accounts are similar, but they would not be expected to be equivalent.

b. EFA accounts for the output of forestry and logging activities, and associated flows of the net increment and removals of timber, will be aligned with the measurement, in physical and monetary terms, of the ecosystem service of wood provisioning. Ecosystem services concern the contribution of ecosystems (in this case forests and other wooded land) to benefits (or products) that are used by economic units. Thus, the net increment will reflect the contribution of the forest to timber production. A similar connection can be drawn between the harvesting of non-wood forest products and the related ecosystem service.

c. EFA accounts for the value of the timber stock will be related, in part, to the estimates in the monetary ecosystem asset account. An ecosystem asset, such as a forest, has a monetary value equal to the discounted future flows of ecosystem services. When considering only wood provisioning services, the resulting ecosystem asset value will be equivalent to the value of the timber stock that is present within the ecosystem asset.

7.29 While there are some connections, care will be needed to align the measurement scopes of the different accounts. This will primarily concern (a) the spatial scope in measurement the area of forest and wooded land and the extent of relevant ecosystem types; and (b) the

range of sources of wood provisioning services – in SEEA EA these can come from any ecosystem type including urban ecosystems. Concerning (b), while this is true in concept, in the methods for ecosystem accounting for European reporting the supply of wood provisioning services is limited to supply by FAWS and hence the measurement scope is likely to be well-aligned with measures of net increment of FAWS in EFA Table A2.

7.30 In addition to these connections, there are a number of aspects of ecosystem accounting that are not recorded in the EFA accounts but are relevant and important aspects of forest measurement. These are:

a. The measurement of ecosystem condition of forests and related ecosystems. This area of accounting provides a structured means of organizing data on the ecological integrity of those ecosystems covering their abiotic characteristics (physical and chemical characteristics); biotic characteristics (structure, composition and function) and landscape characteristics. There are emerging agreed EU-wide approaches for these measures related to forest developed initially by the JRC and being applied in, for example, the reporting on the Nature Restoration Law.

b. The measurement of a wide range of non-wood provisioning ecosystem services generated by forests that are commonly non-market services. The generation of these services will differ depending on the location, size and condition of the forest ecosystem. Bundles of ecosystem services may include (but are not limited to) the following services:

    i. Global climate regulation (carbon sequestration and retention)

    ii. Water regulation and purification

    iii. Rainfall pattern regulation

    iv. Local climate regulation

    v. Air filtration

    vi. Landslide mitigation

    vii. River flood mitigation

    viii. Storm mitigation

    ix. Pollination

    x. Nursery population and habitat

    xi. Recreation-related services

    xii. Visual amenity services

xiii. Education, scientific and research services

xiv. Spiritual, artistic and symbolic services

7.31 The measurement of ecosystem condition and ecosystem services applying the SEEA EA is a rapidly developing area of statistical expertise. While the EFA does not include these data, there are important aspects about which EFA compilers and forestry statisticians should be aware and should indeed be able to support.

7.2.4. Economy-Wide Material Flow Accounts

7.32 Economy-wide material flow accounting (EW-MFA or MFA) is a statistical framework that presents information on the flow and use of materials in physical terms. The accounts provide data regarding material inputs from domestic extraction and import, changes in stocks, and outputs through export and discharge to the environment. The data on MFA can be compiled on national and regional scales and is usually undertaken by national statistical offices using economic, trade and agricultural statistics, measuring the exchange of materials between different products available within an economy.

Table 7.5

Links and deviations between EFA and EW-MFA

Component	Aligned treatment	Differing treatment	Description
Measurement units	-	X	EFA records roundwood removals for industrial roundwood and fuel wood, including wood for charcoal in thousands of cubic metres over bark. MFA records domestic extraction in tons.
Physical / monetary reporting	-	X	EFA reporting is undertaken in both physical and monetary terms; MFA data is gathered and reported in physical terms only
Treatment of cultivated timber	-	X	EFA regards cultivated timber as a produced asset (similar to the SNA and SEEA CF), thus net increment is considered as part of the economy; MFA utilises a “harvest approach”, which implies that cultivated timber (and net increment) forms part of the environment, with flows to the economy only recognised at the point of harvest. Net increment is considered for aggregation of domestic extraction and is only recorded as a memo item to enable comparison with national accounts. These data should be aligned to data in EFA Tables A2 concerning net increment of FAWS.
Treatment of felling residues	-	X	EFA accounts for felling residues in Table A2 under irretrievable losses; MFA accounts for only utilised part of the bark as

Component	Aligned treatment	Differing treatment	Description
			domestic extraction, whilst biomass felled but unused never enters the economic boundary.
SUT for wood in the rough	X	-	MFA entries for timber (industrial roundwood) (MF.1.3.1), and fuel wood and other extractions (MF.1.3.2) align with data included in EFA Table C1.
Treatment of international trade	-	X	In physical terms MFA data are recorded in terms of international trade borders. This may implicitly differ from the recording of transactions in terms of change of ownership as required for national accounts and balance of payments when recording data in monetary terms.

7.33 As described above, the SNA and the SEEA CF consider cultivated biological resources, such as plantation timber, as produced assets such that the growth of timber is recorded as occurring within the boundary of the economy. In the SEEA CF, also recorded are natural inputs into this production process including soil nutrients, water, and carbon dioxide. The boundary between the environment and the economy thus is drawn as the tree grows. In the MFA accounting rules, an alternative boundary is used applying the “harvest approach”. This approach implies that cultivated timber is treated as part of the environment, recognising the flow from environment to economy, i.e., domestic extraction in MFA terms, at the point of harvest (the approach is also acknowledged by SEEA CF in para 3.283).

7.34 Using this approach a range of flows are recorded in the MFA. The table below shows the classification of wood materials in the MFA. The item MF.1.3 (Wood) records the biomass harvested from cultivated and natural forests. In the case of cultivated forests, the MFA also records the following sub-items: timber (industrial roundwood) (MF.1.3.1) and fuel wood and other extractions (MF.1.3.2). These entries should align with data included in EFA Table C1.

Table 7.6

Classification of wood materials in EW-MFA / MFA (cross-tabled with types of flows)

Code	Label	Type of flow	A	B	D	F	G
		EW-MFA	Domestic extraction	Physical imports	Physical exports	Domestic processes output	Balancing items
		SEEA-CF	Natural inputs	Products	Products	Residuals	Natural inputs or residuals
MF.1.3	Wood	-	X	X	X	-	-
MF.1.3.1	Timber (industrial roundwood)	-	X	X	X	-	-
MF.1.3.2	Wood fuel and other extraction	-	X	X	X	-	-
MF.1.3 MEMO	Net increment of timber stock (memo item)	-	X^	-	-	-	-

^Not taken into account when aggregating domestic extraction (DE).
Source: Eurostat (2018). Economy-wide material flow accounts, Table 2 (extract).

7.35 Roundwood removals for industrial roundwood and fuel wood, including wood for charcoal are reported for EFA purposes in thousands of cubic metres over bark. For MFA's recording of domestic extraction, cubic metres must be converted into tonnes. The conversion factors differ by tree species. In the absence of national conversion factors, default international factors, as shown in the table below, can be utilised.

Table 7.7

Conversion factors from cubic metres to metric tonnes for coniferous and non-coniferous roundwood (applicable for both under bark and over bark)[10]

Type of roundwood	Density [t at 15% moisture content / m^3]
Coniferous	**0.52**
Non-coniferous	**0.64**

Eurostat, 2018. Economy-wide material flow accounts, Table 9.

7.36 Roundwood removals in EU forestry statistics distinguish between under bark and over bark. Bark can account for approximately 10% of stem wood weight, with significant parts of it subject to further economic uses (e.g., energy production). In the MFA, only the utilised part of the bark is regarded as domestic extraction, whilst the biomass felled but unused (felling residues) never enters the economic boundary, and thus remains unaccounted as domestic extraction.

