EFORWOOD
Tools for Sustainability Impact Assessment

Manual for data collection for Regional and European cases

Staffan Berg

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Preface

This report is a deliverable from the EU FP6 Integrated Project EFORWOOD – Tools for Sustainability Impact Assessment of the Forestry-Wood Chain. The main objective of EFORWOOD was to develop a tool for Sustainability Impact Assessment (SIA) of Forestry-Wood Chains (FWC) at various scales of geographic area and time perspective. A FWC is determined by economic, ecological, technical, political and social factors, and consists of a number of interconnected processes, from forest regeneration to the end-of-life scenarios of wood-based products. EFORWOOD produced, as an output, a tool, which allows for analysis of sustainability impacts of existing and future FWCs.

The European Forest Institute (EFI) kindly offered the EFORWOOD project consortium to publish relevant deliverables from the project in EFI Technical Reports. The reports published here are project deliverables/results produced over time during the fifty-two months (2005–2010) project period. The reports have not always been subject to a thorough review process and many of them are in the process of, or will be reworked into journal articles, etc. for publication elsewhere. Some of them are just published as a "front-page", the reason being that they might contain restricted information. In case you are interested in one of these reports you may contact the corresponding organisation highlighted on the cover page.

Uppsala in November 2010

Kaj Rosén
EFORWOOD coordinator
The Forestry Research Institute of Sweden (Skogforsk)
Uppsala Science Park
SE-751 83 Uppsala
E-mail: firstname.lastname@skogforsk.se

EFORWOOD

Sustainability Impact Assessment of the Forestry - Wood Chain

Project no. 518128

EFORWOOD

Tools for Sustainability Impact Assessment

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Final version

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Dissemination level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

MANUAL FOR DATA COLLECTION FOR REGIONAL AND EUROPEAN CASES

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INTRODUCTION

This paper is undertaken according to decisions by the IP Board (28) at the Eforwood meeting in Vienna, 5 7 May 2008, in order to support participating EFORWOOD scientists in their data collection for regional cases and the European case.

SCOPE AND OBJECTIVE OF THE MANUAL

The manual is directed to the data collection groups on Energy, Environment, Socio-Economics, Transport and Waste in order to support their members to design data collection forms for the indicators to be considered in regional case studies and the European case. The main idea is to have a common format for each indicator regarding measurement units, boundaries, recommendation and sources and means to procure and calculate values on indicators. There are also spaces for module specific recommendations and key definitions that should be considered in order to have a defined data quality.

ABOUT NUMBERING OF INDICATORS

The numbering of Indicators is according to FWC Sustainability Indicators, revised set 2008, draft April 30th 2008. This numbering may different to the numbers of indicators in the data client interfaces. Not all indicators are supplied with values in all studies. The table below point those indicators in bold.

Revised FWC set	Scandinavian case	Baden-Württemberg	Iberian case	EU case
(1) Gross value added				
(2) Production costs				
(3) Trade balance				x
(4) Resource use, incl. recycled material				
(5) Forest sector enterprise structure		x		(x)
(6) Investment and R&D				
(7) Total production				
(8) Productivity	x	x	x	
(9) Innovation				x
(10) Employment (parts of: rurality)				
(11) Wages and salaries				
(12) Occupational safety and health				
(13) Education and training				
(14) Corporate social responsibility			x	
(15) Quality of employment		x		
(16) Provision of public forest services				x
(17) Consumer behaviour and attitudes				x
(18) Energy generation and use				
(19) GHG emissions and carbon stock				
(20) Transport				
(21) Water use (parts of: ecosystem)				

(22) Forest resources				
(23) Soil condition	x	x		
(24) Water and air pollution		x		
(25) Forest biodiversity (delayed DCP)	x			(x)
(26) Forest damage		x		(x)

GENERAL APPROACH/RULES AND DEFINITIONS

In order to have a smooth operation of ToSIA, there are some general rules valid for data collection in general:

- One **measurement unit** per indicator and indicator subclass per processes. The process is the highest level of detail. All indicators included in the indicator framework have defined measurement units e.g. the measurement unit for the production cost indicator is **€.**
- One **reporting unit** per process. In M2 the indicators are reported per ha and year, and in M3 to M5 there are several reporting units (M2: ha*yr; M3-M5: m^3 or tons). The indicators are calculated per unit of input material flow (the so called **reporting unit)**. In ToSIA, indicators are linked to the material input flow of the process in the selected FWC to calculate the indicator value. E.g. The production cost indicator (subclass labour cost) is calculated for the process transportation of pellets to home scale use; - input material flow to this process = tons of pellets; - the measurement unit of the indicator = €;- the labour cost of transportation is 2,7 €/ton of pellets. The **reporting unit** in our example **per tons of pellets**
- Not explicitly covered in this protocol is the internal **reference unit** used in ToSIA is one ha for Module 2, forest resource management, and one ton of C content in the wood or wood product for all other processes of the project modules 3-5. The reference unit (ha in M2 and Tons of carbon in M3-M5) is the information carrier in ToSIA, is used internally by the application.
- **Conversion factors** are required to convert the product units in the database to different units Each individual product needs several conversion factors. See conversion factor section below.
- If data for a specific indicator is missing, set data availability **not applicable** in case the indicator does not make sense, (- example biodiversity in M4) or set a **zero (0)** value to indicator, if by a change of system (e.g. technical scenario) it could be something else than 0.
- If the indicator is relevant and exact data is missing, **a rough estimate** ("expert opinion") is to be preferred instead of a missing value.
- The presentation of Aske Skovmand Bosselmand available at the link below gives valuable advices for indicators (1), (2), (8), and (9) http://87.192.2.59/Eforwood/DesktopDefault.aspx?tabindex=-1&tabid=598

Many times there are data at hand, but the issue is rather to exercise priorities in procuring them. A practical way is to identify a dominant or comparable system, e.g. technical or

biological, which usually have comprehensive data with defined origin and quality. The rationale for this consideration is the dominant or comparable system exists because it is economically, technically and socially viable. Competitive systems should have similar properties etc. that are satisfactory for the parties. In order to aid the EFORWOOD scientist in finding data, three clusters of data availability are exemplified and identified here below. These can be selected, individually per subclass, for recommendations by the data collection groups or for data collection by the EFORWOOD scientist performing the collection.

A. Specific and empirical

- follow up routines from enterprises
- data from experiments or scientific measurements
- branch statistics.

B. Generic and derived

- official statistics
- weighting or scaling factors relevant for adaption of generic data to specific data for the actual case. E.g. average data of costs per cutting form (final felling/thinning) is adapted to the case in question with the aid of case specific shares of cutting forms.

C. Model-based and estimated

- modelling; e.g. harvest costs and time use model.
- experts' judgement.

The final procurement of data to indicators for a process, may involve a combination of cluster categories.

OVERVIEW OF DATA NEEDS

Data that is collected for the case studies and European FWC

- FWC topology (specified production processes and their linkages). This needs to be entered to the Data Client and is a prerequisite for the database. With incomplete chain structure, data collection is not feasible.

- Process description including input and output products and meta-data about the underlying assumptions of the process

    - Time duration of development stages in M2 processes according to management guidelines (entered as a Module-specific process attribute for M2; the “time multiplier”).

    - Average life-time of wood products in the use/consumption process (entered as a Module-specific process attribute for M5; the “life-time multiplier”)

- Product shares for input and output products for the year 2005. (Scenario implementation will be defined later.)

- Conversion factors for products from reporting unit to internal ToSIA reference unit. For presentation purposes and application of CBA, ToSIA needs also conversion factors from kg and EUR to the internal reference unit.

- To transform the ha information in M2 to carbon flow in M3-M5, there are some specific data needs for the last M2 and first M3 processes around the boundary. See a separate section below.

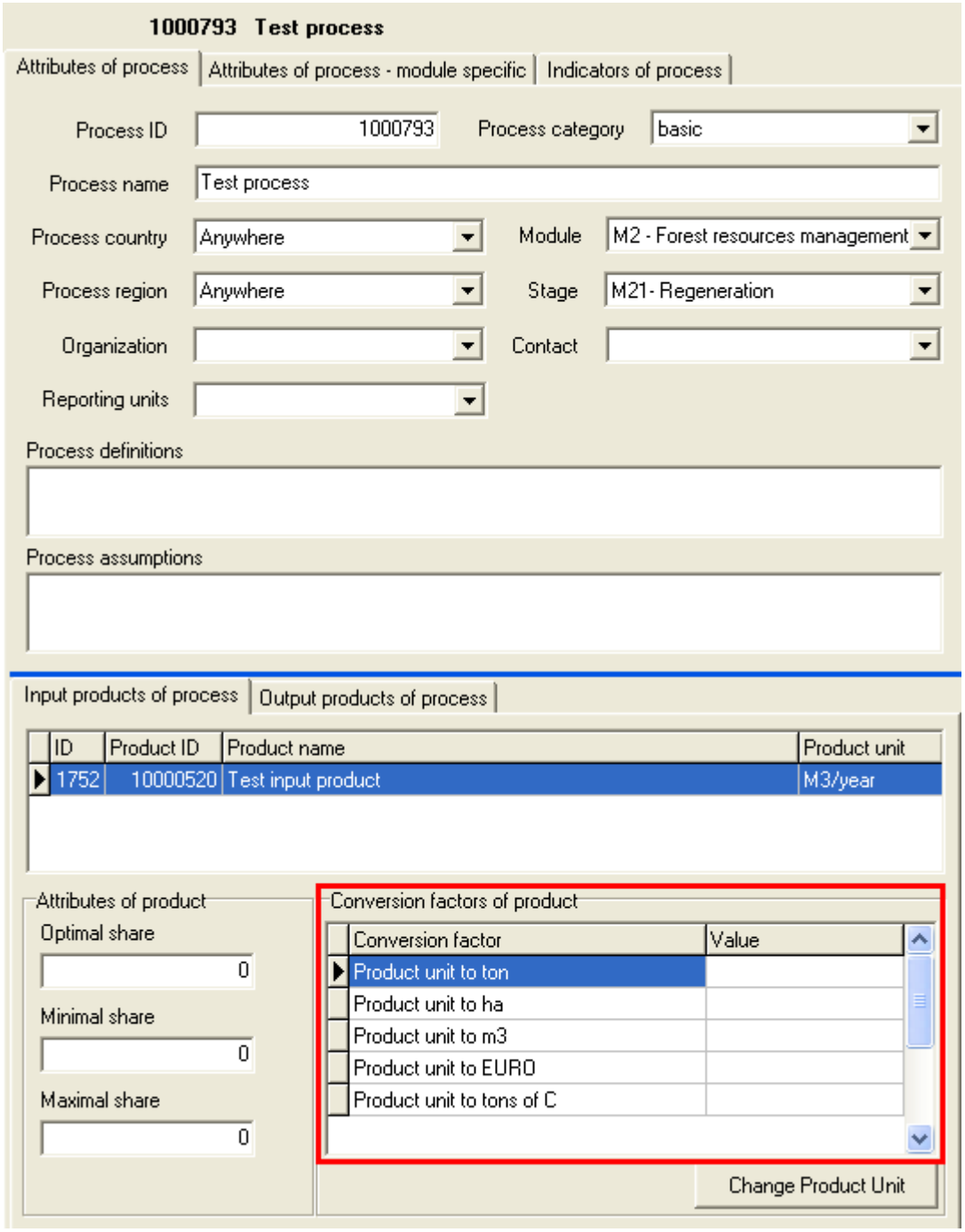
- indicator data

CONVERSION FACTORS

Conversion factors are used in ToSIA for conversions between different units. Conversions are needed for products: the product units need to be converted to reporting units of the processes, to internal reference units (tons of carbon) or to Euros for the ToSIA calculations.

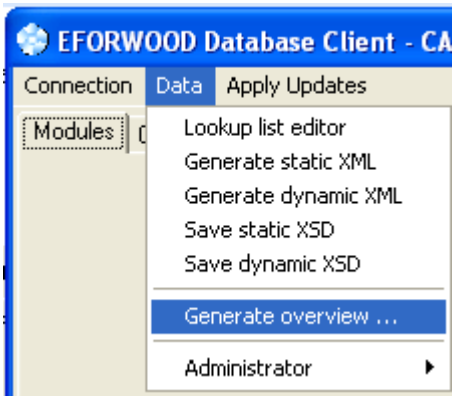
Conversion factors are provided by module experts. Values can be entered directly into the EFORWOOD database using the database client or into the template excel file.

1. Database client:

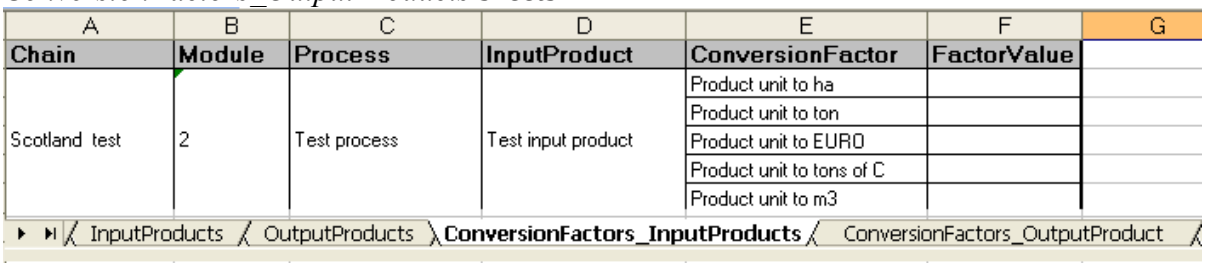


Please note that conversion factors are linked to input / output products, it is necessary to provide values for each input / output product.

2. Excel file: generate the template using the *database client / Data / Generate overview* function.



To fill in the conversion factors use the *ConversionFactors_InputProducts / ConversionFactors_OutputProducts* sheets



	A	B	C	D	E	F	G
	Chain	**Module**	**Process**	**InputProduct**	**ConversionFactor**	**FactorValue**	
	Scotland test	2	Test process	Test input product	Product unit to ha		
					Product unit to ton		
					Product unit to EURO		
					Product unit to tons of C		
					Product unit to m3		

InputProducts | OutputProducts | **ConversionFactors_InputProducts** | ConversionFactors_OutputProduct

The table below shows what conversion factors are required for

		Product units						
		ha	m^3	m^3 ob	m^3 ub	tons	TJ	kWh
Reporting units of processes and other units needed by ToSIA:	ha (in M2)	NA (=1)	NA	NA	NA	NA	NA	NA
	m^3	NA	NA (=1)	TIF	TIF	TIF	TIF	TIF
	tons	NA	TR	TR	TR	NA (=1)	TR	TR
	tons of carbon	NA	TR	TR	TR	TR	TR	TR
	€	TR	TR	TR	TR	TR	TR	TR

NA = not applicable/not to be reported
TR = to be reported
TIF = to be reported IF reporting unit of the process is m^3

INFORMATION FLOW OVER THE M2/M3 BOUNDARY

In ToSIA, internal reference unit used in M2 is hectare whereas the reference unit in M3-M5 is ton of carbon. The information flow over the M2/M3 boundary includes the transformation of the ha information to carbon. That is done with the help of transformation factors. To ensure the fluent flow of information, the following information is collected and reported to the database client for the processes besides the M2/M3 boundary (i.e. for the last processes of M2 and the first processes in M3):

M2 collects:

Collected data	Unit	Symbol
Area of the managed forest in the process in question	ha a^{-1}	A
Total standing stem wood (conifers) and total wood (broadleaved) volume (over bark) from ground to tip of tree marked to be cut. Volume is reported as solid volume[a]. That is all volume above a certain minimum diameter threshold, e.g. above 7 cm in Baden-Württemberg (V_7).	m^3 ob ha^{-1}	V_S
Volume of tree tops and branches (additional to volumes specified in V_s).	m^3 ob ha^{-1}	V_{tb}

[a] This volume is not used by ToSIA. M3 uses it while calculating and reporting V_i volumes below.

M3 collects:

Collected data	Unit	Symbol
Volume of harvested wood assortments (saw logs, pulp wood, etc.)	m^3 a^{-1}	V_i
Volume of harvest residues[b]	m^3 a^{-1}	V_{hr}
Volume of harvested roots (stump)	m^3 a^{-1}	V_{st}
Conversion factors[c] from m^3 to ton of carbon for all products	tons of carbon m^{-3}	cf

[b] Harvest residues include branches, tops and stumps, unless stumps are extracted and reported as a separate output product. So, if stumps are not harvested: $V_{hr} = V_{tb} + V_{st}$. If stumps are extracted: $V_{hr} = V_{tb}$.

[c] N.B. As M3 uses volumes under bark, the reported conversion factors should be from m^3 (under bark) to ton of carbon <u>including</u> bark.