7.37 In the case of cultivated forests, there can be differences between the amount harvested and the amount of timber grown in one accounting period. To "bridge" between these concepts, a "memorandum item" (classification entry MF.1.3. MEMO) reporting "net increment of timber stock" is established. The memo item reports the growth of cultivated timber, which, according to national accounts' concepts, is the output of the production activities in forestry. However, in the MFA's case, the memo item is not taken into consideration when aggregating domestic extraction over all material classes, as it represents a (positive) change on the environment. The item is separately listed to enable comparisons between MFA's harvest approach and national accounts concepts.

7.38 The memo item can be derived from Eurostat's data set "Wood volume" item "Net annual increment in forests available for wood supply (NAI)". Data reported in volume [m^3] should be converted into mass [t at 15% moisture content] by using the factors provided in the above table (Eurostat, 2018). These data should be aligned to data in EFA Tables A2a and A2b concerning net increment of FAWS.

7.39 In addition to wood, the MFA also records the subset MF.1.3.2 (fuel wood and other extraction) that includes natural gum, cork, and other forestry products. Other wild products related to wooded land (mushrooms, berries, nuts, wild animals etc.) are reported under

[10] These density factors refer to oven dry mass of wood. For the purpose of IPCC, a conversion from m^3 to tonnes is required as an interim step for estimating carbon content of wooded biomass. But according to the conventions of EW-MFA, biomass has to be reported in air dry weight (moisture content of 15%). Therefore, the original density factors of the IPCC publication were transformed into factors which convert solid cubic metres into metric tonnes at 15% moisture content.

item MF.1.4.3 hunting and gathering. Short rotation wood, such as Christmas trees and poplars, are reported under classification item MF.1.1.A Other crops excluding fodder crops n.e.c. All this information may be used to support derivation of measures of output of NACE 02 in EFA Table B1.

7.40 Data on international flows of wood in the rough (i.e. imports and exports) will be recorded on the basis of international trade statistics in physical terms. These flows may be different from the timing of physical flows implicit in monetary data recorded based on the change of ownership of wood in the rough as applied in the national accounts and balance of payments.

7.2.5. Economic Accounts for Agriculture

7.41 The Economic Accounts for Agriculture (EAA) are thematic accounts of the European System of Accounts (ESA), providing complementary information and concepts adapted to the specific nature of the agricultural industry. The EAA are compiled based on NACE Rev. 2 statistical classification of economic activities in the European Community, Division 01, on the list of activities that define agricultural industry.

Table 7.8

Links and deviations between EFA and EAA

Component	Aligned treatment	Differing treatment	Description
Compilation basis	X	X	Both frameworks are compiled based on NACE Rev. 2, with EAA scope limited chiefly on Division 01 (agricultural industry), and EFA on Division 02 (Forestry and logging industry), with occasional cross over when secondary activity is reported if a local KAU cannot be separately identified.
Treatment of Christmas trees	-	X	EAA considers Christmas trees grown on agricultural land as agricultural output; For EFA purposes, the same product is recorded in Table B1, under code 1.3 (other products from connected secondary activities in the local KAU), if the product is grown by a local KAU classified to NACE 02 and it is not possible to separately identify the local KAU related to NACE 01.
Treatment of non-wood forest products	-	X	Same treatment as directly above

7.42 For reporting purposes, certain inseparable, non-agricultural secondary activities (activities whose costs cannot be observed separately from the agricultural activity) are also accounted for in EAA. Examples include the processing of farm products on the farm, forestry, logging, and tourism. The output of the agricultural industry recorded in EAA thus results from two kinds of activity:

a. agricultural activities (main or secondary) performed by agricultural units;

b. non-agricultural secondary activities of agricultural units.

7.43 Generally, data on these secondary activities (where they relate to forestry and logging) are not in scope of EFA Table B1 or B2, since that scope is limited to KAU that are classified to NACE 02. However, there may be some situations in which a KAU can be separately identified in which case the forestry related activities of that KAU should be included in the EFA.

7.44 As defined by NACE Rev. 2, the production of nursery trees is treated as an agricultural activity in so far as it relates to the production of tree saplings and fruit-bearing shrubs, vines, and ornamental shrubs, whereas the production of forest plants is treated as a forestry activity if the plants are intended for use in the production of forest trees.

7.45 The production of Christmas trees is also treated as agricultural production if the trees are grown in nurseries with specifically ornamental purposes in mind. However, if, for instance, the Christmas trees are the result of lopping or thinning of forest trees, then it is considered forestry production (Eurostat, 2024. EAA Manual). Note that where Christmas trees are grown by a KAU classified to NACE 02 (forestry industry), the output of NACE class 01.29 (growing of Christmas trees) is recorded in EFA Table B1 Economic aggregates of the forestry and logging industry, under code 1.3 “Other products from connected secondary activities in the local KAU”.

7.46 Growing of wild growing edible products is considered an agricultural activity under Division 01. This includes products in groups 01.13 (growing of mushrooms and truffles), 01.25 (growing of various other tree and bush fruits and nuts), and 01.29 (growing of natural rubber) which correspond to CPA codes 01.13.8 and 01.25 respectively (NACE Rev. 2). If these products are produced by a KAU classified to NACE 02 (forestry industry), then the output of these products for EFA purposes is recorded in Table B1 Economic aggregates of the forestry and logging industry, under code 1.3 “Other products from connected secondary activities in the local KAU”.

7.47 Where forestry is an inseparable non-agricultural activity, EAA recommends that the output of standing timber, which spans several years, should be recorded in the form of work-in-progress. However, this treatment only applies when production is cultivated (i.e., organised, managed and supervised by an institutional unit) and not when there is natural growth of wood which is only recorded at the felling stage. (Eurostat, 2024. EAA Manual). Further, plantations used in forest areas are included under seeds and planting stock, as an element of intermediate consumption (Eurostat, 2024. EAA Manual).

7.48 The EAA incorporates the recording of gross fixed capital formation (GFCF) of cultivated biological resources for cork oak and forest trees for repeat production of fuel wood (e.g., eucalypt), as well as fruit trees and other trees typical of agriculture.

7.49 From an EFA perspective, where resident KAUs with a principal activity in industries such as agriculture carry out the production and/or sale of wood in the rough, it is reported in the supply side of Table B3, under “other industries, if any” (column 51.1). Data from EAA will be relevant in these contexts.

7.3. Forest statistics reporting frameworks

7.50 This section describes connections to frameworks used for reporting forestry statistics. Namely:

a. FAO Global Forest Resources Assessment (FAO FRA) 2020 / 2025

b. Joint Forest Sector Questionnaire (JFSQ)

c. Monitoring framework for resilient European forests

d. Other connections (LUCAS, Copernicus, reporting on GHG emissions)

7.51 In each case, the differences in definitions, terminology, and/or measurement scope of relevant EFA entries are described, highlighting, where possible, the potential to adjust data used for reporting to FRA or JFSQ to support implementation of EFA. The focus is on non-monetary data. The discussion here is not exhaustive in terms of forest statistics reporting frameworks. For example, data are also collected for Forest Europe and The Forest Information System for Europe (FISE). A complete assessment of differences and overlaps would require further investigation.

7.3.1. Global Forest Resources Assessments

7.52 FAO Global Forest Resources Assessment (FAO FRA) provides essential information for understanding the status and trends in the extent, condition, management, and uses of forest resources. The consistency of FRA reporting is enabled through commonly agreed terms and definitions, and the application of standard methodologies, guidelines, and specifications. The scope of FRA has evolved from timber-focused inventories to holistic assessments that seek to respond to increasing information needs related to all aspects of sustainable forest management. FRA focus and any changes respond to the international forest policy arena, such as the 2030 agenda for Sustainable Development (SDG), United Nations Strategic Plan for Forests 2017-2030 (UNSPF), the Paris Agreement, and the Kunming-Montreal Global Biodiversity Framework.