Carbon flow over the M2/M3 boundary is then calculated by ToSIA with the following function:

$$CarbonFlow_{M2/M3} = \sum (V_i * cf_i) + V_{st} * cf_{st} + V_{hr} * cf_{hr},$$

and

$$TransformationFactor = \frac{CarbonFlow_{M2/M3}}{A}$$

DATA COLLECTION PROTOCOL PER RELEVANT INDICATOR

(1) Gross value added

Full name of indicator (including subclasses):	**Gross value added (GVA) at factor cost and contribution to gross domestic product**
Name of subclass	1.1 Gross value added (at factor cost) by [processes within each module (M2-M5)]
Measurement units:	1.1 In € per reporting unit.
System Boundaries	Only prices of inputs and outputs used to produce the specified outputs of a given process are to be included, e.g. avoid including transportation if modeled independently in subsequent processes. This implicitly defines a system boundary.
Possible data source	Current situation (test chains): data collection by modules for each process. Future potential data providers: Eurostat, UN World bank, National Statistics Office. At process level: national organizations of foresters, industry, etc. at national level. In some cases, such organizations compile reliable statistics and estimates.
Calculation mode (incl. conversion factors)	GVA at factor cost = GVA at basic prices – taxes on production + subsidies on production Gross value added at factor cost can be derived from Gross Value Added at basic prices by subtracting indirect taxes and adding subsidies on producer's production. From the point of view of the producer, purchaser's prices for inputs and basic prices for outputs represent the prices actually paid and received. Gross value added is an unduplicated measure of output in which the values of the goods and services used as intermediate inputs are eliminated from the value of output. The production process itself can be described by a vector of the quantities of goods and services consumed or produced in which inputs carry a negative sign. By associating a price vector with this quantity vector, gross value added is obtained as the inner product of two vectors. Example:

	Let q = the N × 1 vector quantities consumed (negative sign) or produced p = the 1 × N vector of prices, Then, Gross Value Added (GVA) = pq (N × N) When p corresponds to basic prices – taxes on production + subsidies on production External effects (noise, GHG, waste, emissions to air) are not usually included in the GVA because they are not internalised by the companies. Externalities will be handled related to the relevant indicators in CBA separately. In addition, some externalities are covered in the environmental indicators.
Module specifications / recommendations	For each process in the forest (M2) that hands over volume for harvesting in a subsequent harvesting process (M3), we do the following: In the M2-process *Report* as part of GVA an *income corresponding to stumpage value* of an output called 'Assigned for thinning' or 'Assigned for Final harvest' etc. In M3: The harvesting process *must report a corresponding cost* under 'GVA' and 'Production cost', where the cost represents raw material – wood – as an input (stumpage price reported in M2). In M3 an *income* is reported in the GVA once a transport process delivers the wood at mill, pulp factory or wood furnace. The corresponding *cost* is reported and accounted for in the M4 process. The benefits of this approach are: a) Stumpage value is reported by M2 reflecting the value added in this module, b) counting stumpage value as a cost happens only in one type of process (harvesting), c) price at mill etc may be different (usually higher) than stumpage price. This represents a value added produced by the re-allocation in space. With this approach, this value-added accrues to M3 as it should. Costs of planting, tending etc in M2 is otherwise accounted for usual in the relevant process. Concerning the handling of different types of cost, e.g. one-time cost and annual cost, in some multi-year processes, see the indicator Production Costs. In M2, if the GVA is derived based on models, it is

	recommended to use the discount rate of 2%. If this is not possible, the discount rate used should be reported as part of meta data. When GVA is derived from the models and when it is computed for a time scope of length T, it should be converted into an annuity, which is calculated as follows: $Annuity = GVA \Big/ \sum_{t=1}^{T} \frac{1}{(1+d)^t}$. Given the number of years and the discount rate, the annuity is an amount which if paid at regular intervals for the same period, would equal the net present value. GVA in consumption: 0 For transport see annex 1.
Key definitions	**Gross Value Added (GVA):** is defined as the value of all newly generated goods and services less the value of all goods and services consumed as intermediate consumption. The depreciation of fixed assets is not taken into account. (Eurostat definition) See definitions below.

Space for example

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

Useful information sources:

ESA 95: http://circa.europa.eu/irc/dsis/nfaccount/info/data/esa95/en/esa95en.htm

Handbook on the economic accounts for agriculture and forestry: http://www.eds-destatis.de/en/publications/detail.php?th=5&k=1&dok=1745

(free pdf download on

http://www.eds-destatis.de/downloads/publ/en5_handbuch_lgr_fgr_97.pdf)

CALCULATION MODE:

General rule:

Output at basic prices	(1)
- Intermediate consumption at purchasers' prices	(2)
= GVA at basic prices	(3) = (1) – (2)
- Other taxes on production	(4)
+ Other subsidies on production	(5)
= GVA at factor cost	(6) = (3) – (4) + (5)

Forestry example:

Timber for industrial uses	(1)
Firewood	(2)
Other products - Cork - Forestry and nursery plants - Afforestation and conversion - Other forestry products	(3)
Forestry goods output	(4) = (1) + (2) + (3)
Forestry services output	(5)
Forestry output	(6) = (4) + (5)
Non-forestry secondary activities (inseparable) - Products from the transformation of forestry products - Other non-separable secondary activities (goods and services)	(7)

Output of the forestry	(8) = (6) + (7)
Total intermediate consumption - Plants - Energy, lubricants (electricity, gas, other fuels and propellants, other) - Fertilisers and soil improvers - Plant protection products and pesticides - Maintenance of materials - Maintenance of buildings - Forestry services - Other goods and services	(9)
Gross value added at basic prices	(10) = (8) – (9)
Other taxes on production	(11)
Other subsidies on production	(12)
Gross value added at factor cost	**(13) = (10) – (11) – (12)**

DEFINITIONS

The basic price is the price receivable by the producers from the purchaser for a unit of a good or service produced as output minus any tax payable on that unit as a consequence of its production or sale (i.e. *taxes on products*) plus any subsidy receivable on that unit as a consequence of its production or sale (i.e. *subsidies on products*). The basic price excludes any transport charges invoiced separately by the producer. However, it includes any transport margins charged by the producer on the same invoice, even if they are included as a separate item on the invoice (cf. ESA 95, 3.48; Handbook, 2.31.1.)

Components of **output** (cf. ESA 95, 3.07-3.58, Handbook, Chapter II.B) such as sales, payments in kind, additions to stocks and intra-unit consumed products should be valued at basic price. Similarly, output for own final use (i.e. own-account fixed capital goods and own final consumption) should be valued at the basic price of similar products sold on the market. Work-in-progress and additions to it are valued proportionally to the current basic price of the finished product.(Handbook, 2.31.2.)

Taxes on products (Handbook, Chapter III.D.1; ESA 95, 4.16) are taxes that are payable per unit of some good or service produced or transacted. The tax may be a specific amount of money per unit of quantity of a good or service, or it may be calculated *ad valorem* as a specified percentage of the price per unit or value of the goods and services produced or transacted. As a general principle, taxes in fact assessed on a product, irrespective of which institutional unit pays the tax, are to be included in taxes on products, unless specifically included in another heading.

Taxes on products are subdivided into (see ESA 95, 4.17-4.21 for definitions):

1. value added type taxes (VAT) (D.211);
2. taxes and duties on imports excluding VAT (D.212):
    a. import duties (D.2121);
    b. taxes on imports excluding VAT and import duties (D.2122);
3. taxes on products, except VAT and import taxes (D.214).

Subsidies on products (Handbook, Chapter III.E.1; ESA 95, 4.30-4.35) are subsidies payable per unit of a good or service produced or imported. The subsidy may be a specific amount of money per unit of quantity of a good or service, or it may be calculated *ad valorem* as a specified percentage of the price per unit. A subsidy may also be calculated as the difference between a specified target price and the market price actually paid by a buyer. A subsidy on a product usually becomes payable when the good is produced, sold or imported. By convention, subsidies on products can only pertain to market output or to output for own final use.

Subsidies on products are subdivided into (see ESA 4.34, 4.35 on definitions):

1. import subsidies
2. other subsidies on products.

Intermediate consumption (cf. ESA 95, 3.69-3.73; Handbook Chapter II.C.) represents the value of all goods and services used as inputs in the production process, excluding fixed assets whose consumption is recorded as fixed capital consumption. The goods and services are either transformed or used up in the production process (cf. ESA95, 3.69).

Intermediate consumption excludes new or existing acquired fixed assets which have been produced in the economy or imported: they are recorded as *gross fixed capital formation* (Handbook, 2.49 (c)-(f)). This concerns items such as buildings or other structures, machines and equipment, plantations. The acquisition of non-produced assets such as land is likewise excluded from intermediate consumption. Tools and other durable goods (saws, hammers, screwdrivers, etc.) are recorded as intermediate consumption when their purchase value does not exceed the 500 EUR threshold (at 1995 prices) per item (or for total purchases, if obtained in large quantities). Beyond this threshold, purchases of these durable capital goods are recorded in gross fixed capital formation (cf. ESA 95, 3.70).

Elements of intermediate consumption (Handbook, Chapter II.C.2):

- seeds and planting stock
- energy, lubricants
- fertilizers and soil improvers
- plant protection products and pesticides
- maintenance of materials
- maintentance of buildings
- other goods and services (rents of residential buildings and other capital assets, fees for workers' medical examinations, fees for forestry consultants, accountants, tax consultants, lawyers etc., expenditure on transport services, postal and telecommunication costs, purchases of small tools, working clothing, payments for

the use of non-produced intangible assets such as patented assets, trade marks, copyright or other production rights, etc.)

Items not included in intermediate consumption (Handbook, 2.49).

- compensation of employees (gross wages and salaries, employers social contributions), travel allowances paid in cash to employees (Handbook, Chapter III.C)
- gross fixed capital formation (purchases of buildings and movable property, financial leasing payments for the use of fixed assets for forestry, expenditure on restoration of fixed capital goods, expenditure on the improvement and repair of capital goods, purchases of services connected with the acquisition of ownership of land, buildings and other existing fixed capital goods) (Handbook, Chapter II.D)
- rents paid for the use of land (cf. Handbook, 3.31.1)
- wear of capital goods
- net insurance premiums (cf. Handbook, 2.48 (g))
- insurance premiums for personal injury and contributions to sickness and working accident insurance schemes

The purchasers' price is the price the purchaser actually pays for the products, at the time of purchase. It includes taxes less subsidies on products (but excluding deductible taxes like VAT on products). The purchaser price also includes any transport charges paid separately by the purchaser to take delivery at the required time and place. It does not include deductions for any discounts for bulk or off-peak purchases from standard prices or charges; interest or service charges added under credit arrangements; and any extra charges incurred as a result of failing to pay within the period stated at the time the purchases were made (cf. ESA 95, 3.06)

Intermediate consumption includes (Extract from ESA 95, 3.70-3.71):

a) the value of all the goods or services used as inputs into ancillary activities. Common examples are purchasing, sales, marketing, accounting, data processing, transportation, storage, maintenance, security, etc. These goods and services are not distinguished from those consumed by the principal (or secondary) activities of a local KAU;
b) the value of goods and services which are received from another local KAU of the same institutional unit (only if they comply to the general definition in paragraph 3.69.);
c) the costs of using rented fixed assets, e.g. the operational leasing of machines or cars;
d) the subscriptions, contributions or dues paid to non-profit business associations (see paragraph 3.35.);
e) items not treated as gross capital formation, like:
    (1) small tools which are inexpensive and used for relatively simple operations, such as saws, hammers, screwdrivers and other hand tools; small devices, such as pocket calculators. By convention, in the ESA, all expenditure on such durables which does not exceed 500 EUR (in prices of 1995) per item (or, when bought in quantities, for the total amount bought), should be recorded as intermediate consumption;

(2) the ordinary, regular maintenance and repair of fixed assets used in production;
(3) military weapons of destruction and the equipment needed to deliver them (but not light weapons or armoured vehicles acquired by police and security forces, which are treated as gross fixed capital formation);
(4) services of research and development, staff training, market research and similar activities, purchased from an outside agency or provided by a separate local KAU of the same institutional unit.

f) payments for the use of intangible non-produced assets like patented assets, trade marks, etc. (excluding payments for the purchase of such property rights: these are treated as acquisitions of an intangible non-produced assets);
g) expenditure by employees, reimbursed by the employer, on items necessary for the employers' production, like contractual obligations to purchase on own-account tools or safety-wear;
h) expenditure by employers which is to their own benefit as well as to that of their employees, because it is necessary for the employers' production. Cases in point are:
(1) reimbursement of employees for travelling, separation, removal and entertainment expenses incurred in the course of their duties;
(2) providing amenities at the place of work;
a more extensive list is presented in the paragraphs on compensation of employees (D.1) (see paragraph 4.07.).
i) non-life insurance service charges paid by local KAUs (see also Annex III 'Insurance'): in order to record only the service charge as intermediate consumption the premiums paid should be discounted for, e.g. claims paid out and the net change in actuarial reserves. The latter can be allocated to local KAUs as a proportion of the premiums paid;
j) the use of financial intermediation services indirectly measured by resident producers;
k) by convention, the central bank output should be entirely allocated to the intermediate consumption of other financial intermediaries (subsectors S122 Đ S123).

Intermediate consumption excludes:

a) items treated as gross capital formation, like:
(1) valuables;
(2) mineral exploration;
(3) major improvements which go considerably beyond what is required simply to keep the fixed assets in good working order, e.g. renovation, reconstruction or enlargement;
(4) software purchased or produced on own-account.

b) expenditure by employers treated as wages and salaries in kind (see paragraph 4.05.);

c) use by market or own-account producer units of collective services provided by government units (treated as collective consumption expenditure by government);

d) goods or services produced and consumed within the same accounting period and within the same local KAU (they are also not recorded as output);

e) payments for government licenses and fees that are treated as taxes on production (see paragraphs 4.79. – 4.80.).

Note, **other taxes (subsidies) on production** are different from **taxes (subsidies) on products**!

Other taxes on production (ESA 95, 4.22-4.24; Handbook, Chapter III.D.2) consist of all taxes that enterprises incur as a result of engaging in production, independently of the quantity or value of the goods and services produced or sold. They may be payable on the land, fixed assets or labour employed in the production process or on certain activities or transactions (ESA 95, 4.22).

Other taxes on production include in particular:

(a) taxes on the ownership or use of land, buildings, or other structures utilised by enterprises in production (including owner-occupiers of dwellings);
(b) taxes on the use of fixed assets (vehicles, machinery, equipment) for purposes of production, whether such assets are owned or rented;
(c) taxes on the total wage bill and payroll taxes;
(d) taxes on international transactions (travel abroad, foreign remittances, or similar transactions with non-residents) for purposes of production;
(e) taxes paid by enterprises in order to obtain business and professional licences if those licences are being granted automatically on payment of the amounts due. However, if the government carries out checks on the suitability or safety of the business premises, on the reliability or safety of the equipment employed, on the professional competence of the staff employed, or on the quality or standard of goods or services produced as a condition for granting such a licence, the payments are treated as purchases of services rendered, unless the amounts charged for the licences are out of all proportion to the costs of the checks carried out by the government;
(f) taxes on pollution resulting from production activities. These consist of taxes levied on the emission or discharge into the environment of noxious gases, liquids or other harmful substances. They do not include payments made for the collection and disposal of waste or noxious substances by public authorities, which constitute intermediate consumption of enterprises;
(g) under-compensation of VAT resulting from the flat rate system, frequently found in agriculture.

Other taxes on production exclude taxes on the personal use of vehicles etc. by households, which are recorded under current taxes on income, wealth, etc.

Other subsidies on production (ESA 95, 4.36-4.40; Handbook, Chapter III.E.2) consist of subsidies except subsidies on products which resident producer units may receive as a consequence of engaging in production. For their other non-market output, other non-market producers can receive other subsidies on production only if those payments from general government depend on general regulations applicable to market and non-market producers as well.

Other subsidies on production include in particular (ESA 95, 4.37):

(a) subsidies on payroll or work force: these consist of subsidies payable on the total wage or salary bill, or total work force, or on the employment of particular types of persons such as physically handicapped persons or persons who have been unemployed for long periods, or on the costs of training schemes organised or financed by enterprises;
(b) subsidies to reduce pollution: these consist of current subsidies intended to cover some or all of the costs of additional processing undertaken to reduce or eliminate the discharge of pollutants into the environment;
(c) grants for interest relief made to resident, producer units, even when they are intended to encourage capital formation [1]. In effect, these are current transfers designed to lighten producers' operating costs. They are treated in the accounts as subsidies to the producers benefiting from them, even when the difference in the interest is, in practice, paid directly by the government to the credit institution making the loan;
(d) over-compensation of VAT resulting from the flat rate system, frequently found in agriculture.

The following are not treated as subsidies (ESA 95, 4.38):

(a) current transfers from general government to households in their capacity as consumers. These are treated either as social benefits or as miscellaneous current transfers;
(b) current transfers between different parts of general government in their capacity as producers of non-market goods and services, except other subsidies on production. The current transfers are shown under the heading current transfers within general government;
(c) investment grants;
(d) extraordinary payments into social insurance funds, in so far as these payments are designed to increase the actuarial reserves of these funds. Such payments are shown under the heading other capital transfers;
(e) transfers made by general government to non-financial corporations and quasi-corporations to cover losses accumulated over several financial years, or exceptional losses due to factors outside the control of the enterprise, are classified under the heading other capital transfers;
(f) the cancellation of debts which producer units have incurred towards the government (resulting, for example, from loans advanced by a government agency to a non-financial enterprise which has accumulated trading losses over several financial years). In general, these transactions are treated in the accounts as other capital transfers (see paragraph 4.165. f);
(g) payments made by general government or by the rest of the world for damage to, or losses of, capital goods as a result of acts of war, other political events or national disasters are shown under the heading other capital transfers;
(h) shares and other equities in corporate enterprises purchased by general government, which are shown under the heading shares and other equity;
(i) payments made by a general government agency which has assumed responsibility for abnormal pension charges affecting a public enterprise. These payments must be recorded under miscellaneous current transfers;

(j) payments made by general government to market producers to pay entirely, or in part, for goods and services that those market producers provide directly and individually to households in the context of social risks or needs (see paragraph 4.84.), and to which the households have a legally established right. These payments are included in individual consumption expenditure of general government and subsequently in social benefits in kind and actual individual consumption of households.

(2) Production cost

Full name of indicator (including subclasses):	**Average production cost and share of cost of wood-based materials**
Name of subclass	2.1 Average cost [by processes within each Module (M2-M5).] 2.1.1. raw material from FWC 2.1.2. raw material from outside FWC 2.1.3. labour 2.1.4 energy (e.g. fuel costs in case of transportation) 2.1.5 other productive costs (maintenance, general industrial costs, administrative costs, sales expenditures, etc) 2.1.6 non-productive costs (corporate taxes, capital charges, VAT and any other taxes or charges) 2.2 Share of cost of wood-based materials
Measurement units:	2.1. In € per reporting unit 2.2. In % of average production cost
System Boundaries	• Marketed non-timber food products (NTFP) and marketed services (e.g. recreation)-only the most important ones should be included. See in addition the indicator *Total production(7)* • Insurance costs are of significant importance especially in M2 and M3. Therefore, they should be included provided they can be identified and their share in total costs is significant. • Non-operating costs, such as, administration costs, leasing rental fees, land rent, etc. are included. • The costs associated with the services and processes not directly related to a product (e.g. administration of companies, maintenance of machinery, etc.) should also be included.
Possible data source	At process level, good information may also be found be the national organizations of foresters, industry, etc. at national level. In some cases, such organizations compile reliable statistics and estimates of e.g. production costs.
Calculation mode (incl. conversion factors)	Costs under items 2.1.1-2.1.5 should be excluding VAT and other indirect taxes, which are accounted for in (f). Possible deviations from the proposed method should be reported.

	All the costs should be reported in nominal values whenever possible. "Raw material costs" for services? - Zero, if no costs were incurred. See examples below on how to report the costs for multi-year processes.
Module specifications / recommendations	M3: Transport cost is not isolated, but is allocated among different cost categories. The costs of fuel are counted as energy costs. For transport see Annex 1.
Key definitions	**Labour cost** is the cost incurred by the employer in the employment of labour. The statistical concept of labour cost comprises remuneration for work performed, payments in respect of time paid for but not worked, bonuses and gratuities, the cost of food, drink and other payments in kind, cost of workers' housing borne by employers, employers' social security expenditures, cost to the employer for vocational training, welfare services and miscellaneous items, such as transport of workers, work clothes and recruitment, together with taxes regarded as labour cost. (Source: ILO statistics at http://laborsta.ilo.org/applv8/data/c6e.html). Distinction between cost and price – in M3 the costs of cutting the wood is usually lower than the price of wood in the market. - Include the costs of cutting the wood. Reported price usually includes VAT, which is deductible by the next refiner in the chain (and the price-VAT becomes his/her cost). The next producer however actually pays a positive amount of VAT, provided that his/hers value added is positive. Only the last in the chain (consumer) actually pays all of the VAT, which is why his/hers costs should include VAT, i.e. the cost would be the price of the product sold by the previous producer.

Space for example:

In some cases, a process may be defined as covering several years, e.g. in M2 forest stand processes or perhaps in M5 consumption or end-of-life processes. Special awareness is needed when reporting costs in such processes, because the reporting unit is still €/hectare and *year* or €/ton or *year*. Thus, even if the process covers several years, all reported costs should be in a per year format. This because TOSIA will afterwards use the process time-multiplier (years it span) to aggregate the data. A few illustrative examples:

- Planting cost in €/ha (e.g. 3.000 €) is a pulse cost occurring only in one year of a forest rotation. So we would naturally think of it as in the reporting unit €/ha and year. However, if we report it straightaway into an M2 regeneration process of duration 7 years as 3.000 for the production cost indicator, then TOSIA will estimate the aggregate indicator to 7 × 3.000 = 21.000. An error has occurred in spite of good data. The data is better approximated as 3.000/7, which will result in a correct aggregation (ignoring small error from time discounting)
- The same may happen for periodic actions: Suppose two precommercial thinnings are undertaken at a cost of 500 €/ha each in a "Young phase"-process of length 20 years. Again, because this is also often perceived as a per year cost, one may be tempted to enter it simply as 2 × 500 = 1.000 into the database. However, in this process, TOSIA will turn this into 20 × 1.000 = 20.000. An error has occurred in spite of good data. The data is better approximated as 1.000/20 = 50 €/ha and year, which will result in a correct aggregation.

Remarks: See Annex 2.

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(3) Trade Balance

Full name of indicator (including subclasses):	**Imports and exports of wood and products derived from wood, and net trade.**
Name of subclass	3.1 Imports of wood and products derived from wood, a) Volume b) Value c) Share of imports in total volume consumed 3.2. Exports of wood and products derived from wood, a) Volume b) Value c) Share of exports of total volume produced 3.3. Net trade in wood and products derived from wood a) Volume b) Value
Measurement units:	3.1.-3.3. a) kg, m3, etc. (depending on product unit), (ton C in EFORWOOD) 3.1.-3.3 b) € 3.1.-3.2. c) %
System Boundaries	Indicator is applicable at country level. Limited applicability at sub-country, sub-sector or management process level.
Possible data source	Data from National statistics, international data bases (FAOSTAT) http://faostat.fao.org/site/382/DesktopDefault.aspx?PageID=382
Calculation mode (incl. conversion factors)	
Module specifications / recomendations	
Key definitions	Definitions of terms (e.g. “products derived from wood”) as per UNECE/FAO/EUROSTAT/ITTO. Products derived from wood: (FAO) • Roundwood

	• Fuel wood and Charcoal • Industrial roundwood • Sawn wood • Wood-based panels • Pulp • Paper and paperboards • Species

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(4) Resource use, incl. recycled material

N.B – Those sub-indicator that are calculated by ToSIA and thus not intended for indicator data collection are printed in grey!

Full name of indicator (including subclasses):	**Use of renewable and non-renewable materials, classified by virgin and recycled material**
Name of subclass	4.1. Volume of renewable materials in total, of which 4.1.1. Wood-based material in total, classified into 4.1.1.1. of virgin origin 4.1.1.2. of recycled origin 4.1.2. Other renewable materials in total, classified into 4.1.2.1. of virgin origin 4.1.2.2. of recycled origin 4.2 . Volume of non-renewable materials in total, of which: 4.2.1 of virgin origin 4.2.2 recycled origin
Measurement units	Kg per reporting unit
How ToSIA calculates the indicator 4.1.1.	Indicators 4.1.1 are calculated in ToSIA as a sum of the material flow at the M2/M3 boundary and the input products entering the FWC from outside system boundaries in M3-M5 (i.e. external input products). For the calculation of the indicator sub-classes in ToSIA all external input products needs to be classified according to the subclasses of virgin and recycled.
Collected data for 4.1.1.	4.1.1 Share of virgin origin for wood-based process external input products (e.g. imported woody material that enters the FWCs in M4).
System Boundaries	Forest nurseries are included
Possible data source	
Module specifications / recommendations	In M3 an example of additional resource use apart from energy would be engine oil (could be based on renewable or not). Usually engine oil is consumed in some ratio to fuel consumption, given an average intensity of use. Thus, in M3 experts may be able to report the use of engine oil and other resources used in transport in kg/reporting unit. In M4 a furniture production process may use metal (nails, screws etc) in some ratio to wood consumption.
Key definitions	Recovery is defined as any waste management operation that diverts a waste material from the waste stream and

	which results in a certain product with a potential economic or ecological benefit. Recovery mainly refers to the following operations: -material recovery, i.e. recycling -energy recovery, i.e. re-use a fuel -biological recovery, e.g. composting -re-use Direct recycling or reuse within industrial plants at the place of generation is excluded. (Eurostat/OECD Definition) Recycling is defined as any reprocessing of material in a production process that diverts it from the waste stream, except reuse as fuel. Both reprocessing as the same type of product, and for different purposes should be included. Direct recycling within industrial plants at the place of generation should be excluded. (Eurostat/OECD Definition) Re-use shall mean any operation by which end of life products and equipment (e.g. electrical and electronic equipment) or its components are used for the same purpose for which they were conceived. Direct reuse at the place of generation (i.e. establishment) is excluded. (Eurostat/OECD Definition)

Space for example

Example how ToSIA calculates the 4.1.1.1 for one single chain.
To calculate the indicator 4.1.1.1 Volume of renewable materials, Wood-based materials from virgin origin for a FWC, ToSIA sums all woody material entering M3 at the M2/M3 boundary. That is calculated based on the hectare information in M2 and transformation factors provided. In addition to that, all wood-based products from virgin origin entering the chain in M3-M5 are added to the indicator. This is done based on the classification of the these products and the calculation is done with process shares and conversion factors provided.

Expert to contact in case of questions:
Irina Prokofieva Irina.prokofieva@ctfc.es)

(5) Forest sector enterprise structure

Full name of indicator (including subclasses):	**5. Number of forest holdings and forest-based enterprises classified by size classes**
Name of subclass	5.1. number of forest holdings in total, and classified by a) Public b) Private 5.2. Average forest holding size, and classified by a) Public b) Private 5.3. forest based enterprises classified by size classes a) Micro and small enterprise (0-49 employees) b) Medium size (50-249 employees) c) Large enterprises (>250 employees)
Measurement units:	5.1. Number per subclass 5.2. hectare per holding in sub-subclasses a and b 5.3. number per subclass
System Boundaries	Indicator is applicable at country level. Limited applicability at sub-country, sub-sector, or management process level.
Possible data source	EUROSTAT National Statistics Offices
Calculation mode (incl. conversion factors)	
Module specifications/ recommendations	5.1 and 5.2 are M2 relevant only.
Key definitions	Key definitions of enterprises as used by EUROSTAT. Classifications as specified by EUROSTAT (e.g. international holdings or corporations)

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(6) Investment and research & development

Full name of indicator (including subclasses):	Investment (gross fixed capital formation) and R&D expenditure
Name of subclass	**6.1. Investment (gross fixed capital formation) in total and classified by total value of fixed assets:** **6.1.1. machinery and other equipment** **6.1.2. vehicles** **6.1.3. the value of land improvements** **6.1.4 buildings** **Per process per module.** **6.2. Research & Development expenditure in total and classified by** **6.2.1. private expenditure** **6.2.2. public expenditure**
Measurement units:	**6.1. In € per reporting unit** **6.2. In € per reporting unit**
System Boundaries	
Possible data source	**Current situation (test chains): data collection by modules for each process** **Future potential data providers: Eurostat, National Statistics Office**
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	Business investment **is defined as the gross fixed capital formation by the private sector. (Eurostat definition).** Gross fixed capital formation (GFCF) **consists of resident producers' acquisition, 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. (Eurostat definition)** Fixed assets **are defined in national accounts as non-financial produced assets that are used repeatedly or continuously in production for more than one year. Fixed assets include not only dwellings, buildings, structures, machinery and equipment but also cultivated assets such as livestock for breeding and**

	vineyards. They also include intangible assets such as computer software and entertainment, literary or artistic originals. (Eurostat definition) Non-produced assets**: are non-financial assets that come into existence other than through processes of production; they include both tangible assets and intangible assets and also include costs of ownership transfer on and major improvements to these assets. (Eurostat definition)** Gross domestic product (GDP) **is the central aggregate of National Accounts. Since GFCF is an integral part of GDP (according to the expenditure approach), the numbers given are true shares. They are intended to give an impression of the relative importance of investments as opposed to, for example, consumption (Eurostat definition).** R&D expenditures **include all expenditures for R&D performed within the business enterprise sector (BERD) on the national territory during a given period, regardless of the source of founds. R&D expenditure in BERD are shown as a percentage of GDP (R&D intensity). (Eurostat definition)**

Space for example

Remarks: see Annex 4

Useful information sources:

ESA 95: http://circa.europa.eu/irc/dsis/nfaccount/info/data/esa95/en/esa95en.htm

Handbook on the economic accounts for agriculture and forestry: http://www.eds-destatis.de/en/publications/detail.php?th=5&k=1&dok=1745

(free pdf download on

http://www.eds-destatis.de/downloads/publ/en5_handbuch_lgr_fgr_97.pdf)

For **gross fixed capital formation (sub-indicator 6.1.)**, see Chapter II.D and Appendix II.C.

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(7) Total Production

N.B - This indicator is not intended for data collection thus printed in grey! But to be able to calculate the indicator, ToSIA needs conversion factors.

Full name of indicator (including subclasses):	Production of goods and services
Name of subclass	7.1 Goods classified by: 7.1.1. Volume 7.1.2. Value
Measurement units:	7.1.1. kg 7.1.2. in € (price)
Data needed	Conversion factors (to EUR and to tons) for the end-products of the FWC.
How ToSIA calculates the indicator	ToSIA calculates the material flow to the end-products of the FWC and through the consumption processes in M5 and reports the production of these end-products and consumed products in kg (7.1.1) and in € (7.1.2) using conversion factors provided for these products.
System Boundaries	
Possible data source	
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	**Production** is an activity carried out under the control and responsibility of an institutional unit that uses input labour, capital and goods and services to produce goods and services. Production does not cover purely natural processes without any human involvement or direction, like the unmanaged growth of fish stocks in international waters (but fish farming is production). Production is an activity resulting in a product. It is used with reference to the whole range of economic activities. The term id not reserved for the agricultural, mining or manufacturing sectors. It is also used in relation to the service sector. More specific terms may be used to denote production: provision of services, processing, manufacturing, etc.,

	depending on the branch of activity. Production may be measured in various ways either in physical terms or according to value. (Eurostat definition) **"Product"** is used to cover both goods and services. (Oslo Manual, 3rd edition, OECD/Eurostat 2005, p.32) **Product classification:)** **Goods:** (1) round wood - industrial wood in the rough (saw logs and veneer logs, pulpwood (round and split), others) - wood fuel (2) wood-based panels - plywood - particle board, especially oriented strand board (OSB) - fibreboard - veneer sheets (3) wood pulp (mechanical, semi-chemical, chemical, dissolving grades) (4) other pulp - pulp from fibres other than wood - recovered fibre pulp (5) paper and paperboard - newsprint - printing and writing papers (uncoated mechanical; coated mechanical; coated woodfree ; uncoated woodfree) - tissue - case materials (kraftliner, testliner, fluting medium) - carton-boards (SBS, FBB, WLC, LPB) - wrappings (sackkraft); - specialised papers (other) (6) secondary materials - building elements (windows, roof trusses, doors, flooring) - packaging: wooden pallets - recovered paper (7) others **Engineered products including wood composites**

Space for example

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(8) Productivity

N.B - This indicator is not intended for data collection thus printed in grey.

Full name of indicator (including subclasses):	8. Labour productivity
Name of subclass	8. Annual production per employee of total forest sector, and per sub-sector
Measurement units:	m^3/ employee or t/employee (full time equivalent)
System Boundaries	
Possible data source	Specifications as used by EUROSTAT National statistics may supply numbers of employees in sub-sector as well as the GVA at sector level.
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	Specifications as used by EUROSTAT

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(9) Innovation

Full name of indicator (including subclasses):	Share of forest-based enterprises with new and significantly improved products or processes, and share of turnover
Name of subclass	9.1. Share of forest-based enterprises with new or significantly improved goods or services (merged categories) 9.2. Share of forest-based enterprises with new or significantly improved production process, distribution method, or support activity for goods o services (merged categories) 9.3. Share of turnover from new or significantly improved products as a share of total turnover.
Measurement units:	% of total forest-based sector and per NACE category
System Boundaries	Only applicable for NACE industry sectors for which data is collected (manufacturing industries) - 2 digit NACE code;
Possible data source	Data from EU Community Innovation Survey 4 (CIS4) e.g. under manufacturing (NACE 15-37) most relevant sub-categories for FWC 20, 21 and 22. CIS4 can be found on EUROSTAT webpage: http://epp.eurostat.ec.europa.eu/ (direct link below).
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	Key definitions as per EU Community Innovation Survey;

Direct link to CIS4:

http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/intrse/inn/inn_cis4&language=en&product=EU_MASTER_industry_trade_services_horizontal&root=EU_MASTER_industry_trade_services_horizontal&scrollto=327

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(10) Employment

Full name of indicator (including subclasses):	Number of persons employed in total and by gender
Name of subclass	10.1. Number of persons employed in total, and 10.2. Classified by gender 10.2.1. male 10.2.2. female 10.3. Employment on enterprise sites 10.3.1. Located in rural areas 10.3.2. Located in urban areas Per process per Module (total as well as directly involved in processes)
Measurement units:	10.1 absolute number. 10.2.1, 10.2.2, 10.3.1 and 10.3.2. % of total (in full-time equivalents in reference year)
System Boundaries	
Possible data source	National statistics if the unit is a (sub-)sector in country
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	Key definitions as per EU rural development regulation and its implementation specifications. Definition of "rural": So far a common (policy) concept at EU level of what constitutes a rural area has not been developed, despite the billions of € spent on it. The widely used OECD definition is based on the share of population living in rural communes (i.e. with less than 150 inhabitants per km2) in a given NUTS III region. This is the

	only internationally recognised definition of rural areas, which is also used for descriptive purposes in the EU Rural development strategy. At regional level (NUTS 3) the OECD distinguishes: • Predominantly rural regions: over 50% of the population lives in rural communes (with less than 150 inhabitants/ km2) • Significantly rural regions: 15 to 50% of the population living in rural communes • Predominantly urban regions: less than 15% of the population living in rural communes "Rural" thus comprises "predominantly rural areas" and "significantly rural areas" Definition of "site": as per EMAS Article 2(t) of Regulation (EC) No 761/2001, all land at a distinct geographic location under the management control of an organisation covering activities, products and services. This includes all infrastructure, equipment and materials.