Table 7.9

Links and deviations between EFA and FAO FRA

Component	Aligned treatment	Differing treatment	Description
Reporting cycle	-	X	EFA has an annual reporting requirement, FRA reports every 5 years.
Definitions related to the classes of wooded land	X	-	EFA adopts FAO's internationally agreed definitions for forest, other wooded land and other land with tree cover.
Definitions related to growing stock / timber stock	-	X	EFA reporting is aligned with SEEA CF definition of timber stocks.
Recording in physical terms	X	X	EFA utilises FRA forest land data, following a land use definition for reporting on forest area. EFA distinguishes between areas available for wood supply and not available for wood supply (AWS / NAWS) based on land-use and applicable restrictions (environmental, social and economic).
Recording in monetary terms	-	X	EFA reports in both physical and monetary terms.

7.53 The key points of difference and alignment between FRA and EFA are:

a. The FRA reports are produced every five years. Since EFA has an annual reporting requirement, reconciliation will only take place infrequently.

b. The FRA "Forest" definition is an internationally recognised reference definition and is used by the Joint Forest Sector Questionnaire (JFSQ) and the EFA.

c. EFA makes use of FRA forest land results, following a land use definition for reporting on the European forest area.

d. EFA adopts the following FAO definitions on the classes of wooded land (as noted in Chapter 3):

   i. Forest

   ii. Other wooded land

   iii. Other land with tree cover

e. The FRA variables of relevance for EFA purposes include the extent of forest and other wooded land, and the stock and changes in stock of timber resources. This data can support the completion of EFA physical tables A1a on the area of wooded land and A2a on the volume of timber.

7.54 With regard to the variables related to timber stock, EFA definition differs from FAO in certain parts, and aligns with SEEA CF, as noted in the table below.

Table 7.10

FAO FRA and EFA variables related to timber / growing stock components

Component	FAO FRA	EFA
Frequency of dissemination	5-yearly	Annual
Growing stock	Living trees, including laying living trees	All trees, living or dead (SEEA CF)
Stem diameter	Dbh > 10cm	Dbh > 0cm (SEEA CF)
Top	Included	Included
Stump	Included	Included
Large branches	Excluded	Included (SEEA CF)
Small branches	Excluded	Excluded
Foliage	Excluded	Excluded
Dead trees	Excluded	Included, if usable (SEEA CF)

Source: Pilli and Grassi (2021).

7.3.2. Joint Forest Sector Questionnaire

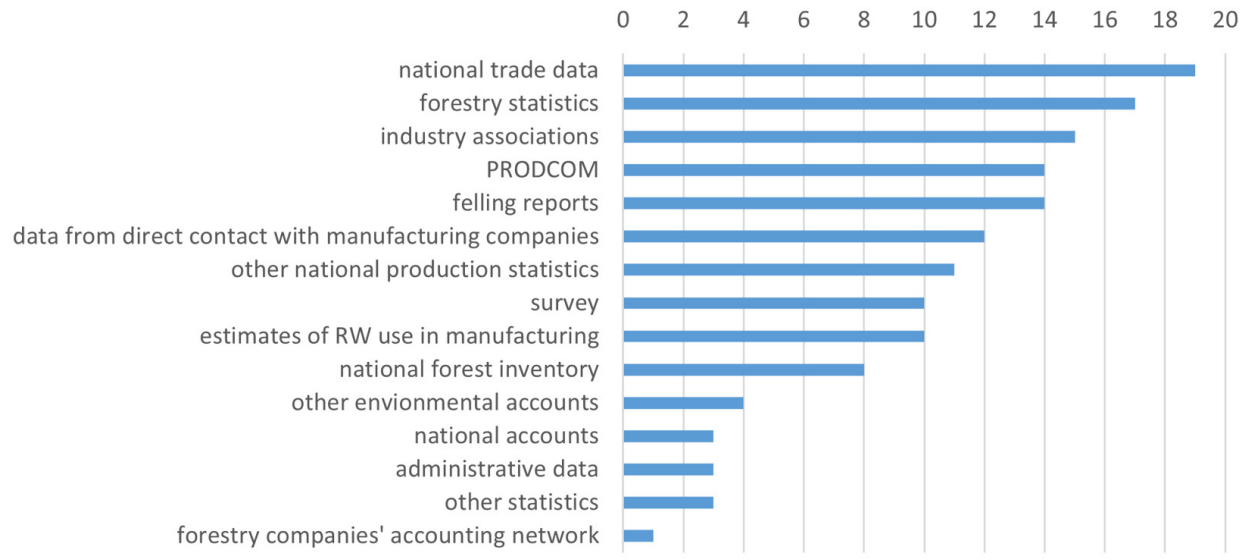
7.55 The Joint Forest Sector Questionnaire (JFSQ) is an annually disseminated, global forest product reporting framework developed by Eurostat, FAO, ITTO and UNECE. All terms and definitions have been harmonised and are internally consistent. The collection is utilised for publications, researchers, companies, investors, IPCC for harvested wood products, and to support SDG 15 Life on land.

7.56 The questionnaire contains three joint production and trade questionnaires common to all countries and organisations (JQ1, JQ2, and JQ3), followed by other questionnaires addressing the specific needs of individual organisations. JQ1 covers removals and production in volume units of 1000m^3 or 1000 metric tonnes for primary products, such as removals of roundwood, sawn wood, wood-based panels, wood pulp, and paper and paperboard. JQ2 covers imports and exports in volume and value (in 1000 national currency) for the same products as JQ1. JQ3 covers imports and exports in value only for secondary products.

7.57 Countries use a wide range of data sources for the compilation of JFSQ. Categories presented in the table below are not all mutually exclusive, with some used to provide data for a single item, others utilised for whole tables.

Figure 7.1

JFSQ data sources



Source: JFSQ (2024).

Table 7.11

Links and deviations between EFA and JFSQ

Component	Aligned treatment	Differing treatment	Description
Definition related to removals	X	X	EFA utilises the JFSQ definition of removals, however including the bark (over bark). JFSQ removals are estimated under bark (excluding bark).
Product boundary	-	X	In JFSQ, logs are further classified according to their level of transformation as basic, primary, or secondary products. Thus, JFSQ estimates of roundwood include roundwood that will be used to produce pulp, particleboard, or fibreboard, either as roundwood, split wood or as wood chips made directly in the forest from roundwood. EFA recording is based on the first step of the supply chain, thus wood in the rough includes logs and fuel wood only.

7.58 Eurostat is responsible for JFSQ data collection within EU and EFTA countries. The EFA uses the JFSQ definition of Removals for Table A2 “Timber”, with an exception concerning the approach to under bark / over bark reporting. In JFSQ, removals are estimated under bark (i.e. excluding bark), whilst EFA reporting is undertaken over bark, and must be thus adjusted. Due to this, conversion factors are required to convert from one unit of measure to another. Also, JFSQ reporting of removals may be limited to forests only while in EFA all wooded land is within scope as per the descriptions in Chapter 4.

7.59 Pulpwood in the JFSQ is roundwood that will be used for the production of pulp, particle board, oriented strand board (OSB) or fibreboard. This product is included in EFA Table B1 within “Wood in rough” (code 02.20.1) under “Logs” and is approximated by the roundwood removed from the forest by the logging activity (Eurostat, 2021). Pulpwood may also be included in the output if it is part of the secondary activity of a KAU with its principal activity in forestry and logging (NACE 02). It can be included in EFA Table B1 under code 1.3 “Other products from connected secondary activities in the local KAU”.

7.60 If a first transformation of wood in the forest, such as chipping, is relevant, their value can be included in “Other products” (always providing explanations). The same should be done for sliced wood or felling residues that have some value (Eurostat, 2021).