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(11) Wages and salaries

Full name of indicator (including subclasses):	**Wages and salaries (gross earnings) classified by gender and in relative terms**
Name of subclass	11.1. Wages and salaries [by processes within each Module (M2-M5)] classified by gender category 11.1.1. male 11.1.2 female 11.2 average wages & salaries per employee 11.2.1 Relative to country average 11.2.2 Weighted by purchasing power parity [Per process per Module (total as well as directly involved in processes)]
Measurement units:	11.1. In Euro per reporting unit 11.2.1. In % 11.2.2 In Euro per reporting unit
System Boundaries	
Possible data source	Current situation (test chains): data collection by modules for each process Future potential data providers (DS5): Eurostat (see Population and Social Conditions), National Statistics Office, ILO data (October Inquiry data) Alternative sources: scientific work on gender differences in salaries, if the official and reliable data is not available http://laborsta.ilo.org
Calculation mode (incl. conversion factors)	The wages and salaries should ideally be reported as gross earnings, i.e. before any deduction for tax or contributions to social security by the worker and the employer. Note that this indicator is intended to collect the data on the *total amount of money* spent on salaries and wages per gender, and not on the salary level of each gender. Note, that *Wages and salaries* indicator may be different from the indicator 2c - *Labour costs* (compare the definitions). Country average wages and PPP can be downloaded from OECD: (www.oecd.org) for OECD countries 1. Difficult to find data by gender - Use estimates from scientific studies. 2. Data available for professions, not for activities or products - Estimate the allocation to processes using the profession

	data Depending on the available data the indicator values can be computed in different ways. See examples below. Specifically for *multi-year processes*: Be aware that wages paid in actions that does not occur every year in a multi-year process need to be reported in a way that takes into account that the process covers several years. For example, planting 1 ha. of forest may involve paying *x* €/ha but only once in the regeneration process of *y* years. Thus, it should be reported as *x*/*y* €/ha and *year*, which is the correct reporting unit. See also general examples under the Production Cost indicator and example below.
Module specifications / recommendations	
Key definitions	**Employees** are all persons who have a direct employment contract with the enterprise or local unit and receive remuneration, irrespective of the type of work performed or the number of hours worked. (Eurostat, http://europa.eu.int/estatref/info/sdds/en/earn/earn_ses_sm.htm) **Gross earnings** cover remuneration in cash paid directly by the employer, before deductions of tax and social security contributions. (Eurostat, http://europa.eu.int/estatref-/info/sdds/en/earn/earn_ses_sm.htm) **Wage or salary rates** are the rates paid for normal time of work, comprising: basic wages and salaries, cost-of-living allowances and other guaranteed and regularly paid allowances. The following should be excluded: overtime payments, bonuses and gratuities, family allowances, other social security payments made by the employer directly to employees and ex gratia payments in kind supplementary to normal wage and salary rates. ILO-definition (http://laborsta.ilo.org/applv8/data/tO1E.html#t1): **PPP**: Purchasing Power Parities (PPPs) are currency conversion rates that both convert to a common currency and equalise the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion. (OECD Statistics Division)

Example on how to compute 11.2.

Suppose the average wage in a given process per employee is 24000 €.

The country average is 20438.8 € (see Annex 3) and the PPP is 0.89818 (see Annex 3).

The indicator 11.2.1. is computed as follows:

100%* (24000 € / 20438.8 €) = 117.4 % (reported value 117,4%)

This means that the average wage in a process in question is 117,4% of the country average wage, that is, 17,4 % higher.

The indicator 11.2.2. is computed as follows:

24000 € / 0.89818 = 26720.70 € (reported value 26720.70 €)

This indicator is useful for comparing salary levels in different countries, as it takes into account the differences in purchasing power.

Example for a multi-year process:

Assume that planting one ha of forest costs 1400 EUR/ha. The process “Regeneration phase” lasts 7 years, and the planting operation takes place in the 1st year of this phase. Thus, the indicator value reported for the “Wages and Salaries” should be 1400 EUR/ha / 7 years = 200 EUR/ha per year. This is a rough approximation that ignores a small distortion arising due to the lack of time discounting.

Examples

These three examples are three possible ways of calculating the total money spent per reporting unit (not the salary level) for the "salary and wages" indicator in the process depending on the data available:

1. If the data that available is: the **salary level for male/female in EUR/time unit (e.g. hour)** and **the employment time for male/female** in certain **time units per reporting unit (**we use in this example time unit as hours, but this is just a simplification of the time unit, in the database is person year, for the reporting unit we used tons of pellets in the example**)**.

   CALCULATION PROCEDURE: First we would multiply the salary cost level for male/female by the employment time. Then we have to relate this to the reporting unit of the process (e.g. m3, tons of pellets…). This is done by dividing the previous result by the production in the process.

   Example:
   Salary level male in Eur per time- 10€/hour
   Salary level female in Euros per time- 8 €/hour
   Total time needed doing a ton of pellet is = 16.3 hours /ton of pellet
   Employment time male 14.7 hours/ton pellet (this data is input to indicator (8) Employment)
   Employment time female 1.6 hours/ton of pellet (this data is input to indicator (8) Employment)

   To calculate the indicator to be reported in the client "wages and salaries male":
   10€/hour * 14.7 hours/ton pellet = 147 €/ton of pellet (input to indicator (11))
   To calculate the indicator to be reported in the client "wages and salaries female":
   8€/hour * 1.6 hours/ton of pellet = 12,8 €/ton of pellet (input to indicator (11))

   The sum of both salary costs giving the "wages and salaries indicator" = 159.8 €/ton of pellet which at the same time if we consider there are no other labour related costs, the labour costs in the Production cost indicator would be this value 159.8 €/ton of pellet.

2. If the data available is the total **salary expenditure paid to each one of the genders in EUR** in a certain time frame, and we have the **total production in this process** (in m3 or other units) for this time period.

   CALCULATION PROCEDURE: Then the calculation of the reported indicator is just to divide the total expenditure for each of the genders by the total production.

   Example:
   Total Expenditure on male salaries for a time period (e.g. in one year) - 147000 €
   Total Expenditure on female salaries for a time period (e.g. in one year)- 12800€
   Total production during the same time period of the salary expenditure (in the example on year)- 1000 tons of pellets

   To calculate the indicator (11) to be reported in the client "wages and salaries male": (147000€/year) / (1000 tons of pellets/year) = 147 €/ton of pellet

To calculate the indicator to be reported in the client "wages and salaries female": (12800 €/year) / (1000 tons of pellets/year) = 12,8 €/ton of pellet

3. If the data that is available is: i) the total **salary expenditures paid to both genders in EUR, but not differentiated between genders**, ii) **the total production** in this process for the same time than the total expenditure, and iii) **the employment time** for male/female in appropriate time units.

   CALCULATION PROCEDURE: Then the estimation of the reported indicator per gender and per reporting unit is: first, divide the total expenditure in salaries by the total production; this gives us an average cost per reporting unit. Then we weight this average cost with the working time for each gender (i.e. multiply by the working time of one gender and divide by the total working time of both genders). IT HAS TO BE CLEAR THAT WE WOULD BE ASSUMING THE SAME SALARY LEVEL FOR BOTH GENDERS

   Example:
   We have the total Expenditure on male and female in salaries for a time period (e.g. in one year) - 159800 €
   Total production during the same time period of the salary expenditure- 1000 tons of pellets
   Employment time male 14.7 hours/ton pellet
   Employment time female 1.6 hours/ton of pellet
   Total time needed doing a ton of pellet is = 16.3 hours /ton of pellet

   To calculate the indicator (11) to be reported in the client "wages and salaries male": (159800 € / 1000 tons of pellets)*(14.7 hours/ton of pellets) / (16.3 hours /tons of pellets) = 144,11 €/ ton of pellet

   To calculate the indicator to be reported in the client "wages and salaries female": (159800 € / 1000 tons of pellets)*(1.6 hours/ton of pellets) / (16.3 hours /tons of pellets) = 15,68 €/ ton of pellet

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(12) Occupational safety and health

Full name of indicator (including subclasses):	**Frequency of occupational accidents and occupational diseases**
Name of subclass	12.1 Occupational accidents [by processes within each module (M2-M5)] classified by: 12.1.1 Non-fatal occupational accidents 12.1.2 Fatal occupational accidents 12.2 Occupational diseases [by processes within each

	module (M2-M5)])
Measurement units:	12.1. absolute numbers per 1000 employees per reporting unit 12.2. frequency of cases in ‰ (per 1000 employees) per reporting unit
System Boundaries	Administrative and management staff - Allocate professions to processes.
Possible data source	Current situation (test chains): data collection by modules for each process Future potential data providers: Eurostat (European Statistics on Accidents at Work), European Occupational Diseases Statistics (EODS), International Labour Organisation (ILO), National Statistics Office Extrapolation from public data (e.g. trade union data and possibly health insurance services)
Calculation mode (incl. conversion factors)	The estimations can be obtained using the ratio of accidents per e.g. pulp volume, and then multiplying the ratio by the volume of pulp produced.
Module specifications / recommendations	
Key definitions	**Absence from work of more than 3 working days**: ESAW considers only full working days of absence from work of the victim excluding the day of the accident. Consequently more than 2 days, means at least 4 days which implies only accidents with a resumption of work not before the fifth day after the day or the accident or later. (see http://ec.europa.eu/employment_-social/publications/2002/ke4202569_en.pdf9) **Fatal accident at work**: accidents at work leading to the death of the victim within a year (after the day) of the accident. (see: http://ec.europa.eu/employment_social/-publications/2002/ke4202569_en.pdf) **Occupational disease** is a case of disease recognised by the national authorities as being caused by a factor at work. (The EODS data collection covers two types of occupational diseases: a) An incident occupational disease is an occupational disease recognised for the first time as an occupational disease during the reference year. This excludes occupational diseases which had been recognised

	already earlier even if they became more severe during the reference year and were consequently recognised for a higher level of disability. B) A fatal occupational disease is a death recognised by the national authorities as due to an occupational disease during the reference year regardless of when the occupational disease had been recognised for the first time.) (see: European Occupational Diseases Statistics (EODS)

Space for example

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(13) Education and training

Full name of indicator (including subclasses):	**Education levels and training**
Name of subclass	13.1. Highest level of education of employees 13.1.1. up to lower secondary education 13.1.2. post secondary and tertiary education 13.2. Training time per employee
Measurement units:	13.1 Number of employees per class and reporting unit 13.1.1. ISCED classes 1-2 [compulsory education]; 13.1.2 CED classes 3-6 13.2. Average hours /year and reporting unit
System Boundaries	Education and training is considered to include the activities performed during the work time and directly related to the work. Thus, for example, the training of a harvester is included under this category. The basic education, driving licenses etc. are not included.
Possible data source	Current situation (test chains): data collection by modules for each process Future potential data providers: Eurostat (European Social Survey), Nations Education, Scientific and Cultural Organisation (UNESCO-UIS), organization for Economic Cooperation and Development (OECD), National Statistic Office
Calculation mode (incl. conversion factors)	Summary: We have simplified the reporting unit to focus on direct measures/reporting unit. Note that for 13.2 we have also converted from measuring unit/year and employee (which is not a reporting unit anywhere) and to average number of hours/year and reporting unit. Thus, if a forest worker is on average on training 20 out of 2000 hours/year, then we can use the productivity measures to calculate hours of training/year and reporting unit: Example: If in a process we use 0.5 hours/m3 produced, then the related training indicator is 20/2000* 0.5 hours/m3 = 0.005 hours/m3. A small number but it is there. And directly ready for multiplication with flow. Other comments from here. 1. If the employee is financing the education, should this really be included? - No, because this is a matter of individual choice. Only the education and training co-financed or fully financed by the

	employer should be counted. 2. If the company supports education for a driving licence, etc., should it be included? - M1 and M2: Include any kind of education/training co-financed or fully financed by the employer, since it may be hard to separate in the data and it is all likely to be more or less relevant to the needs of the job. M4: If the intention of this indicator is to show how much the industry is putting effort to keeping the know-how of the employers adequate, then it should exclude any other training, but include any such education, shall it be basic or additional. Of course there are some countries in which the public education for some sectors is far better than for some others, and the former sectors benefit from that. But perhaps at least part of the purpose of this indicator is to show just how much effort the industry itself has to put in education & training. Then we would just have to be careful not to misinterpret this indicator to e.g. be telling about the education needs and requirements of one particular industry.
Module specifications / recommendations	
Key definitions	The international classification of education, ISCED, is the basis for data collection on education. ISCED-97, which is the current ISCED, distinguishes between seven education levels, from ISCED 0, pre-primary education, to ISCED 6, second stage of tertiary education leading to an advanced research qualification. The full description of ISCED-97 is available on the Unesco Institute of Statistics website, address: http://www.uis.unesco.org/ev.php?ID=3813_201&ID2=DO_TOPIC **Educational categories** See: http://forum.europa.eu.int/irc/dsis/employment/info/data/eu_lfs/F_LFS_STATISTICAL_CLASSIFICATIONS.htm 0= not completed primary education 1= primary or first stage of basic education 2= lower secondary or second stage of basic education 3= upper secondary education 4= post secondary, non tertiary education

	5= first stage of tertiary education 6= second stage of tertiary education

Space for example

Expert to contact in case of questions: Irina Prokofieva (Irina.Prokofieva@ctfc.es)

(14) Corporate social responsibility

Full name of indicator (including subclasses):	**14. Forest holdings and forest-based enterprises with third party certified management and share of wood sourced from third party certified sustainable production**
Name of subclass	14.1. forest holdings and forest-based enterprises with third party certified management a) Forest certification schemes b) Environmental management system 14.2. Share of wood sourced from third party certified sustainable production
Measurement units:	14.1 a) and b) number of enterprises (no shares) 14.2. % of total volume sourced, per NACE category
System Boundaries	Indicator is applicable at country level. Limited applicability at sub-country, sub-sector, or management process level. 14.1 a) PEFC, FSC; b) EMAS, ISO 14.001 (ISO 26 000 Social responsibility standard is planned to be released in 2010 and might be relevant in the future). Includes related "chain of custody" certificates.
Possible data source	Forest owner organisations National (forest) agencies PEFC and FSC e.g. have their own information on this
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(15) Quality of employment

Full name of indicator (including subclasses):	**15. Persons employed part-time, temporary employed persons, and self-employed persons**
Name of subclass	15.1. Persons employed part-time and employees with a contract of limited duration (annual average) in total, a) Male b) Female 15.2. Self-employed persons
Measurement units:	15.1. % of total persons employed 15.2. % of total person employed
System Boundaries	
Possible data source	EUROSTAT for manufacturing industries
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	Definitions as used by EUROSTAT Specifications as used by EUROSTAT (e.g. “contract of limited duration”) **<u>Definitions as used by EUROSTAT:</u>** **Part time employment rates** represent persons employed part time as a percentage of the same age population. **Full-time/part-time distinction in the main job** is declared by the respondent except in the Netherlands, Iceland and Norway where part-time is determined if the usual hours are fewer than 35 hours and full-time if the usual hours are 35 hours or more, and in Sweden where this criterion is applied to the self-employed.

	Self-employed are persons who work in their own business, farm or professional practice. A self-employed person is considered to be working if she/he meets one of the following criteria: works for the purpose of earning profit, spends time on the operation of a business or is in the process of setting up its business. **Employees with temporary contracts** are those who declare themselves as having a fixed term employment contract or a job which will terminate if certain objective criteria are met, such as completion of an assignment or return of the employee who was temporarily replaced.

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

(16) Provision of public forest services

Full name of indicator (including subclasses):	**16. Provision of public forest services**
Name of subclass	16.1. Forest area designated for a) Recreational use b) Protective services 16.2. Number of visits to forests
Measurement units:	16.1. in ha 16.2. in absolute numbers per year
System Boundaries	Indicator is applicable at country level. Limited applicability at sub-country, sub-sector, or management process level.
Possible data source	16.1 a) is identical and corresponds fully with MCPFE indicator 6.10; 16.1 b) is identical with the sum of areas reported for MCPFE indicators 5.1 and 5.2. 16.2: absolute numbers of visits per year may be obtained for several countries from outputs of COST E33 'Forest Recreation and Tourism' (Working Group 2), MCPFE 2007 (State of Europe's forests), and UN-ECE 2005 (European forest sector outlook study).
Calculation mode (incl. conversion factors)	16.2: data may need to be reworked to ensure consistency between countries. It may also be necessary to aggregate data for some contiguous European countries because of gaps in country-level data. In some cases regional data will be available which would be preferable.
Module specifications / recommendations	
Key definitions	

Space for example

Example:

Expert to contact in case of questions:

David Edwards, FR
Jeoffrey Dehez, Cemagref, Bordeaux (COST E33)

(17) Consumer behaviour and attitudes

Full name of indicator (including subclasses):	**Consumption of wood per capita and consumer attitudes towards forests and forest industry**
Name of subclass	17.1. Apparent consumption of wood per capita 17.2 share of population perceiving a) forest area, b) forest biodiversity, c) forest health as stable or increasing 17.3. Share of population perceiving forest industry to be a) environmentally friendly b) an attractive employer
Measurement units:	17.1. in m3/capita 17.2. and 17.3. in % of ordinal classes, per country
System Boundaries	Indicator is applicable at country level. Limited applicability at sub-country, sub-sector, or management process level.
Possible data source	17.1 is calculated from production and trade data, using classifications as used in these respective indicators 17.2 and 17.3 are based on available national representative survey data.
Calculation mode (incl. conversion factors)	
Module specifications / recommendations	
Key definitions	

Space for example

Example:

Expert to contact in case of questions: Irina Prokofieva (irina.prokofieva@ctfc.es)

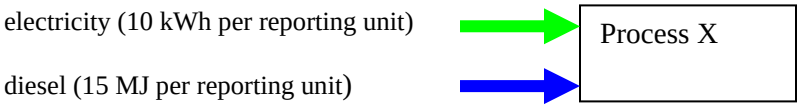
(18) Energy generation and use

Full name of indicator (including subclasses):	**On-site energy generation (from renewables) and energy use classified by origin including the share of self-sufficiency**
Name of subclass	18.1 On-site energy generation from renewables: 18.1.1 On-site *heat* generation from renewables classified by type: 18.1.1.1 from residues from process – inputs (wood processing residues and lignin) 18.1.1.2 from other wood biomass – (wood with the main purpose to be used for energy) (branches, small logs, tops, debris and other forest residues) 18.1.1.3Non-wood based renewable heat (other biomass, wind, solar, geothermal, hydropower etc.) 18.1.2 On-site *electricity* generation from renewables classified by type: 18.1.2.1 from residues from process – inputs (wood processing residues and lignin) 18.1.2.2 from other wood biomass – (wood with the main purpose to be used for energy) (branches, small logs, tops, debris and other forest residues) 18.1.2.3Non-wood based renewable electricity (other biomass, wind, solar, geothermal, hydropower etc.) 18.1.3 On-site *fuel* generation from renewables, excluding fuel used for mill site heat and electricity generation and excluding fuel that is used as a product further in the FWC classified by type: 18.1.3.1 from residues from process – inputs (wood processing residues and lignin) 18.1.2.2 from other wood biomass – (wood with the main purpose to be used for energy) (branches, small logs, tops, debris and other forest residues) 18.1.2.3 Non-wood based renewable fuel production (other biomass) 18.2. Energy use classified by origin: 18.2.1 *Heat* use classified by origin: 18.2.1.1. heat from renewable sources 18.2.1.2. heat from fossil sources 18.2.2 *Direct fuel* use (i.e. fuel used for generation of electricity and or heat in the process not included) classified by origin:

	18.2.2.1. renewable fuel 18.2.2.2. fossil fuel 18.2.3 *Electricit*y use 18.2.3.1. from 100% renewable sources 18.2.3.2. from 100% fossil sources 18.2.3.3. from the grid (external electricity; this may origin from renewable or non-renewable sources)
Measurement units:	- Electricity in kWh per reporting unit - Heat in MJ_h per reporting unit - Fuel in MJ per reporting unit
System Boundaries	All renewable energy that is produced in the process and all (renewable and non-renewable) energy that is used in the process. Remark concerning other indicators: The supply chains of energy to the FWC are included (see data collection protocol –system boundary remark).
Possible data source	Scientific studies, national or European associations, mill specific data, environmental reports, statistics, expert opinion.
Calculation mode (incl. conversion factors)	Secondary energy is reported in all cases, so no conversion to primary energy needed. 1 kWh = 3,6 MJ N.B. An overview of the characteristics (e.g. shares renewable and fossil) of grid electricity per country will be provided by the Energy group and included in ToSIA. Within ToSIA, electricity from the grid will then per country, be calculated into renewable and non-renewable shares.
Module specifications / recommendations	M4/M5 Energy that is produced within the FWC and sold to the grid, will leave the FWC with a 'rucksack' and this should be accounted for in your data reporting, in the same way as energy bought from the grid will come with a 'rucksack'.
Key definitions	Renewables energy sources are defined as renewable non-fossil energy sources: wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. (Eurostat definition) Electricity produced from renewable energy sources comprises of the electricity generation from hydro plants (excluding pumping), wind, solar, geothermal and electricity from biomass/wastes. Biomass/wastes electricity comprises of electricity generated from wood/wood wastes and other solid wastes of renewable nature (straw, black liquor) burning, municipal solid waste incineration, biogas (incl. landfill, sewage, farm gas) and liquid biofuels. (EEA definition).

Space for example

A typical M2/M3/M5 example



18.1 Energy generation from renewables

18.1.1. Heat
- i. Process residues = 0
- ii. Other wood = 0
- iii. Non-wood = 0

18.1.2. Electricity
- i. Process residues = 0
- ii. Other wood = 0
- iii. Non-wood =0

1.81.3. Fuel
- i. Process residues = 0
- ii. Other wood = 0
- iii. Non-wood =0

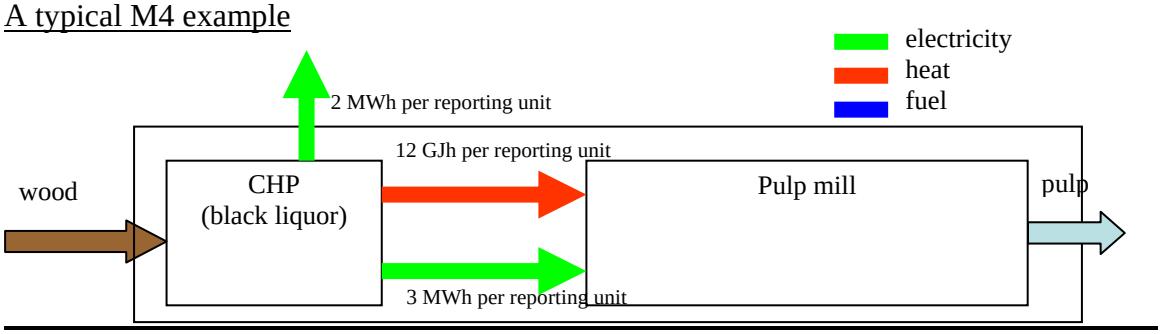
18.1 Energy use

18.1.1. Heat
- i. renewable = 0
- ii. fossil = 0

18.1.2. Fuel
- i. renewable = 0
- ii. fossil = 15 MJ per reporting unit

18.1.3. Electricity
- i. 100% renewable =0
- ii. 100% fossil = 0
- iii. Grid mix =10 kWh per reporting unit

A typical M4 example



18.1 Energy generation from renewables

18.1.1. Heat
- i. Process residues = 12000 MJh per reporting unit
- ii. Other wood = 0
- iii. Non-wood = 0

18.1.2. Electricity
- i. Process residues = 5000 kWh per reporting unit
- ii. Other wood = 0
- iii. Non-wood =0

18.1.3. Fuel
- i. Process residues = 0
- ii. Other wood = 0
- iii. Non-wood =0

18.1 Energy use

18.1.1. Heat
- i. renewable 12000 MJh per reporting unit
- ii. fossil = 0

18.1.2. Fuel
- i. renewable = 0
- ii. fossil = 0

18.1.3. Electricity
- i. 100% renewable = 3000 kWh per reporting unit
- ii. 100% fossil = 0
- iii. Grid mix =0

Expert to contact in case of questions: Jobien Laurijssen (J.Laurijssen@kcpk.nl)

(19) Greenhouse gas emissions and carbon stock

.

Full name of indicator (including subclasses):	**Greenhouse gas emissions and carbon stock**
Name of subclass	19.1. Greenhouse gas emissions in total 19.1.1. Greenhouse gas emissions from machinery 19.1.2. Greenhouse gas emissions from wood combustion 19.2. Carbon stock: 19.2.1 in living woody biomass above ground 19.2.2 in living woody biomass below ground 19.2.3 in dead wood 19.2.4 in soils of forest 19.2.5 in wood products (is internally calculated by ToSIA)
Measurement units:	19.1.1 kg CO_2 equivalents per reporting unit. 19.1.2 kg CO_2 equivalents per reporting unit 19.2.1 kg CO_2 equivalents per reporting unit (i.e. ha) 19.2.2 kg CO_2 equivalents per reporting unit (i.e. ha) 19.2.3 kg CO_2 equivalents per reporting unit (i.e. ha) 19.2.4 kg CO_2 equivalents per reporting unit (i.e. ha) 19.2.5 years of average life time CO_2 equivalents calculated applying Global Warming Potential (GWP) of 100 years.
How ToSIA calculates the indicators	19.1. Greenhouse gas emissions in total ToSIA aggregates 19.1.1 and 19.1.2 along the chain and subtracts the carbon sequestrated internally 19.2.5 Carbon stock in wood products ToSIA multiplies the flow of carbon through the use/consumption processes in M5 with the average life time of wood products provided for those processes and sums these stocks with the carbon stock of the end-products (i.e. products leaving the chain) of FWC.
System Boundaries	• between processes / Modules Boundary between M2 and M3: M2 considers ecosystem response while M3 considers machine

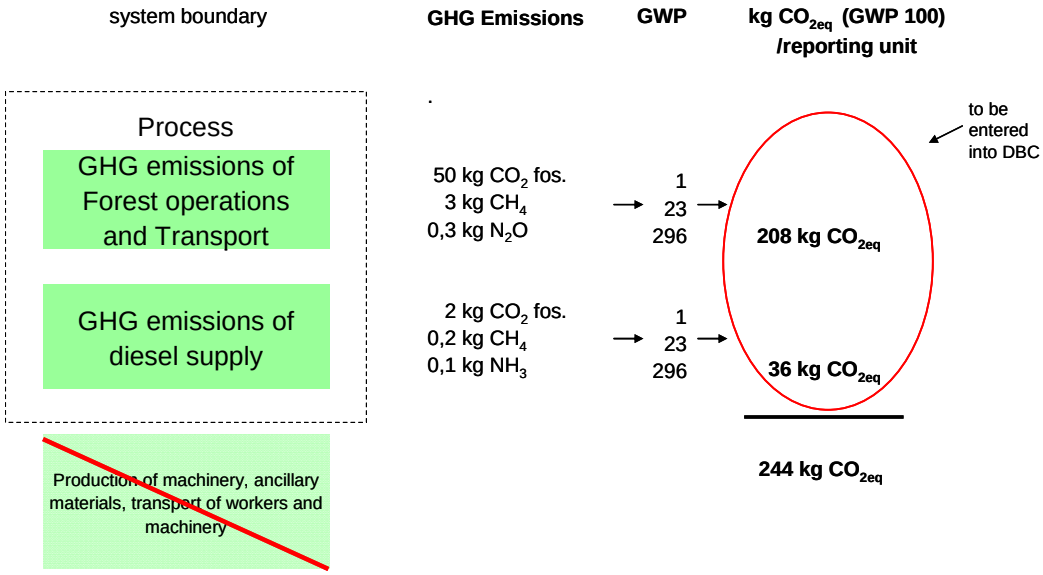
	emissions. All production processes that did take place in the past (e. g. planting of a stand) should be assessed as if the planting (or other processes) would take place in the reference year. • inside/outside FWC The system boundary is narrow in regards to other materials, e.g. we are not taking into account machinery, ancillary materials (lubricants), chemicals, etc. Transport of workers or machinery to the production process is outside the FWC. GHG emissions of these processes are not collected.
Possible data source	Scientific studies, statistics, growth models, mill specific data, environmental reports, expert opinion
Calculation mode (incl. conversion factors)	19.1: In order to show the uniqueness of the forest industry sector, the indicator covers both biotic and fossil CO_2The CO_2 uptake will be accounted for as a negative value internally within ToSIA. The release of biotic CO_2 at the end of life of a product will be accounted for as a positive value. Hence, the amount of biotic CO_2 in any FWC is visible and at the end of life the account for biotic CO_2 is balanced.
Module specifications / recommendations	19.1: - For all: Only CO_2, methane and nitrous oxide are relevant. - For M3: GHG emissions of road transport should be reported including backhaul. Since water content of wood is not considered as water use in indicator 10, water content should be reflected when calculating GHG emissions for transport (e. g. High water content = low mass of carbon per transport unit) 19.2: - For M4, M5: In order to calculate net volume of carbon stock in wood products, average lifetime of wood products need to be defined by M4, M5 experts and reported to ToSIA developers. - M5 experts have to decide on how to handle carbon stocks and methane release from landfill. If it is decided to account for carbon stocks in

	landfill, average biotic carbon dioxide/methane release from landfill need to be defined and reported. Biotic carbon dioxide as well as other biotic GHG (e. g. methane) needs to be accounted for in 13.1.
	Draft 2006 IPCC Guidelines for National Greenhouse Gas Inventories: (http://www.ipcc-nggip.iges.or.jp/public/2006gl/ppd.htm) The following greenhouse gases are covered in the *2006 Guidelines*3: **GWP** • carbon dioxide (CO2) **1** • methane (CH4) **23** • nitrous oxide (N2O) **296** • hydrofluorocarbons (HFCs) **12 – 12.000** • perfluorocarbons (PFCs eg. CF4) **5.700** • sulphur hexafluoride (SF6) **22.200** • nitrogen trifluoride (NF3) • trifluoromethyl sulphur pentafluoride (SF5CF3) **18.000** • halogenated ethers (e.g. C4F9OC2H5 **55** (e.g. CHF2OCF2OC2F4OCHF2) **1.800** • and other halocarbons not covered by the Montreal Protocol including: CF3I **1** CH2Br2 **1** CHCl3 **30** CH3Cl **16** CH2Cl2 **10** An extensive list of GWP conversions factors of greenhouse gases can be found here: http://www.grida.no/climate/ipcc_tar/wg1/248.htm **Carbon sequestration**: The active sequestration of atmospheric carbon in biomass **Carbon uptake**: Synonym for carbon sequestration **Carbon storage**: Storage of carbon in wood based products, soil and landfill

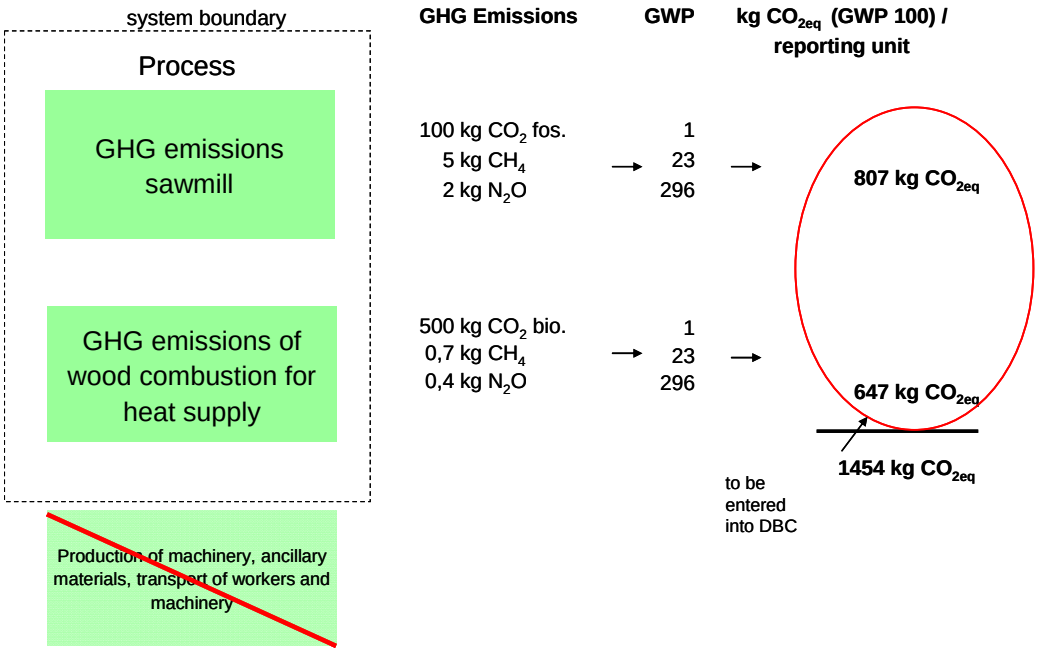
Space for example

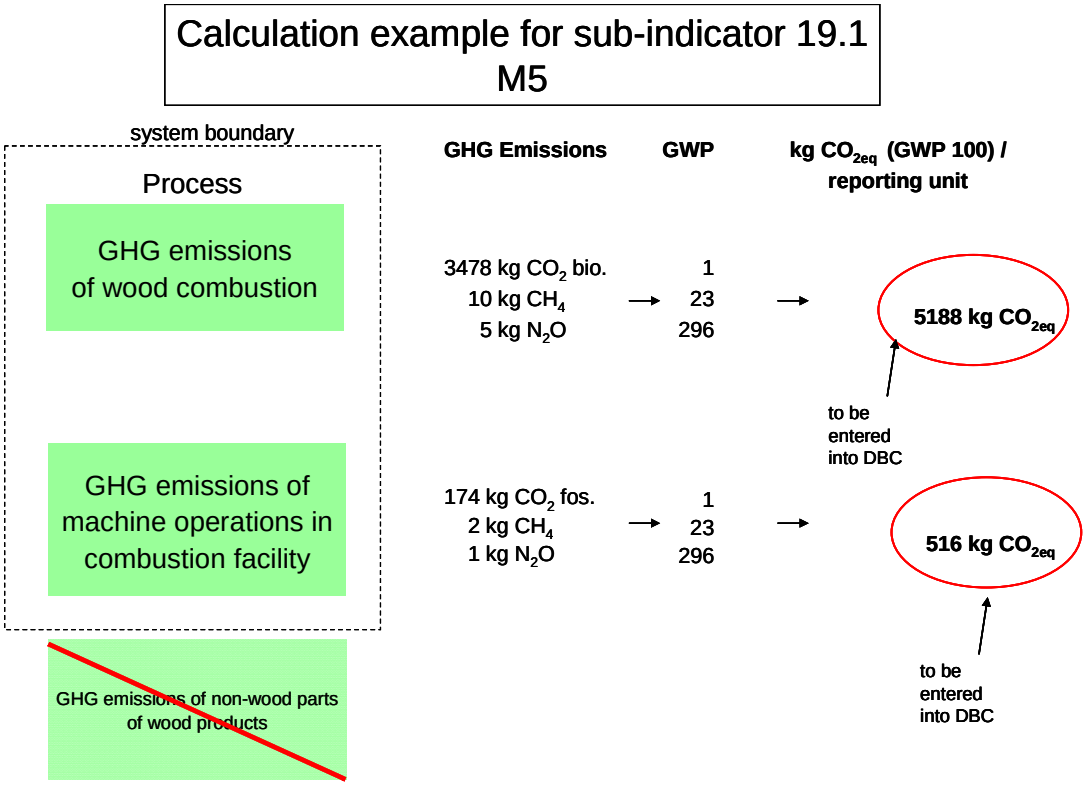
19.1: The following examples may help to calculate the CO_{2eq} applying GWP (100). Please notice that the figures used, are examples to show the calculation mode. They are not real:

Calculation example for sub-indicator 19.1 M2/M3



Calculation example for sub-indicator 19.1 M4





19.2:
Data on the stocks are usually available from National Forest Inventories (NFI) and often computerised when used for UNFCCC or Kyoto Protocol reporting. Typical data for a broadleaved forest stand could be (values are realistic but must be collected specifically for each region):

Average stock of merchantable wood (include crown biomass to 5 cm): 150 m^3ha^{-1}
Average amount of dead wood: 5 m^3ha^{-1}
Average amount of carbon in the soil to 1 m: 110 t C ha^{-1}

Conversion to CO_2-equivalents:
Living aboveground biomass: 150 m^3ha^{-1} x 0.55 t m^{-3} x 1.03* x 0.5 t Ct^{-1} x 44/12 CO_2 C^{-1} = 151 tons CO_2 ha^{-1}
Root biomass: Living aboveground biomass x 0.25**= 38 tons CO_2 ha^{-1}
Dead wood: 5 m^3ha^{-1} x 0.35 t m^{-3}§ x 0.5 t Ct^{-1} x 44/12 CO2 C^{-1} = 3.2 tons CO_2 ha^{-1}
Soil: 110 t C ha^{-1} x 44/12 CO2 C^{-1} = 403 tons CO_2 ha^{-1}

* Expansion factor
** Root:Top ratio
§ Dry weight factor varies depending on degree of decay.