7.61 In the JFSQ, estimates of roundwood include roundwood that will be used to produce pulp, particleboard, or fibreboard, either as roundwood, split wood or as wood chips made directly in the forest from roundwood. Thus, while “Wood in the rough” is the target variable as defined in CPA classification, chips or slices made directly in the forest for the same purposes are also to be added to that wood in the rough, so the boundaries of the JFSQ products are not as clear as in EFA (Eurostat, 2021).

7.3.3. Monitoring framework for resilient European forests

7.62 The aim of the newly proposed Regulation on a Forest Monitoring Framework (the Forest Monitoring Law) is to develop an EU-wide comprehensive forest observation framework that provides public access to detailed, accurate and regular information on the condition and management of European forests, and to enable Member States, forest owners and foresters improve their response to increasing pressures on forests and strengthen forest resilience. The framework will help to create an integrated forest governance by ensuring cooperation among Member States and by encouraging them to set up long-term forest plans that consider all the relevant policy dimensions and the multi-functionality of forests.

7.63 Under the proposed law, the EU Commission and national governments are required to collect and publish data on various indicators, ranging from forest area to tree species composition and richness. There will be a number of connections to data in the EFA that will be clarified and developed over time.

7.3.4. Other connections

7.64 This section provides a short description of other possible connections to forest related data. The following data sets have been described here:

a. LUCAS data on forest area

b. Copernicus data on forest area

c. Reporting on GHG emissions due to LULUCF including measurement of carbon stocks.

7.3.5. LUCAS data on forest area

7.65 The Land Use and Cover Area frame Survey (LUCAS)[11] is an EU-wide geographical data collection undertaken by either the direct (in situ) field observation or by photointerpretation (PI). LUCAS generates harmonised and comparable data for European statistics every three years since 2006, to identify changes in: a) land use (meaning the socioeconomic use of land, for instance agriculture, forestry, recreation, or residential use); and b) land cover (for instance crops, grass, broad-leaved forest, or built-up area).

7.66 The aggregated results for the EU-27 and national totals show the land cover and land use for each of the main categories and their subclasses, as well as woodland areas by size and canopy cover. The statistics can also be analysed at a more detailed level.

[11] See also Land cover and land use, landscape (LUCAS) reference metadata.

7.67 The classifications used within LUCAS are comparable with other statistical standards, such as the EU's farm structure survey (FSS), those used by UN FAO, or the European Nature Information System (EUNIS) for classifying forestry types and areas. The share of forest area based on the LUCAS data is also used as an indicator for the Sustainable Development Goal 15 Life on land (SDG 15) (FISE, 2021). In addition, LUCAS data are used for Agro Environmental Indicators (AEI), LULUCF (land use, land use change and forestry) indicators, Europe Resource Efficiency indicators and are planned to be used in assessing the Good Agricultural and Environmental Condition (GAEC). Moreover, in the context of CORINE Land Cover (CLC) and all other pan-EU mapping initiatives, such as the Copernicus HRL (High Resolution Layers), LUCAS is used for production, verification and validation processes.

7.68 The rules for mapping LUCAS to FAO definition for forestry-related classes has been based on the semantic analysis of the classes reported in FRA 2015 "Forest Resources Assessment Working Paper 180", and in the LUCAS 2018 "Technical reference document C1: Instructions for Surveyors" published by FAO and Eurostat, respectively. For details on mapping LUCAS to FAO, see also LUCAS 2022.

7.69 The key elements and definitions for the forest classes used in LUCAS 2018 and in FAO (FRA 2015) are reported in tables below.

Table 7.12

Terms, definitions and remarks for the "woodland" class in LUCAS

Term	Definition	Remark
Woodland (C00)	Areas covered by trees with a canopy of at least 10%. Woody hedges and palm trees are also included in this class.	• Height of trees at maturity and width of woody features have to be assessed. • The 10% of canopy cover has to be assessed in the extended window of observation (area 0.13ha). • If the wooded area is larger than 0.5ha, the height of trees is above 5m at maturity and the width of the wooded feature is more than 20m, the surveyor has to indicate the forest cover code in the respective "LC plant species" field, according to the forest type classification of the European Environment Agency. • Trees that are known as forest trees can also be grown as an orchard.

Source: LUCAS (2018).

Table 7.13

Terms and definitions of the FAO forestry-related classes in FAO

Term	Definition
Forest	Land spanning more than 0.5ha with trees higher than 5m and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not defined as "Forest", spanning more than 0.5ha, with trees higher than 5m and a canopy cover of 5-10%, or trees able to reach these thresholds; or with a combined cover of shrubs, bushes, and trees above 10%. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as forest or other wooded land
Other land with tree cover (sub-category)	Land considered as "other land", that is predominantly under agricultural or urban land use and has patches of tree cover that span more than 0.5ha with a canopy cover of more than 10% of trees able to reach a height of 5m at maturity. It includes both forest and non-forest tree species

Source: FAO (2015).

7.70 In LUCAS, Woodland has been defined in a way that allows providing estimates compatible with the FAO results and hence should be able to be reconciled to EFA forest land accounts. The comparability with FAO forest classification has been strengthened with the inclusion of variables area size, height of trees, width of features and percentage of land cover. However, differences between the semantic definition of LUCAS wooded areas and FAO forest definitions have to be taken into account: if an area has > 10% of trees (excluding fruit trees in permanent crops) then in LUCAS it is labelled as "wooded area", FAO takes this into account only if it is > than 0.5ha. Thus, woodland in LUCAS includes: "Forest" and "Other wooded land" as defined according to FAO standards as well as other areas covered by trees but not respecting the FAO definition.

7.3.6. Copernicus data on forest area

7.71 Copernicus is an Earth observation component of the EU's Space programme, based on a combination of satellite and *in situ* observations, that supply data for six thematic streams of Copernicus services: atmosphere, marine, land, climate change, security, and emergency.

7.72 The Copernicus Land Monitoring Service (CLMS) is one of the most important European land cover surveys, incorporating its pan-European component the CORINE Land Cover (CLC) datasets, and High-Resolution Layers (HRL) for Forest. The CLMS provides

geospatial information on land cover and its changes, land use, vegetation state, water cycle and Earth's surface energy variables. By integrating this information, applications can support various domains including spatial planning and development, forest and water management, agriculture and food security, conservation and restoration, ecosystem accounting, mitigation / adaptation to climate change, and emergency management.

7.73 The CORINE Land Cover (CLC) is provided for 1990, 2000, 2006, 2012, and 2018. The vector-based dataset includes 44 land cover and land use classes (including four forest classes). The time-series includes a land change layer, highlighting changes in land cover and land-use. The countries validate collected information before publishing and aligning forest definitions on forest cover and land use.

7.74 The method used for the CLC map is a special remote sensing case because it is implemented by human delineation of the polygons using land use and land cover definitions[12]. The definitions differ from the definitions of NFIs and other remote sense methods (FISE, 2021).

7.75 The High-Resolution Layers (HRL) are raster-based datasets which provide information about different land cover characteristics and are complementary to land-cover mapping (e.g. CORINE) datasets. Three products are relevant for forest area that are available for the reference years 2012, 2015 and 2018: 1) tree cover density (TCD) (level of tree cover density in a range from 0-100%); 2) dominant leaf type (DLT) (broadleaved or coniferous majority); 3) forest type (FTY) which estimates the forest type product to get as close as possible to the FAO forest definition. No information is extracted on specific stand characteristics such as tree species, tree height, and stem diameter. Therefore, when using satellite data, it is very important to interpret and verify them against a national source, e.g. from NFIs (FISE, 2021).

7.3.7. Reporting on GHG emissions due to LULUCF

7.76 Accounting for carbon stocks and flows in forests, and the assessment of carbon sequestration are important considerations, as the capacity of forests to sequester and store carbon is an important contributor to the EU's climate change mitigation endeavour.