Expert to contact in case of questions:

19.1: Jörg Schweinle

19.2: Karsten Raulund Rasmussen

(20) Transport

Full name of indicator (including subclasses):	**Distance and volume (load) indicator**
Name of subclass	20.1. Distance by mode (km) 20.1.1. Loaded (all modes) (km) 20.2.1 Unloaded for road mode only (km) 20.2. Volume : Load capacity of vehicles (by mode) (ton/vehicle)
Purpose of the indicator	20.1.1 and 20.1.2 tells about: – the intensity of the transportation in terms of ton-km – the share of each transport mode (the road share in particular), that is to say the modal split 20.2. tells about the intensity of the transportation in terms of vehicle-km
How ToSIA calculates the result indicator	For more information cf. D3.3.3 and addendum (D3.3.3bis) 1. ToSIA multiplies the collected loaded distance (km) with the mass of the material flow calculated internally by ToSIA material (ton), this results in the loaded transport intensity (t.km). 2. ToSIA multiplies the collected unloaded distance (km) with the mass of the transferred material (ton) and sum this result with 1.1. to get the Total transport intensity. 3. ToSIA calculates the vehicle-movement intensity by using the result of loaded transport intensity (1.1 loaded ton km) dividing it by the collected loaded capacity (tons/vehicle). This results in the transport intensity information on vehicle movements (vehicle-km).
Measurement units of collected information:	20.1.1 = km 20.1.1.1 - Distance by mode - road transport – loaded: km 20.1.1.2 - Distance by mode - rail transport - loaded: km 20.1.1.3 - Distance by mode - water transport (inland waterways) - loaded: km 20.1.1.4 - Distance by mode - water transport (maritime - sea-going ships) - loaded: km 20.1.1.5 - Distance by mode - air transport - loaded: km 20.1.2 = km 20.1.2.1 - Distance by mode - road transport – unloaded: km 20.2 = ton/vehicle 20.2.1.1 - Freight volume - road transport - loaded capacity: tons / vehicle 20.2.1.2 - Freight volume - rail transport - loaded capacity: tons / vehicle 20.2.1.3 - Freight volume - water transport (inland waterways) -

	loaded capacity: tons / vehicle 20.2.1.4 - Freight volume - water transport (maritime - sea-going ships) - loaded capacity: tons / vehicle 20.2.1.5 - Freight volume - air transport - loaded capacity: tons / vehicle
System Boundaries	**System boundaries: movements of what ?** – In EFORWOOD, the focus is on the FWC and its products, therefore, we work only on transport for **freight**. We integrate "loaded distance" and "unloaded" distance for road mode because they are important in the reality of FWC transport. It will be therefore possible to make sensitivity analyses with ToSIA concerning the impact of changed backhauling due to different logistics approaches and regulation changes. – Transport of worker(s) to and from the respective working places, as well as detours for lunch breaks are excluded. – For products integrating in the transport streams, see the blue line in the figure 2. **System boundaries for case studies: geographical** (see figure and examples) The incoming harbour in Europe is the system boundary. This indicator as others aims to cover "60-80% of the wood material flows". So less important movements, can be dropped under this above condition. For the BW case study, the region's system boundaries should be defined as the political borders of Baden-Württemberg. Import transport distance will be defined from the border to the location of processing or consumption. Export distance should be defined as the distance from the location of production to the BW border. For the different product classes the average distances will be considered.
Possible data source	Specific and empirical – Professional organisations (average distance, empty backhaulage, loaded capacity, …) – Enterprises information (origin/destination, average distance, empty backhaulage, loaded capacity, …) Generic and derived – Eurostat – http://epp.eurostat.ec.europa.eu - aggregated data by products. – CEMT/OECD (European Conference of Ministers of Transport http://www.cemt.org/ – National statistical offices – aggregated data by products. Model-based and estimates

	– Models (for distance matrix country x country, see for instance: http://www.cepii.org/anglaisgraph/bdd/distances.htm) – Expertises
Calculation mode (incl. conversion factors) for the collected information	**<u>For 20.1:</u> need to know the origin/destination and the associated km by transport mode** *For import/export movements inside European area* 1. Imports and exports in tons (conversion factors) from European harbour or extra-European border 2. Origin and destination (O/D) are known (from official statistics) but not transport mode in general 3. Distance can be estimated from O/D matrix in km 4. Transport mode are estimated. **For 20.1.1 - Loaded km** a) Direct information from enterprises: we know exactly the km (origin-destination) within the European territory b) Tkm information can be found also in Eurostat and National Data and are based on loaded movement and on inland streams. Average distance: this information can be estimated by enterprises, experts, professional organisations, Eurostat/National Data (we have tons and tkm so it is possible to deduce average km). c) Additional information could be needed for maritime transport and for movements that are including in the case studies boundaries (cf. figure) and within European territory (intra-European flows). For20.1.2 - Unloaded distance (km): special work for road mode 1. Unloaded movements are important for road mode. This "burden" has to be integrated in the evaluation of this mode. 2. It is an additional information to integrate to existing statistics (Eurostat/National Data, usual information giving by enterprises and official organisation and even expertise) (Attention must be paid to avoid double counting that is to say having unloaded km twice). **For 20.2** **Freight movement** This information aims to highlight regional specificities such as 60 tonnes trucks in Northern Europe versus "40 tonnes" in other countries. It is possible to get information per country for road (cf. table). We use: ▪ legal weight and load capacity (maximum weight of goods declared permissible by the competent authority of the country

of registration of the vehicle; from UN Glossary for Transport Statistics)

- and not load factor - the ratio of the average load to total vehicle freight capacity, in tonnes or volume (vans, trucks, train wagons, ships and aircraft). As such data are not available for the whole EU for all modes (except for aviation), the load factor is defined as the number of tonne-km divided by the number of vehicle-km (TERM, EEA).

Load capacity tells also that mass or volume can be the limited factor and therefore information needed to identify transport and the importance of material density:

– *Example 1:* Transportation of particle boards (density 0.66 tons/m^3) by a 40 tons truck.
Depending on the equipment and country for a load capacity of 25 tonnes we can have:
* for a "classic" equipment (usually tractor + semi-trailer) about 85 m^3
* for "large volume" or "mega trailer" equipment (usually road train = truck + trailer) about 95 m^3, up to 120 m^3 for jumbo truck.
So for particle board: 0.66*85 = 56 tonnes > loaded capacity, than the maximum possible is 25 tonnes that is to say 37.8 m^3
20.1.2 reported loaded capacity is 25 tons per vehicle.

Example 2: Transportation of chairs (density 0.3 tons/m^3) by a 60 tons truck, loading volume 100 m^3. Loaded capacity with this low-density product is limited by the volume of the truck, it is thus 100 m^3 * 0.3 tons/m^3 = 30 tons.

For M4/M5, it is important to identify density factors from product to load weight or load volume by vehicle (ex. number of chairs/40 tonnes truck; volume of corrugated board/wagon). This work has to be done at case study level.

Wood density: *(*Wood density (default values, use real density if possible).

Roundwood[1]	**Kg/m^3**
Spruce	790
Douglas	710
Scots Pine	855
Maritime Pine	880
Black Pine	930

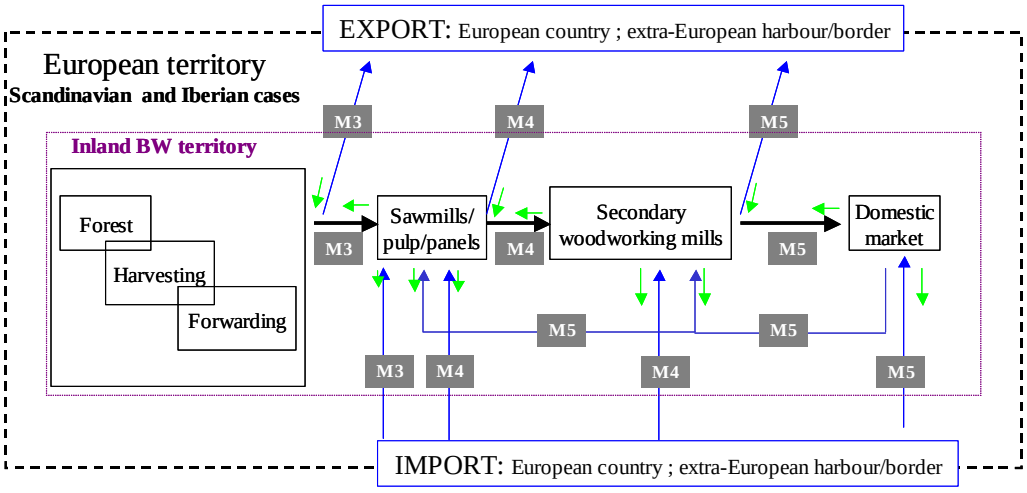
1

	Aleppo Pine	970
	Oak	950
	Beech	1025
	Poplar	790
	Spanish Chestnut	850
	Chip: 1 apparent m^3 of chip (in average, depends on tree species, humidity, compaction and the size of the chips)	250
Module specifications / recommendations	**For 20.1** M2: It is optional and mainly for "cultivated forest": transport can be estimated for instance for the plantations. M3/ M4/M5: If there is not specific information available on backhaulage practices, we suggest using 45% for M3 and 25 % for M4-M5 by default. However, those % can be higher for Light Duty Vehicles (LDV)and Vans. The bounds between modules (who is responsible of a particular flow?) are determined in the figure. The general principle is that at the outward door flows belong to the next process. However, exchanging information between modules is of course of interest (some mills have information on their transport deliveries and distribution systems to their customers). **For 14.2** M3: Specific information required for wood due to the impact of equipment used and type of products (roundwood, long logs and chips) M4/M5: Generic information can be used	
Key definitions	**Transport** 1/ is defined as any movement of goods (freight) and/or of passengers using a given network (Eurostat). **2/** any movement of goods (freight) using a given network **(EFORWOOD definition).** **Eforwood modal split** (% in total inland freight tonne-km): defined as the percentage share of each mode of transport in total *European territory* movements expressed in tonne-kilometre (tkm). It includes transport by road, rail, inland waterways and maritime movement between European countries (movements on national territory + movements to the extra-European import/export harbour and extra-European borders) (adjusted from Eurostat definition) **Extra-European** Flows (import and export) and associated transport (km) outside the European inland territory	

System boundaries

GEOGRAPHIC

FLOWS for a specific FWC



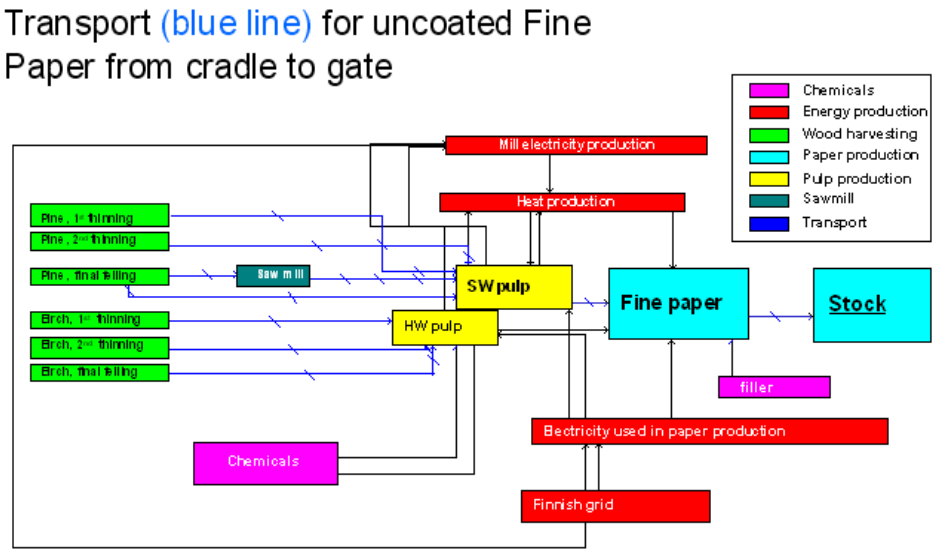
Mx Module responsibility on the stream

Empty backhaulage flows for road mode only

PRODUCTS

The indicator aims to track the material flows of the FWC (wood/wooden inputs and FWC outputs).

For instance:



Source: from "Flowsheet example from KCL-ECO software".

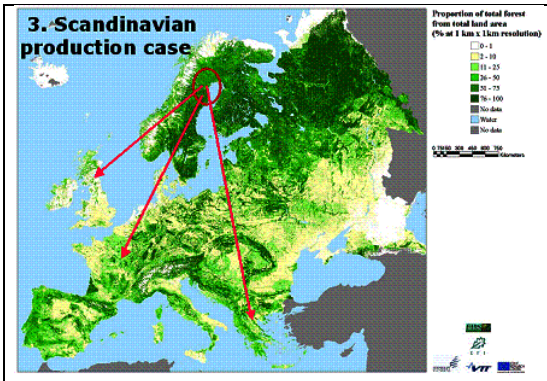
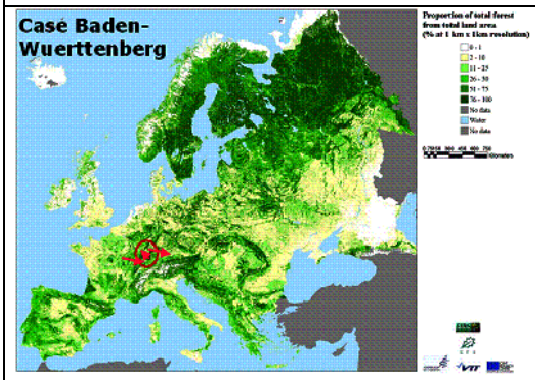
Examples

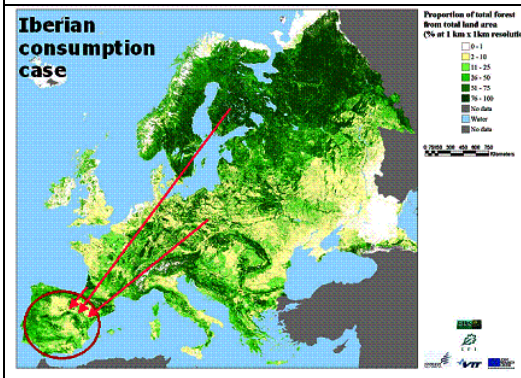
System boundaries

- import from Brazil (ship) is integrating in the system only from the European harbour to the final destination on the European territory (inland waterways, railways or truck).
- import from Russia (railways) is integrating in the system only when it crosses the European border (ex. Finnish border).

Distances:

- *Example 1:* loaded km from forest to mill is 100 km. If we estimate that 75 % of the backhaulage distance is empty and link with the wood procurement, then unloaded distance reported is 75 km.
- *Example 2:* loaded km from mill to end customer is 100 km. If we do not have any information on specific backhaulage practices, we rely on general information: each loaded km generates 0.25 km empty backhaulage. Therefore, the unloaded distance reported is 25 km.

	<u>Transport by truck</u> From the forest to the mill (truck – loaded 14.1.1 and empty backhaulage 14.1.2) <u>Transport by train</u> From the mill to the export harbour (train)	20.1.1 Loaded: 70 km 20.1.2 Unloaded: 0.40*70 = 28 km 20.1.1 Loaded: 150 km
	**Export** <u>Transport by truck</u> 1. From the forest to the mill (truck – loaded 14.1.1 and empty backhaulage 14.1.2) <u>Transport inland waterways</u> 2. From the mill to the BW border (inland waterways) 3. From the border to the mill (not in BW): excluded since that is out of the system boundaries Ex. 50 km from the BW border to the mill in another German Lander (25 km)=excluded **Import** <u>Transport by truck</u> From the forest to the mill (truck 150 km ▪ In France: 75 km (loaded) ▪ From the German border to BW border (loaded): 10 km	20.1.1 Loaded: 50 km 20.1.2 Unloaded 0.5*50 km = 25 km 20.1.1.Loaded 100 km From the BW border to the BW mill = 150-75-10 = 65 km (to be calculated). This is the loaded part of the transport.

		If the empty backhaulage represents 45% of the back returns, then unloaded km = 45% * 65km = 29.25 km Total km = 65+29.25 = 94.25 It is important to see if there is one transport mode or more
	**Import** Transport by truck 1. From the Swedish mill to the harbour (truck): Transport maritime 2. From the Swedish harbour to the Spanish harbour (sea shipping) Transport by train 3. From the harbour to the platform (railways) Transport by truck 4. From the platform to the shop (light duty truck) Transport by truck 5. From the shop to the final consumer (van)	20.1.1 Loaded: 100 km 14.1.2 Unloaded: 0.3^{2}*100km= 30 km Sub Total = 130 km 20.1.1Loaded 2500 km 20.1.1Loaded 150 km 20.1.1 Loaded: 50 km 20.1.2. Unloaded: 0.5*50km= 25 km Sub Total = 75 km 20.1.1 Loaded: 15 km 20.1.2 Unloaded: 1*15 km= 15 km Sub Total = 30 km It is important to identify the share of empty backhaulage for road mode (it depends on the products and also the vehicles types)

Put 0 or not applicable
0 when we know that it is not applicable at the moment: ex. Airways for roundwood (till now)
"Not applicable" as a choice means it does not make sense (ex. inland waterways where there is not river)

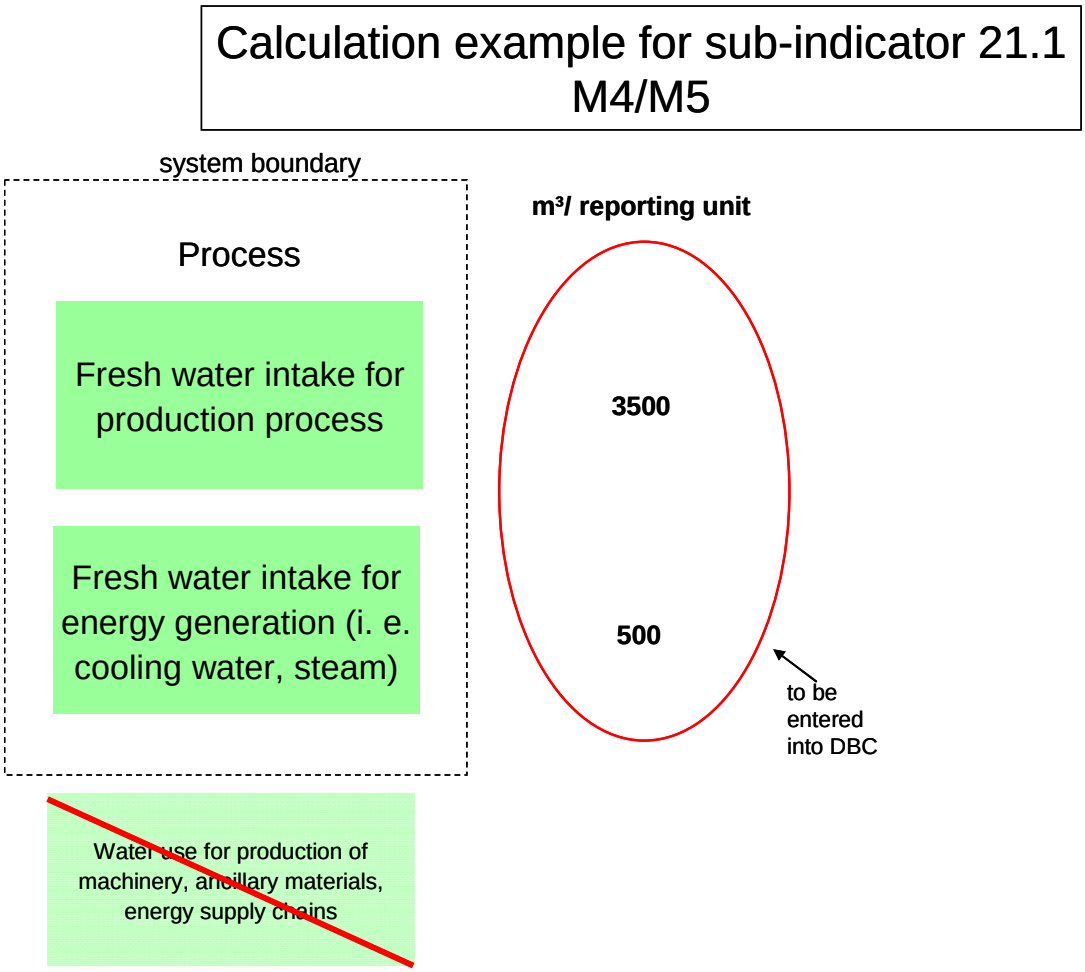
Expert to contact in case of questions:
M3: Elisabeth Le Net, e-mail: elisabeth.lenet@fcba.fr
M4: Katri Behm, e-mail: katri.behm@kcl.fi

[2] For example.

(21) Water Use

Full name of indicator (including subclasses):	**Water use**
Name of subclass	21.1 Water use (freshwater intake by industry) [relevant for industry] 21.2 Water use of the forest ecosystem 21.2.1: Evapotranspiration from the forest ecosystem 21.2.2: Groundwater recharge
Measurement units:	21.1: m^3 per reporting unit 21.2.1: m^3 per reporting unit (i.e. ha) 21.2.2: m^3 per reporting unit (i.e. ha)
System Boundaries	• inside/outside FWC Data on water use related to energy generation in industry (i.e. paper mill) need to be collected. For the energy supply chains data collection **is not** necessary. Water use related to other supply chains is outside the system boundary.
Possible data source	21.1: Industry data, expert guess 21.2: model calculations, literature
Calculation mode (incl. conversion factors)	21.1: Data on total fresh water intake for each process in industry is needed. At this time there is no distinction made between different water qualities. Water pollution or emissions into water are covered by indicator 24 21.2.1: The loss of water from a given area during a specified time by evaporation from the soil and plant surface and by transpiration from plants. Process models may be used for management scenarios under defined site conditions. Literature sources. 21.2 2: Output of process models. Validity of estimates dependent on site conditions. Estimates will be good for conditions where surface runoff can be neglected.
Module specifications / recommendations	21.1: For M3: Water content of wood is not considered here (cf. indicator 14).
Key definitions	

Space for example



Expert to contact in case of questions:

21.1: Jörg Schweinle

21.2: Karsten Raulund Rasmussen

(22) Forest Resources

.B - Those indicators that are not intended for direct data collection are printed in grey!

Full name of indicator (including subclasses):	Forest Resources
Name of subclass	22.1. Forest and Other Wooded Land Area per process 22.2 Standing Volume or Growing Stock per process 22.2.1 Total volume above ground with stump over-bark 22.2.2 Total volume above ground with stump under-bark 22.2.3 Total volume above ground without stump over-bark 22.2.4 Total volume above ground without stump under-bark 22.2.5 Commercial volume over-bark with a top diameter of di 22.2.6 Commercial volume under-bark with a top diameter of di 22.3.. Balance of afforestation and defforestation: 22.3.1 - Afforestation area 22.3.2 - Defforestation area 22.4. Balance of increments and fellings: 22.4.1 - Net annual increment per process and year 22.4.2 - Volume of felled trees 22.5. Age and/or diameter distribution: 22.5.1.1 - Age distribution: number of classes 22.5.1.2 - Age distribution: coefficient of variation 22.5.2.1 - Diameter distribution: number of classes 22.5.2.2 - Diameter distribution: coefficient of variation
Measurement units:	22.1 ha 22.2.1 $m^3.ha^{-1}$ 22.2.2 $m^3.ha^{-1}$ 22.2.3 $m^3.ha^{-1}$ 22.2.4 $m^3.ha^{-1}$ 22.2.5 $m^3.ha^{-1}$ 22.2.6 $m^3.ha^{-1}$ 22.3.1 ha

	22.3.2 ha 22.4.1 $m^3.ha^{-1}$ 22.4.2 $m^3.ha^{-1}$
System Boundaries	Forest resources are specific to M2. The system boundaries depend on the case study definition. In both, regional- and forest-defined case studies, the system boundary is geographically defined. In the case of the consumption-defined case study, the system boundary is defined by the resource demand to fulfill the consumption. The resources may be located in different geographical regions (e.g. in Iberia, France and Sweden).
Possible data source	NFI data, Forest Statistics and/or Forest Simulators (regional or European)

Calculation mode (incl. conversion factors)	22.1: Forest and Other Wooded Land Area Many forest inventories provide information regarding forest and other wooded land area. It can be obtained from aerial photo interpretation data if available for 2005. In case there is no data for the reference year this area must be estimated. 22.2: Standing Volume or Growing Stock With the data provided by the NFI, each regional case has to provide all volumes from a) to f), if possible, using allometric equations. In case there is no NFI data for the reference year volumes from a) to f) will have to be simulated. 22.4: Balance of increments and fellings Net Annual Increment is obtained subtracting total volume above ground with stump over-bark in years i and i-1 (V_i and V_{i-1}) and dividing it by the number of years between NFIs (n). This method requires two consecutive NFIs. $NAI = (V_i - V_{i-1}) / n$ In case there is no data available, increments will have to be simulated. Felled volume will be derived internally in ToSIA from the material flow at the M2/M3 boundary.

	22.5. Age and/or diameter distribution According to the indication of some colleagues age and/or diameter distribution were difficult to take into account in the multicriteria decision analysis, therefore we simplified it by two values: number of classes and coefficient of variation. • Coefficient of variation (CV) The coefficient of variation represents the ratio of the standard deviation to the mean, and it is a useful statistic to measure the dispersion of data points around the mean. $CV = \frac{standard\ \ deviation}{mean}$ • Age distribution Different age classes for each forest specie • Diameter distribution Different diameter classes for each forest specie *Example*: *Classes interval: ≤ 10 cm; 11-20 cm; 21-30 cm; 31-40 cm; 41-50cm;51-60 cm; 61-70cm; 71-80cm; 81-90 cm; > 90cm* *In the case of Eucalyptus, the major number of trees are within the first class, diameter≤ 10 cm*
Module specifications / recommendations	
Key definitions	FAO, 2005. Forest Resources Assessment – Terms and definitions. • Forest Area - Forest Land: Land spanning more than 0.5 ha with trees higher than 5 m 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 agriculture or urban land use. (FRA – Terms and definitions) - Other Wooded Land: Land not classified as forest, spanning more than 0.5 ha with trees higher than 5 m and a canopy cover between 5% and 10%, or trees able

	to reach these thresholds *in situ* or with a combined cover of shrubs, bushes and trees above 10%. It does not include land that is predominantly under agriculture or urban land use. • Growing Stock Volume of all living trees more than X cm of d.b.h it may also include branches to a minimum diameter of Y cm. Includes the stem from ground level or stump height up to the tree top. • Commercial Growing Stock Volume of all living trees more than X cm of d.b.h it may also include branches to a minimum diameter of Y cm. Includes the stem from stump height level up to a tree top diameter of di cm that can vary according to the species and the country definitions. di indicates the top diameter that can be fixed by M3, M2 will be able to provide results depending on the needs from M3; this is the reason why we included a generic di. • Afforestation Establishment of forest plantations on land that, until then, was not classified as forest. Implies a land use change from non-forest to forest land. • Defforestation Conversion of forest to another land use or the long term reduction of the tree canopy cover below the minimum 10% threshold. Conversion implies a different use during at least 10 years Balance of afforestation and defforestation is one of the more relevant indicators, giving information about the increase or decrease of the forest area (note that this indicators are provided as ha in the region/Europe). • Net annual increment Net annual increment is a very important indicator, that provides information on the way forest is growing (or not, if negative). Is defined as the average annual volume of living trees above the minimum d.b.h. threshold over the given reference. • Fellings Is defined as the over-bark volume of all trees, living or dead, above a minimum d.b.h. threshold felled annually in forest or other wooded land, weather or not

	they are removed from the forest. It includes thinnings, pre-commercial thinnings and cleanings of trees left in the forest, and natural losses that are recovered.

Expert to contact in case of questions:

Veronique Cucchi, INRA e-mail: cucchi@cirad.fr

Margarida Tome, ISA email:magatome@isa.utl.pt

(23) Soil condition

Full name of indicator (including subclasses):	**Soil condition as expressed by chemical soil properties, and soil compaction**
Name of subclasses:	23.1 Chemical soil properties related to soil acidity and eutrophication (pH, CEC, C/N, organic C, base saturation), classified by main soil types 23.1.1: pH 23.1.2: CEC 23.1.3: C/N ratio 23.1.4: organic C 23.1.5: base saturation 23.1.6: site nutrient budget averaged over total rotation period (N, P, K, Ca, Mg) 23.2: Soil compaction from machine operations
Measurement units:	23.1.1: pH classes 23.1.2: cmol per reporting unit (i. e. ha) 23.1.3: ratio per reporting unit (i. e. ha) 23.1.4: g per reporting unit (i. e. ha) 23.1.5: % (calculated as sum base cations/CEC)*100 per reporting unit (i. e. ha) 23.1.6: % difference over total rotation period per reporting unit (i. e. ha) 23.2: percentage of drive-over area in scarification and harvesting/hauling processes per reporting unit (i. e. ha)
System boundaries	Only in forests (M2) and only for forests within Forest Wood Chain and forests associated with these through presence in the same region (i.e. for a regional analysis ALL forests should be taken into account, also those where no harvesting takes place for conservation or other reasons). The balance is calculated over the whole rotation period or the whole time interval a process belongs to a phase and averaged over the number of years
Possible data source	1.2 Literature
Calculation mode (incl. conversion factors)	Conversion factors needed: reporting unit > reference unit
Module specifications / recommendations	Only for M2 und M3

Key definitions	

Space for example

23.2: Calculation example for **soil compaction from machine operations**:

Only to be estimated for scarification processes (M2) and harvesting/hauling processes (M3).

15 % driven-over area per reporting unit

If scarification and harvesting/hauling processes are based on permanent strip roads, the driven-over area stays constant. The driven-over area needs to be reported once, i. e. for scarification. If the same strip roads are later used for harvesting and forwarding there is no additional soil compaction and 0 needs to be reported for these processes.

If processes take place only on frozen ground, 0 needs to be reported, as there is no impact on the soil.

Expert to contact in case of questions:

Karsten Raulund Rasmussen

(24) Water and Air Pollution

Full name of indicator (including subclasses):	**Water pollution classified by organic substances and nutrients, and non-greenhouse gas emissions into air**
General FWC sustainability indicator subclasses:	24.1 Water pollution 24.1.1: organic substances (biochemical oxygen demand) 24.1.2: nutrients as Nitrogen or TKN (Total KJELDAHL Nitrogen) 24.2. Non-greenhouse gas emissions into air 24.2.1: CO 24.2.2: NO_x 24.2.3: SO_2, 24.2.4: NMVOC)
Measurement units:	24.1.1: kg BOD5 per reporting unit 24.1.2: kg TKN per reporting unit 24.2.1: kg per reporting unit 24.2.2: kg per reporting unit 24.2.3: kg per reporting unit 24.2.4: kg per reporting unit
System boundaries	• inside/outside FWC Data on water pollution and non-greenhouse gas emissions related to all production processes and energy generation in industry (i.e. harvesting machines, paper mill) need to be collected. For the energy supply chains data collection **is not** necessary. Water pollution and non-greenhouse gas emissions related to other supply chains is outside the system boundary. **Accidental Pollution** by pesticides, fertilizers, lost fuels and hydraulic oils are outside FWC.
Possible data source	Data on BOD5 and TKN should be available at industry if they release non-treated or treated waters into rivers and other water bodies. The Water Information System for Europe (WISE) provides a variety of data on water pollution. http://water.europa.eu Data on non-greenhouse gas emissions are available for almost all combustion processes (forest machinery,

Calculation mode (incl. conversion factors) **Module specifications / recommendations**	trucks, production processes, energy generation, etc.) from public data bases, industry, machine manufacturers.
Key definitions	**Biological Oxygen Demand** (BOD) is a chemical procedure for determining how fast biological organisms use up oxygen in a body of water. BOD is not an accurate quantitative test, although it could be considered as an indication of the quality of a water source. **Total Kjeldahl Nitrogen** is the sum of organic nitrogen, ammonia NH_3 and ammonium NH_4^+ in a sample (i.e. water).