7.77 The land use, land use change and forestry (LULUCF) sector plays a key role in achieving EU's goal of zero net emissions by 2050, in accordance with the European Green Deal. The LULUCF Regulation (EU) 2023/839, revised in 2023, sets an EU-level land-based net carbon removal target of 310Mt CO2e by 2030, to be implemented through binding national net removal targets.

[12] For further detail, see EEA 2019 Corine Land Cover (CLC) illustrated nomenclature guidelines.

7.78 Under the UN Framework Convention on Climate Change (UNFCCC), parties annually report on land use, land use change and forestry (LULUCF) to provide information on carbon greenhouse gas emissions and removals from land use, including forests. The forest definition follows the 2006 IPCC Guidelines on national greenhouse gas inventories (vol. 4) which allows to set minimum thresholds for area, tree height and tree crown cover density according to national circumstances. Specific Member States implementations are reported in National Inventory Reports and listed in Annex II of the LULUCF Regulation. In some cases, there are differences between definitions in National inventory reports and the LULUCF Regulation which will require reconciliation for compliance (FISE, 2021).

7.79 As the UNFCCC focuses on anthropogenic emissions and removals, and this is distinguished by whether land is managed (anthropogenic) or unmanaged (non-anthropogenic), Parties also report on whether areas are managed or unmanaged. Using the land-based approach means including all the national territory in one of the six land use categories and all emissions and removals from managed land will then be included in the national greenhouse gas inventory. Countries provide information on the base of guidelines on the forest area following their own criteria for crown cover, tree height, minimum area (for land spanning elements) and minimum width (for linear elements) (FISE, 2021).

7.80 The following references are helpful in further understanding the relevant measurement issues:

a. Carbon stocks and sequestration in terrestrial and marine ecosystems: a lever for nature restoration? (EEA, 2022)

b. Measurements for Estimation of Carbon Stocks in Afforestation and Reforestation Project Activities under the Clean Development Mechanism: A Field Manual (UNFCCC, 2015)

c. How has the forest-based carbon sink and stock evolved in the European Union? (Harald Mauser (EFI), 2022)

Annexes

Annex A: Conversion factors

The forestry sector utilises conversion factors as a tool for measuring forests and wood-based forest products, and to support both current analysis and forecasting. Conversion factors enable converting units of measure (e.g. tonnes to m^3), completion of silvicultural growth models, undertaking biomass calculations, estimating forest carbon and appraisals of timber sales and values.

Due to a wide range of units in public use, and the diversity between them, as well as the broad scope of reporting requirements (EU-wide statistics, global statistics), a range of guidance and lists of conversion factors have been developed, enabling accurate and comparable reporting and analysis of trade and production data on wood-based forest products, and periodic assessments of the prospects for the forestry sector.

For the compilation of European Forest Accounts (EFA), conversion factors are most relevant for reporting on the items listed in the following EFA Questionnaire physical asset tables:

- Table A2a – timber on wooded land, in 1000m^3 over bark
- Table C1a – supply of wood in the rough by all industries, in 1000m^3 over bark
- Table C1b – use of wood in the rough by all industries, in 1000m^3 over bark

In compiling these tables, the following conversion factors can be considered:

Bark conversions: Depending on the source data used for removals, adjustment for bark conversion factor must be applied. A common factor is 10% but it can vary, therefore validation by forestry experts is beneficial. Comparisons should also be made to estimates reported annually in JFSQ, recognising that JFSQ reports in volumes under bark. Thus, when using JFSQ data to derive EFA estimates, conversion factors from under bark to over bark are needed. Additionally, conversion factors vary according to different species, and may also vary over time. Countries are encouraged to use nationally estimated conversion factors that relate to their individual contexts. Table A.1 below summarises the implied over bark / under bark ratio applied by countries over recent years. General conversion factors can be applied where national conversion factors are absent.

Units of measure conversions: When estimates of imports and exports are recorded in tonnes of dry matter, the volumes should be converted to cubic metres (m^3) of timber.

Table A.1

Over bark / under bark roundwood ratio, calculated based on data submitted to the Joint Forest Sector Questionnaire (JFSQ)

Country	2015	2016	2017	2018	2019	2020	2021	2022
Bulgaria (BG)	1.152	1.150	1.097	1.131	1.133	1.131	1.132	1.134
Estonia (EE)	1.141	1.141	1.145	1.145	1.145	1.145	1.148	1.148
Spain (ES)	1.174	1.290	1.170	1.171	1.170	1.172	1.174	1.174
France (FR)	1.179	1.179	1.179	1.124	1.124	1.115	1.115	-
Italy (IT)	1.568	1.163	1.165	1.163	1.134	1.143	-	-
Latvia (LV)	1.133	1.133	1.138	1.143	1.144	1.143	1.144	1.144
Lithuania (LT)	1.185	1.129	1.129	1.129	1.130	1.130	1.130	-
Luxembourg (LU)	1.150	1.000	1.176	1.176	1.176	1.176	1.176	1.176
Hungary (HU)	1.222	1.223	1.223	1.223	1.223	1.224	1.224	-
Netherlands (NL)	1.139	1.148	1.131	1.142	1.154	1.152	1.152	-
Austria (AT)	1.120	1.120	1.120	1.120	1.120	1.120	1.120	1.120-
Poland (PL)	1.111	1.111	1.111	1.111	1.111	1.111	1.111	1.111
Portugal (PT)	1.188	1.306	1.303	1.308	1.284	1.294	1.310	1.311
Romania (RO)	1.059	1.101	1.039	1.052	1.050	1.051	1.051	1.051
Slovenia (SI)	1.092	1.095	1.094	1.096	1.092	1.089	1.088	1.089
Slovakia (SK)	1.148	1.144	1.141	1.130	1.130	1.127	1.125	1.124
Finland (FI)	1.145	1.145	1.145	1.145	1.145	1.145	1.144	1.144
Sweden (SE)	1.200	1.200	1.140	1.140	1.141	1.152	1.152	1.152
Switzerland (CH)	1.097	1.097	1.097	1.098	1.098	1.099	1.098	1.098
Norway (NO)	1.111	1.111	1.102	1.168	1.105	1.105	1.000	1.096

For further detail on conversion factors, following sources are relevant:

- FAO, ITTO and United Nations 2020 "Forest Product Conversion Factors"
- UNECE/FAO 2010 "Forest product conversion factors for the UNECE Region."

Annex B: NACE – CPA – EFA correspondence table on the products and activities for output

Table B.1

EFA correspondence table

NACE Rev. 2	NACE ACTIVITY	CPA Ver 2.1	CPA PRODUCT	EFA
02	FORESTRY AND LOGGING INDUSTRY			
02.1	Silviculture and other forestry activities			
		02.10.1	live forest tree plants; tree seeds	1.1.1.1 Live forest tree plants and tree seeds
		02.10.11	live forest tree plants	1.1.1.1 Live forest tree plants and tree seeds
		02.10.12	forest tree seeds	1.1.1.1 Live forest tree plants and tree seeds
		02.20.2 to 02.10.20	forest tree nursery services	1.2 Services characteristic of the forestry and logging activity
		02.10.3 to 02.10.30	forest trees	1.1.1.2 Forest trees
02.2	**Logging**			

NACE Rev. 2	NACE ACTIVITY	CPA Ver 2.1	CPA PRODUCT	EFA
02.20	Logging	02.20.1	wood in the rough	1.1.2 Wood in the rough (includes charcoal produced in the forest)
		02.20.11	logs of coniferous wood	1.1.2.1 Logs
		02.20.12	logs of non-coniferous wood, except tropical wood	1.1.2.1 Logs
		02.20.13	logs of tropical wood	1.1.2.1 Logs
			any other wood in the rough except fuel wood	1.1.2.1 Logs
		02.20.14	fuel wood of coniferous wood	1.1.2.2 Fuel wood (includes charcoal produced in the forest)
		02.20.15	fuel wood of non-coniferous wood	1.1.2.2 Fuel wood (includes charcoal produced in the forest)
02.3	**Gathering of wild growing non-wood products**			
02.30	Gathering of wild growing non-wood products	02.30.1	natural gums	1.1.4 Non-wood products
		02.30.11	Balata, gutta-percha, guayula, chicle and similar natural gums	1.1.4 Non-wood products
		02.30.12	Lac, balsams and other natural gums and resins	1.1.4 Non-wood products
		02.30.2 to 02.30.20	natural cork, raw or simply prepared	1.1.4 Non-wood products

NACE Rev. 2	NACE ACTIVITY	CPA Ver 2.1	CPA PRODUCT	EFA
		02.30.3 to 02.30.30	parts of plants, grasses, mosses and lichens suitable for ornamental purposes	1.1.4 Non-wood products
		02.30.4 to 02.30.40	wild growing edible products	1.1.4 Non-wood products
			any other wild growing non-wood product	1.1.4 Non-wood products
02.4	**Support services to forestry**			
		02.4 to 02.40.10	support services to forestry	1.2 Services characteristic of the forestry and logging activity
			any other services provided by a local KAU belonging to the forestry industry	1.2 Services characteristic of the forestry and logging activity
	OTHER INDUSTRIES			
	Other products from connected secondary activities in the local KAU			
01.13	Growing of vegetables and melons, roots, and tubers	01.13.8 to 01.13.80	mushrooms and truffles	1.3 Other products from connected secondary activities in the local KAU
01.25	Growing of other tree and bush fruits and nuts	01.25.19	other berries, the fruits of the genus vaccinium n.e.c.	1.3 Other products from connected secondary activities in the local KAU
01.29	Growing of other perennial crops	01.29.10	natural rubber	1.3 Other products from connected secondary activities in the local KAU

NACE Rev. 2	NACE ACTIVITY	CPA Ver 2.1	CPA PRODUCT	EFA
16.10 / 16.11 (Rev 2.1)	Sawmilling and plaining of wood	16.10.39	other wood in the rough, including split poles and pickets	1.3 Other products from connected secondary activities in the local KAU
20.14	Manufacture of other organic basic chemicals	20.14.72	wood charcoal	1.3 Other products from connected secondary activities in the local KAU
91.04 / 91.42 (Rev 2.1)	Botanical and zoological gardens and nature reserves activities / Nature reserve activities (Rev 2.1)	91.04.12	Nature reserve services, including wildlife preservation services	1.3 Other products from connected secondary activities in the local KAU
			any other product produced by a local KAU	1.3 Other products from connected secondary activities in the local KAU
	Other products			
08.92	Extraction of peat	08.92	Peat	1.4 Other products

Glossary

Afforestation and other increase refer to the increases in the area of classes of wooded land due to (i) the establishment of new forest on land that was previously not classified as wooded land; (ii) silvicultural measures such as planting and seeding (including conversion of other wooded land to forest); or (iii) natural succession arising from natural seeding, sprouting, suckering or layering (SEEA CF, 5.291-292).

Annual Work Unit (AWU) An annual work unit (AWU) corresponds to the work performed by one person who is occupied in a forestry and logging local KAU on a full-time basis. Full-time means the minimum hours required by the relevant national provisions governing contracts of employment. To allow cross-country comparisons and the calculation of the EU aggregate, EFA uses – in addition to country-specific calculations – a harmonized AWU representing 1800 working hours, equivalent to 225 working days, per year (Eurostat, 2021).

Basic price is defined as the price receivable by the producers from the purchaser for a unit of good or service produced as output minus any tax (i.e., taxes on products) payable on that unit as a consequence of its production or sale, plus any subsidy (i.e., subsidies on products) receivable on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. It also excludes holding gains and losses on financial and non-financial assets (ESA 2010, 3.44).

Capital transfers require the acquisition or disposal of an asset, by at least one of the parties to the transaction. Made in cash or in kind, they result in a commensurate change in the financial, or non-financial, assets shown in the balance sheets of one or both parties to the transaction (ESA 2010, 4.145).

Changes in inventories (ESA code P.52) are measured by the value of the entries into inventories less the value of withdrawals and less the value of any recurrent losses of goods held in inventories during the accounting period (ESA 2010, 3.146).

CIF price (cost, insurance, freight) is defined as “the price of a good delivered at the frontier of the importing country, or the price of a service delivered to a resident, before the payment of any import duties or other taxes on imports or trade and transport margins within the country.” (ESA 2010, 3.169).

Closing area / closing stocks refers to the area / volume of stocks measured at the end of the given reference period. It must equal to the opening area or opening stocks measured at the start of the following reference period. Opening area / stock value plus changes in area / stocks (additions less reductions) must equal the closing area / stocks.

Compensation of employees is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during an accounting period. The employee compensation is made up of gross wages and salaries, and employers' social contributions (actual and imputed pension and non-pension contributions) (ESA 2010, 4.02).

Consumption of fixed capital (CFC) is the decline in value of fixed assets owned, as a result of normal wear and tear and obsolescence. The estimate of decline in value includes a provision for losses of fixed assets as a result of accidental damage which can be insured against. Consumption of fixed capital covers anticipated terminal costs. Such terminal costs are recorded as consumption of fixed capital at the end of the service life, when the terminal costs are recorded as gross fixed capital formation (ESA 2010, 3.139).

Dead wood (deadwood) is 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, and stumps larger than or equal to 10cm in diameter, or any other diameter used by the country (FAO FRA T&D 2025).

Deforestation and other decrease refers to decreases in the area of classes of wooded land due to (i) the complete loss of tree cover and transfer of wooded land to other uses (e.g. use as agricultural land, land under buildings or roads) or to no identifiable use (noting that removals of standing timber or standing timber destroyed by fires do not lead to decreases in wooded land unless the land use also changes after felling or other exogenous event); or (ii) natural regression (adapted from SEEA CF, 5.293-294).

Entrepreneurial income (ESA code B.4n) corresponds to the operating surplus or mixed income (on the resources side): plus property income receivable in connection with financial and other assets belonging to the enterprise (on the resources side), minus interest on debts payable by the enterprise, other investment income payable, and rents payable on land and other *natural* resources rented by the enterprise (on the uses side). Property income payable in the form of dividends, withdrawals of income from quasi-corporations, or reinvested earnings on foreign direct investment, is not deducted from entrepreneurial income (ESA 2010, 8.28).

Exports consist of transactions in goods and services (sales, barter, and gifts) from residents to non-residents (ESA 2010, 3.158). Exports are valued FOB ("free on board") at the point of exit from the exporter's economy. It includes the cost of transport from the exporter's premises to the border of the exporting economy. (SNA 2008, 14.70).

Final consumption concerns to two concepts: (a) final consumption expenditure (ESA code P.3); (b) actual final consumption (ESA code P.4). Final consumption expenditure is expenditure on goods and services used by households, NPISHs and government to satisfy individual and collective needs. In contrast, actual final consumption refers to its acquisition of consumption goods and

services. The difference between these concepts lies in the treatment of certain goods and services financed by the government or NPISHs (non-profit institutions serving households) but supplied to households as social transfers in kind (ESA 2010, 3.93).

Fixed assets (ESA code AN.11) are produced non-financial assets that are used repeatedly or continuously in production processes for more than one year. Fixed assets consist of dwellings, other buildings and structures, machinery and equipment, weapons systems, cultivated biological resources, and intellectual property products (ESA 2010, Annex 7.1).

Forest is defined as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10% or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural land use or trees in urban settings, such as city parks, alleys and gardens (Regulation (EU) 691/2011 Annex VII; FAO FRA T&D 2025).

Forest available for wood supply (FAWS) are forests where any environmental, social, or economic restrictions do not have a significant impact on the current or potential supply of wood. These restrictions can be established by legal rules, managerial/owner's decisions or because of other reasons (Regulation (EU) 691/2011 Annex VII).

Forest not available for wood supply (FNAWS) are forests that are not considered available for wood supply. These are forests where environmental, social, economic, or legal restrictions prevent any significant wood supply. It includes (a) forests with legal restrictions or restrictions resulting from other political decisions that totally exclude or severely limit wood supply for reasons such as environmental or biodiversity conservation (protection forest, national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest); (b) forests where physical productivity or wood quality is too low or harvesting and transport costs are too high to justify wood harvesting, apart from occasional cuttings for auto-consumption (Regulation (EU) 691/2011 Annex VII).

Forest trees constitute the most significant part of the output in forestry and logging industry. The product Forest trees is measured as the net increment of timber in cultivated forests (Regulation (EU) 691/2011 Annex VII).

Free-on-board (FOB) (ESA code P.61) refers to the valuing of imports and exports of goods at the border of the exporting country. This value is: (a) the value of the goods at basic prices; (b) plus the related transport and distributive services up to that point of the border, including the cost of loading on to a carrier for onward transportation; (c) plus any taxes less subsidies on the goods exported; for intra-EU deliveries this includes VAT and other taxes on the goods paid in the exporting country (ESA 2010, 3.168).

Fuel wood (wood fuel) comprises of wood intended to be used for energy purposes either directly or indirectly, in logs, billets, twigs, faggots, or similar forms (Eurostat, 2021). Fuel wood uses include cooking, heating, and power production. It includes wood harvested from main stems, branches, and other parts of trees (where these are harvested for fuel), round or split, and wood that will be used for the production of charcoal (e.g. in pit kilns and portable ovens), wood pellets and other agglomerates (JFSQ T&D 2021).

Gross capital formation consists of: (a) gross fixed capital formation (P.51g): (1) consumption of fixed capital (P.51c); (2) net fixed capital formation (P.51n); (b) changes in inventories (P.52); (c) acquisitions less disposals of valuables (P.53). Gross capital formation is measured gross of consumption of fixed capital. Net capital formation is calculated by deducting consumption of fixed capital from gross capital formation (ESA 2010, 3.122-123).

Gross fixed capital formation (GFCF) consists of resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are produced assets used in production for more than one year. GFCF represents the difference between investments and disposals of fixed assets. Investments include new or existing fixed assets: purchased, acquired through barter, or received as capital transfers in kind; fixed assets produced and retained for producers' own use, including own account production of fixed assets not yet completed or fully matured. Disposals include existing fixed assets sold, surrendered in barter, or surrendered as capital transfers in kind) (ESA 2010, 3.124-125). GFCF is valued at purchasers' prices including installation charges and other costs of ownership transfer. When produced on own account, it is valued at the basic prices of similar fixed assets, and if such prices are unavailable, at the costs of production plus a mark-up (except for non-market producers) for net operating surplus or mixed income (ESA 2010, 3.135).

Gross operating surplus (GOS) (ESA code B.2g) can be defined in the context of national accounts as a balancing item in the generation of income account representing the remuneration of the production factor capital. GOS differs from profits shown in company accounts for several reasons. Only a subset of total costs are subtracted from gross output to calculate the GOS. Essentially GOS is gross output less the cost of intermediate goods and services to give gross value added, and less compensation of employees and taxes and subsidies on production and imports. It is *gross* because it makes no allowance for consumption of fixed capital (Eurostat, 2024. Statistics Explained. Glossary).

Gross value added (GVA) is defined as output valued at basic prices less intermediate consumption valued at purchasers' prices (ESA 2010, 9.31).

Imports are valued at the customs frontier of the exporting country. The import values will be collected at prices including "cost, insurance and freight' (CIF) incurred between the country of origin and the importing country i.e. on a CIF basis (ESA 2010, 8.69).

Industrial roundwood is the sum of sawlogs and veneer logs; pulpwood, round and split; and other industrial roundwood (JFSQ T&D, 2021).

Intermediate consumption (ESA code P.2) consists of goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services are either transformed or used up by the production process (ESA, 3.88).

Irretrievable losses are defined as felling residues and all fellings from windthrow that cannot be removed from the forest, and timber lost through forest fires (Regulation (EU) 691/2011 Annex VII).

Kind-of-activity-unit (KAU) is a part of an enterprise. The KAU groups together all the offices, production facilities etc. of an enterprise, which contribute to the performance of a specific economic activity defined at class level (four digits) of the European classification of economic activities (NACE Rev. 2.). In order to statistically subdivide enterprises into KAUs, the enterprise's information system must be capable of indicating or calculating for each KAU at least the value of production, intermediate consumption, manpower costs, the operating surplus, employment and gross fixed capital formation (Eurostat, 2024. Statistics Explained. Glossary).

Labour inputs are classified on the basis of the same statistical units as used for the analysis of production, namely the local kind-of-activity unit and the institutional unit. The aggregates of the labour input figures are usually annual totals, for which average labour input during the year has to be used, and include allowances made for casual and seasonal work (ESA 2010, 11.03-04).

Local kind-of-activity unit (local KAU, LKAU) is the part of a kind-of-activity unit (KAU) which corresponds to a local unit. The local KAU is called establishment in the 2008 SNA and ISIC Rev. 4. A KAU groups all the parts of an institutional unit in its capacity as producer contributing to the performance of an activity at class level (four digits) of the NACE Rev. 2 and corresponds to one or more operational subdivisions of the institutional unit. The institutional unit’s information system must be capable of indicating or calculating for each local KAU at least the value of production, intermediate consumption, compensation of employees, the operating surplus and employment and gross fixed capital formation (ESA 2010, 2.148).

Logs refers to a category of wood in the rough (industrial roundwood), i.e. the sum of logs of coniferous wood (CPA product 02.20.11), logs of non-coniferous wood except tropical wood (product 02.20.12), and logs of tropical wood (product 02.20.13) (Regulation (EU) 691/2011 Annex VII)

Market output (ESA code P.11) consists of output that is disposed of on the market or intended to be disposed of on the market. Market output includes: (a) products sold at economically significant prices; (b) products bartered; (c) products used for payments in kind (including compensation of employees in kind and mixed income in kind); (d) products supplied by one local KAU to another within the same institutional unit to be used as intermediate inputs or for final uses; (e) products added to the inventories of finished goods and work-in-progress intended for one or other of the above uses (including natural growth of animal and vegetable products and uncompleted structures for which the buyer is unknown) (ESA 2010, 3.17-18).

Mixed income (ESA code B.3n) – In the case of unincorporated enterprises in the households sector, the balancing item of the generation of income account implicitly contains an element corresponding to remuneration for work carried out by the owner or members of the family. This income from self-employment has characteristics of wages and salaries, and characteristics of profit due to work carried out as an entrepreneur. This income, neither strictly wages nor profits alone, is referred to as ‘mixed income’ (ESA 2010, 8.19)

Net annual increment of timber is defined as the average annual volume growth of live trees. It is calculated from the live tree stock (growing stock) available at the start of the year less the average annual mortality (Regulation (EU) 691/2011 Annex VII)

Net operating surplus (NOS) (ESA code B.2n) is calculated by deducting consumption of fixed capital (CFC) from gross operating surplus (GOS) (Eurostat, 2024. Statistics Explained. Glossary).

Net value added (NVA) is equal to gross value added (GVA) less consumption of fixed capital (ESA 2010, 3.145).

Non-market output (ESA code P.13) refers to output that is provided to other units for free, or at prices that are not economically significant. Non-market output (P.13) is subdivided into two items: 'Payments for non-market output' (P.131), which consists of various fees and charges, and 'Non-market output, other' (P.132), which is output provided for free. Non-market output is produced for the following reasons: (a) It may be technically impossible to make individuals pay for collective services because their consumption of such services cannot be monitored and controlled. The production of collective services is organised by government units and financed out of funds other than receipts from sales, namely taxation or other government incomes; (b) Government units and NPISHs may also produce and supply goods or services to individual households for which they could charge but choose not to do so as a matter of social or economic policy. Examples are the provision of education or health services, for free or at prices that are not economically significant. (ESA 2010, 3.23).

Non-wood forest products (NWFP) are goods derived from forests that are tangible and physical objects of biological origin other than wood (FAO FRA T&D 2025).

Opening area / opening stocks refers to the area / volume of stocks measured at the beginning of the given reference period. It must equal to the closing area / stocks measured at the end of the previous reference period.

Other industrial roundwood is defined as industrial roundwood (wood in the rough) other than sawlogs, veneer logs and/or pulpwood. It includes roundwood used for poles, piling, posts, fencing, pitprops, shingles and shakes, wood wool, tanning, distillation, shiitake mushroom growing and match blocks, etc (JFSQ T&D 2021).

Other land with tree cover is land classified as "Remaining land area", spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity (FAO FRA T&D 2025).

Other land with tree cover available for wood supply includes agroforestry, short-rotation forestry and short-rotation coppices on agricultural land. Orchards of fruit or nut trees are excluded (Eurostat, 2021.).

Other subsidies on production consist of subsidies except subsidies on products which resident producer units may receive as a consequence of engaging in production (ESA 2010, 4.36).

Other taxes on production consist of all taxes that enterprises incur as a result of engaging in production, independent of the quantity or value of the goods and services produced or sold. These may be payable on the land, fixed assets or labour employed in the production process or on certain activities or transactions (ESA 2010, 4.22).

Other wooded land (OWL) is defined as land not classified as "forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10% or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees greater than 10%. It does not include land that is predominantly under agricultural land use or trees in urban settings, such as city parks, alleys and gardens (Regulation (EU) 691/2011 Annex VII; FAO FRA T&D 2025).

Output is the total of products created during the accounting period. Examples of output include the following: (a) the goods and services which one local KAU provides to a different local KAU belonging to the same institutional unit; (b) the goods produced by a local KAU that remain in inventories at the end of the period in which they are produced, whatever their subsequent use. Goods and services produced and consumed within the same accounting period and within the same local KAU are not separately identified. They are not recorded as part of the output or intermediate consumption of that local KAU. (ESA 2010, 3.14). Three types of output are distinguished in the ESA 2010: (a) market output (P.11); (b) output produced for own final use (P.12); (c) non-market output (P.13) (ESA 2010, 3.16).

Output produced for own final use (ESA code P.12) covers the total value of goods and services that are retained either for final consumption or for gross fixed capital formation by the same institutional unit (ESA 2010, 3.20).

Principal activity of a local KAU is the activity where the value added of such activity exceeds that of any other activity carried out within the same unit. The classification of the principal activity is determined by reference to NACE Rev. 2, first at the highest level of the classification and then at more detailed levels (ESA 2010, 3.10).

Producer's prices approach implies that all taxes on both products and production (possibly excluding any VAT type taxes) will be included in the value of output, and all subsidies on both products and production will be excluded (SNA 2008, 16.49).

Product balance for any product recognises that the sum of output at basic prices plus imports plus trade and transport margins plus taxes on products less subsidies on products is equal to the sum of intermediate consumption, final consumption, and capital formation, all expressed at purchasers' prices, plus exports (SNA 2008 14.5).

Property income (ESA code D.4) is the sum of investment income and rent (ESA 2010, 4.41).

Purchaser's price is the price the purchaser pays for the products. The purchaser's price includes the following: (a) taxes less subsidies on the products (but excluding deductible taxes like VAT on the products); (b) transport charges paid separately by the purchaser to take delivery at the required time and place; (c) deductions for any discounts for bulk or off-peak-purchases from standard prices or charges. The purchaser's price excludes the following: (a) interest or services charges added

under credit arrangements; (b) extra charges incurred as a result of late payment, where late payment means failing to pay within the period stated at the time the purchases were made (ESA 2010, 3.06).

Reclassification are changes in assets that result from situations in which an asset is used for a different purpose. A reclassification of an asset in one category should be offset by an equivalent reclassification in another category. (SEEA CF, 5.48-49).

Removals are defined as 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 unsold roundwood stored at the forest roadside. It also includes natural losses that are recovered, removals during the year of wood felled in an earlier period, removals of non-stem wood (such as stumps and branches), and removal of trees killed or damaged by natural causes (known as natural losses), e.g. fire, wind, insects, and diseases. It does not include non-woody biomass or any wood that is left in the forest and not removed during the year, e.g. stumps, branches, treetops and felling residues (harvesting waste) (Regulation (EU) 691/2011 Annex VII).

Revaluation relates to changes in the value of assets due solely to price changes and reflect nominal holding gains and losses on environmental assets. The nominal holding gain for environmental assets is calculated as the increase in value accruing to the owner of the asset as a result of a change in its price over an accounting period (SEEA CF, 5.60).

Roadside pickup price, also referred to as the wood in the rough or raw wood prices, is the price paid for the logged timber at the roadside, ready for the subsequent transport and processing.

Secondary activity is an activity carried out within a single local KAU in addition to the principal activity. The output of the secondary activity is a secondary product (ESA 2010, 3.11).

Stumpage price is an output price related to a finished, unharvested tree**.** It reflects the price paid for timber as it stands – before being cut – in the forest, differentiated by different categories (types of trees, size class, standing or blown down and broken, quality of the wood, topography of the site, etc.) (Eurostat, 2021).

Taxes less subsidies on production consist of taxes payable or subsidies receivable on goods or services produced as outputs and other taxes or subsidies on production, such as those payable on the labour, machinery, buildings or other assets used in production". Taxes on production do not include any income taxes payable by the recipients of incomes accruing from production, whether employers or employees (SNA 2008, 7.5).

Timber stocks (also referred to as **stock of timber, growing stock, growing stock of timber, timber resources)** are 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. 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 (SEEA CF, 5.350).

Total factor income is equal to value added at basic prices less other taxes on production plus other subsidies on production (ESA 2010, 9.32).

Total intermediate consumption is defined as goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services are either transformed or used up by the production process (ESA 2010, 3.88).

Trade margins are defined as the difference between the actual or imputed sale price realised on a good purchased for resale, and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of (ESA 2010, 3.56). Trade margins are usually produced within the economy but may apply to both domestic production and to imports (SNA 2008, 14.52).

Transport margins may be provided by and to both residents and non-residents, though it is helpful to consider the case of domestic transport charges first and see how they are included in the supply and use tables before turning to transport margins on imports. Typical entries for transport margins are treated in the same manner as trade margins (SNA 2008, 14.51-53).

Tree, crop and plant resources yielding repeat products (ESA code AN.1152) refer to trees (including vines and shrubs) cultivated for products they yield year after year, including those cultivated for fruits and nuts, for sap and resin and for bark and leaf products, whose natural growth and regeneration are under the direct control, responsibility and management of institutional units ESA 2010, Annex 7.1)

Wood in the rough (roundwood) including sales of timber from uncultivated forests, comprises the following items (a) fuel wood and (b) logs (Regulation (EU) 691/2011 Annex VII). It includes all wood obtained from removals from forests and other wooded land in both cultivated and natural production contexts. It includes wood from planned harvesting operations and wood recovered from incidental fellings. It does not include the felled wood left in forests in the form of felling residues.

Work-in-progress on cultivated biological assets (ESA code AN.1221) refers to livestock raised for products yielded only on slaughter, such as fowl and fish raised commercially, trees and other vegetation yielding once-only products on destruction and immature cultivated assets yielding repeat products (ESA 2010, Annex 7.1).

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