Space for example

24.1.1: Calculation example for water pollution in a paper mill > **BOD5**:
0,56 kg BOD5/m³ waste water x 0,0035* = 0,000196 kg BOD5/reporting unit

24.2.2: Calculation example for non-greenhouse gas emissions of a forest machine > **NOx**:
0,57 kg NOx/kg fuel x 7** = 3,99 kg NOx/Machine Hour

3,99 kg NOx/Machine Hour / 15*** = 0,266 kg NOx/t wood

Conversion factor: **reporting unit -> functional unit** needs to be reported for calculation in ToSIA

* conversion factor: m³ waste water -> reporting unit
** conversion factor: kg fuel -> machine hour
*** conversion factor: machine hour -> reporting unit

Expert to contact in case of questions:

Jörg Schweinle

(25) Forest biodiversity

Full name of indicator (including subclasses):	**Tree species distribution, dead wood and area of protected forests**
General FWC sustainability indicator subclasses:	25.1. tree species distribution 25.1.1 total number occurring 25.1.2 of which introduced [as specified in MCPFE] 25.2. Volume of standing and of lying deadwood on forest and other wooded land in total, and classified by 25.2.1 standing deadwood 25.2.2 lying deadwood 25.3. Area of Protected forests according to MCPFE Assessment Guidelines (www.mcpfe.org)
Measurement units:	25.1. total number per 1000 ha 25.2. m^3 ha^{-1} (average per 1000 ha) 25.3. % protected area in of total forested area in the region.
System boundaries	KR suggest: Forested area (according to FAO definition) in the region
Possible data source	Current situation: NFI's will be the best source in most countries Other potential (inter)national data providers: European Environmental Agency (EEA) UNECE / FAO Berne Convention data Council of Europe: EMERALD data UNEP MCPFE (http://www.mcpfe.org/) National Environmental Agencies National Ministry of Environment
Calculation mode (incl. conversion factors)	25.1 and 25.3 - No calculation needed – direct reporting. 25.2 The indicator should be reported as m3 ha-1. However because the variability is relative high the estimate of the number per ha should be calculated over per 1000 ha.
Module specifications / recommendations	Only for M2

Key definitions	25.1. All occurring tree species should be included. 25.2 Use local definitions of dead wood. They may vary slightly between countries, but the differences are not significant. 25.3 Protected forests are forests that comply with the definition on protected area. Protected Area: A protected area is an area of land (and/or sea) especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (World Conservation Union (IUCN)).(source: http://esl.jrc.it/envind/un_meths/UN_ME109.htm)

Expert to contact in case of questions:

Karsten Raulund-Rasmussen [KRR@life.ku.dk]

(27) Generation of waste

Full name of indicator (including subclasses):	**Generation of waste: total, hazardous, and categorised by type of waste management**
Name of subclass	27.1. Generation of waste 27.1.1. Not classified as hazardous waste 27.1.2. Classified as hazardous waste 27.2. Waste management 27.2.1. Waste to reuse or material recycling 27.2.2. Waste to incineration 27.2.3. Waste to landfill
Measurement units:	kg per reporting unit
System Boundaries	All waste generated should be accounted for. See Key definitions.. 27.1. All waste classified as hazardous waste (27.1.2) should be accounted for, independent of following treatment option. See Key definitions. 27.2. All waste which is directed to respective management option should be accounted for. In this indicator what is measured is waste directed towards a waste management option. It is not considered what will in the end be treated through this option (e.g. material losses in recycling processes are not considered). When the waste inventoried is "undefined" and the treatment option is not known an approximation could be the national average treatment, e.g. 10% to material recycling, 50% to incineration and 40% to landfilling.
Possible data source	27.1. Eurostat – have data on municipal waste generated, incinerated and landfilled on a national level. European Topic Centre on Waste and Material Flows (ETC/WMF) has compiled a list of national waste databases: http://waste.eionet.europa.eu/wastebase/national_databases. LCA-data in different databases. ISO certified enterprises, communes and county boards etc. ADEME (France) National statistical offices – probably aggregated data. Relevant conference proceedings Expert opinion
Calculation mode (incl. conversion factors)	27.1. Humidity of the waste (% of water present) should be noted in the Data Client when possible (in the "Indicator note" section). 27.2. Note: All waste of wood and non-wood origin that is produced is

	divided between management options. If not known otherwise, hazardous waste is directed to landfill.
Module specifications / recommendations	27.1. M2/M4 - When biomass from forests is burned for energy, ash is produced as a waste product. Depending on the concentration of problematic elements (often cadmium) or compounds such ash may be hazardous (27.1 b) or within subclass waste for recycling (27.2 a). M3 - For M3, 27.1 for Europe (in case of lack of national statistics)can be calculated using French data (annual quantities of waste per type of forest machine) gathered in the GEDEON project (see : ttp://www.afocel.fr/GEDEO/English/index.htm). The extrapolation to EU25 has been done through known machine fleet (the most accurate) and using wood harvest per country with estimation of mechanisation rate : logging operations in Europe produce between 25000 to 30000 tonnes of waste per year, of which 70 % are hazardous according to the European nomenclature (see : http://www.afocel.fr/gedeon/English/Collecte_Tri_dechets_France.htm) M4 and M5 - Process/Industry specific data should be used in M5 as far as possible. If not available sector averages or even national averages may be used. 27.2. M3 - The suggestion is to consider the generic data at the national level. M4 and M5 - Process/Industry specific data (e.g. LCA data, sustainability reports) should be used whenever possible. Regarding the waste streams (material recycling, incineration or landfill) sector averages are probably best available data. National averages for respective waste material could be used if sector averages are not available.
Key definitions	27.1. Based on Eurostat and OECD deinitions which can be found at: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM&StrGroupCode=CONCEPTS&StrLanguageCode=EN COM(2007) 59 final. Communication from the Commission to the council and the European Parliament on the Interpretative Communication on waste and by-products. (includes criteria for making the distinction between waste and by-products) Waste refers to materials that are not prime products (i.e. products produced for the market) for which the generator has no further use for own purpose of production, transformation or consumption, and which he discards, or intends or is required to discard. Waste may be generated during the extraction of raw materials during the processing of raw materials to intermediate and final products, during the consumption of final products, and during any other human activity. Excluded in this definition are: - Residuals directly recycled or reused at the place of generation (i.e.

	establishment); - Waste materials that are directly discharged into ambient water or air. (Eurostat / OECD definition) i.e. waste includes also waste that is later recovered through e.g. material recycling or energy recovery. Hazardous waste refers to the categories of waste to be controlled according to the Basel Convention on the control of trans-boundary movements of hazardous waste and their disposal (Article 1 and Annex I). (Eurostat / OECD definition) http://www.basel.int/text/documents.html 27.2 Re-use shall mean any operation by which end of life products and equipment (e.g. electrical and electronic equipment) or its components are used for the same purpose for which tey were conceived. Direct reuse at the place of generation (i.e. establishment) is excluded. (Eurostat/OECD Definition) Recycling is defined as any reprocessing of material in a production process that diverts it from the waste stream, except reuse as fuel. Both reprocessing as the same type of product, and for different purposes should be included. Direct recycling within industrial plants at the place of generation should be excluded. (Eurostat / OECD Definition) Incineration is the controlled burning of solid, liquid or gaseous waste materials at high temperatures. (Eurostat / OECD Definition) Landfill refers to the final placement of waste in or on the land in a controlled or uncontrolled way according to different sanitary, environmental protection and other safety requirements. (Eurostat / OECD Definition)

An example

Process: Demolition of LVL beam

Reporting unit: kg of LVL beam

The process used in an illustrative example (rough data) is demolition of a LVL beam used in construction. The total weight of the product to be demolished is 400 kilograms. At demolition of a house, all of it becomes waste. We assume that no other waste is produced, which is not necessarily the case (i.e. If you break a sledge hammer in the process, please include it as waste). The produced waste is partly hazardous (8 kg) because of the glue/resin and lacquer remains. All of the hazardous waste is taken to landfill and treated there. Also 10 kg of wood-based waste is taken to landfill, because it is of poor quality and can no longer be recycled or is toxic and should not be incinerated. Majority of the wood, 280 kg (70% of the total waste) is taken to incineration and 102 kg

of wood is recycled to make new wood products (e.g. panelboards). The total flow directed to waste management options is thus: 102 + 280 + (8 + 10) = 400 kg. The moisture content of the wood is 13% - a note on this is made in the Data Client (in the "Indicator note" section).

The reporting of the figures should be as follows (material flows illustrated in figure below):

27.1.1. total waste 1 kg per reporting unit (1 kg of product, this could be more as noted above if other waste is produced)

27.1.2. hazardous waste 0.02 kg per reporting unit (calculated from 8 kg/400 kg)

27.2.1. destination reuse/recycling 0.26 kg per reporting unit (calculated from 102 kg/400 kg)

27.2.2. destination incineration 0.55 kg per reporting unit (calculated from 280 kg/400 kg)

27.2.3. destination landfill 0.05 kg per reporting unit (calculated from 18 kg/400 kg)

Expert to contact in case of questions:

Laura Peuhkuri, Pöyry Forest Industry Consulting Oy, e-mail: laura.peuhkuri@poyry.com

Annex 1 Transport

Annex 1.1 - Transport: an indicator and a process

For the transport impacts (as a process), we work only on **loaded km or loaded tkm.**

The indicators of the transport

(1) Gross value added	Transport process
(2) Production cost	Transport process
(4) Resource use incl. recycled materiel	(calculated by Tosia) Not a transport process
(7) Total production	(calculated by Tosia) Not a transport process
(8) Employment	Transport process
(9) Wages and salaries	Transport process
(10) Occupational safety and health	Transport process
(11) Education and training	Transport process
(**12) Energy** generation and **use**	Transport process (for energy use)
(13) Greenhouse gas emissions and carbon stock	Transport process (for GHG)
(14) Transport	By definition
(15) Water use	Not a transport process
(19) Generation of waste	Not a transport process

Some propositions to calculate the indicators

(1) Gross value added	Ratio used on general official data on transport (share of tkm/total tkm)	By mode By country	Probably not direct information
(2) Production cost	Models/calculation Compute project information	By mode By country	For desegregation use national % if not direct information
(8) Employment	Ratio used on general official data on transport (share of tkm/total tkm) or FTE/tkm	By mode By country	For desegregation use national % if not direct information
(9) Wages and salaries	General official data on transport	By mode? By country	For desegregation use national % if not direct information
(10) Occupational safety and health	Ratio used on general official data on transport (share of tkm/total tkm)	By mode? If not, use modal split in total tkm By country	For desegregation use national % if not direct information
(11) Education and training	Ratio used on general official data on transport (share of tkm/total tkm)	By mode? If not, use modal split in total tkm By country	For desegregation use national % if not direct information
(12) Energy generation and use	Via fuel consumption by tkm (difference loaded and unloaded) For road mode: diesel for HDV and LDV and for Vans:	By mode By country	See tkm information (transport indicator)

	diesel or petrol (but diesel is the main energy use)		
(13) Greenhouse gas emissions and carbon stock	From energy use (12) For road mode: see share of Euro type of vehicle for road mode (if not, Euro 3 is dominating)	By mode By country	See the Indicator 13 Data Collection Protocol (calculation mode)

Some references

- **General**

  Eurostat (2007), "Panoroma of Transport"
  http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1073,46587259&_dad=portal&_schema=PORTAL&p_product_code=KS-DA-07-001

  UN Glossary for Transport Statistics (available in English and in French)
  http://www.cemt.org/online/glossaries/GloStat3e.pdf

  Bilan Carbone (in French) (equipments and energy consumption) (cf. in particular, Guide des facteurs d'émission - Edition janvier 2007 (V5))
  http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=15729&m=3&catid=15736

- **On cost**

  COMPETE Project (2006), "Analysis of the contribution of transport policies to the competitiveness of the EU economy and comparison with the United States, October 2006 (Cf. annex 1 in particular;

  http://ec.europa.eu/ten/transport/studies/index_en.htm

- **On IWT (inland waterways transport)**

  PINE project (2004), "Prospect of Inland navigation within enlarged Europe"
  http://ec.europa.eu/ten/transport/studies/index_en.htm

  Knörr and Reuter (2005) (in German) for (load capacity)

Annex 1.2 – Freight equipments by mode

Road

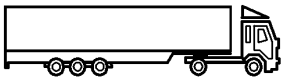
Decision of the transport group:

	Module 3[3]	Module 4	Module 5
Heavy duty vehicle	Roundwood Long logs Chips	Semi-trailer	Semi-trailer (Diesel)
Light duty vehicle	-	-	Delivery lorries (Diesel)
Vans	-	-	Diesel (mainly) vans

References:
M3: PD 3.3.2
M3/M4/M5: http://lipasto.vtt.fi/yksikkopaastot/freight_road.htm
M3/M4/M5: http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm

Heavy duty vehicle (22 tonnes of load or more), Euro classification 3
1. **M3** (3 types of truck: roundwood, long logs, chips), cf. PD. 3.3.2
2. **M4/M5**: 1 general type (cf. table 1 for permissible weight)

To illustrate, from LIPASTO for M4/M5



Semitrailer combination lorry *Gross vehicle mass 40t, pay load capacity 25t. This category includes e.g. MAN 18.372/25.372 and SISU SM372C. The figures have been given for highway and urban driving. Delivery driving emissions can be estimated by adjusting these with the appropriate highway driving percentage.*

Light duty vehicle (7t of load) for M4/M5

Delivery lorries *A lorry used for delivery without a trailer. At this moment there exists data of two different delivery lorries: small and big ones. Smaller one's gross weight is 6 tonnes and pay load capacity 3.5t. The gross weight of the bigger one is 15t, pay load capacity 9t. This category includes e.g. the Mercedes-Benz 1524, Scania G93-240 etc. The delivery lorries come in several types and sizes. In addition to the highway and urban driving figures, delivery-driving figures have also been represented with 30 % highway driving.*

Vans: for **M5** only (distribution to final consumer)
To illustrate, from LIPASTO:

[3] Cf. WP33.

Diesel vans *Gross vehicle mass 2.7t, pay load capacity 1.2t. This category includes e.g. the VOLKSWAGEN TRANSPORTER 2.5 TDI and FORD TRANSIT 2.5 D. There are so far no unit emission figures for gasoline powered vans as their share of the van fleet decreases continuously and their use in actual freight transportation is slight. In addition to the highway and urban driving figures, delivery-driving figures have also been defined for vans in order to represent typical van usage with 30 % highway driving.*

Maximum Gross Vehicle Weight in tonnes

	Lorries		Road train		Articulated vehicles	
	2 axles	3 axles	4 axles	5 axles and more	5 axles and more	
BE	19	26	39	44	44	**BE**
CZ	18	25/26	36	42	42	**CZ**
DK	18/19	24/26	38	44/40	40/48	**DK**
DE	18	26	36	40	40	**DE**
EE	18	26	36	40	40	**EE**
EL	18	26	36	40	40	**EL**
ES	18	26	36	40	40	**ES**
FR	19	26	38	40	40	**FR**
IE	17	26	35	40	40	**IE**
IT	18	26	40	44	44	**IT**
CY						**CY**
LV	18	25	36	40	40	**LV**
LT	18	26	36	40	40	**LT**
LU	19	26		44	44	**LU**
HU	20	24	36	40	40	**HU**
MT			40	40	40	**MT**
NL	21.5	33	40	50	50	**NL**
AT	18	25	36	38	38	**AT**
PL	19.5	29.5	37	40	40	**PL**
PT	19	26	38	40	40	**PT**
SI	18	25		40	40	**SI**
SK	18	26	40	40	40	**SK**
FI	18	26	38	60	48	**FI**
SE	18	26		60	60	**SE**
UK	18	26	36	40	40	**UK**
BG	16	26	36	40	40	**BG**
RO	18	24	34	40	40	**RO**
HR			40	40	40	**HR**
MK			40	40	40	**MK**
TR	18	25	36	40	40	**TR**
IS	18	26	37	40	44	**IS**
NO		26		50	47	**NO**
CH	18	25	34	34	34	**CH**
LI	18	26	36	40	40	**LI**

Source : National sources, ECMT

Notes :

An articulated vehicle consists of a road tractor coupled to a semi-trailer. A road train is a goods road motor vehicle coupled to one or more trailers.

Many countries allow higher weight limits in certain circumstances: wheelbase, rear-axle spacing, double tyres, type of engine, type of road, type of load (containers).

DK: national / international

From ADEME – Bilan carbone (weight, emission for unloaded and loaded and max. loaded capacity)

PTAC	Emissions (kg équ. C/vehicule.km)		Charge utile maximale CU
	à vide (E_{vv})	A pleine charge (E_{vpc})	
< 1,5 t essence	0,062	0,062	0,40
< 1,5 t diesel	0,059	0,059	0,40
1,5 à 2,5 t essence	0,070	0,070	0,70
1,5 à 2,5 t diesel	0,068	0,068	0,70
2,51à 3,5 t essence	0,123	0,123	1,20
2,51 à 3,5 t diesel	0,088	0,088	1,20
3,5 t	0,101	0,101	1,40
3,51 à 5 t	0,136	0,196	2,37
de 5,1 t à 6 t	0,107	0,154	2,84
de 6,1 t à 10,9 t	0,158	0,228	4,69
de 11 t à 19 t	0,208	0,300	9,79
de 19,1 t à 21 t	0,240	0,346	11,62
21,1 à 32,6 tonnes	0,302	0,435	16,66
tracteurs routiers	0,252	0,363	25,00

Tableau 80 : Facteurs d'émission à vide et à pleine charge du transport de marchandises.

Train		
	Whole train	**Single wagon**
Modules	M3 to M5	M3
Size	M3 Scandinavia : 2 600 tonnes (70% for net load) For M4-M5 in Scandinavia: 1 250 tonnes (70% for net load) Otherwise in average : 900 tonnes (net load = 600) Baltic countries: average weight of goods is three times as much*	Cf. PD 3.3.2
Energy	Diesel / Electric**	

** =Eurostat (2007), "Rail freight transport 2005", Statistics in Focus, 16/2007.*

*** = Energy use will depend on locomotive and train size, . A generic value for Swedish system is value 0,23 Mj/tkm ref. "Lindholm, E-L., Berg, S. 2005. Energy requirement and environmental impact in timber transport. Scandinavian Journal of Forest Research, 20;184-191*

References:

M3: PD 3.3.2
M3/M4/M5: http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm
M3/M4/M5: UN Glossary for Transport Statistics
M3/M4/M5: ADEME – Bilan Carbone
M3/M4/M5: http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm

Sea shipping

- 15 000 and/or 9 000 dwt storo[4] or ro-ro ship for Baltic Sea/North Sea. The emissions, especially of sulphur is depending on which kind of fuel that are used. There are EU regulations for naval traffic on traffic close to coast states . Some basic technical information about (bunker) fuel qualities can be found at. http://www.bunkerworld.com/technical/tech_grades.htm. Energy use is depending on the size of the vessel and routes.
- For information on vessels: http://www.ctctimber.co.za/jit_default_783.html

References:

M3: PD 3.3.2
M3/M4/M5: http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm
M3/M4/M5: UN Glossary for Transport Statistics
M3/M4/M5: ADEME – Bilan Carbone

Definitions from UN Glossary :

- Deadweight (DWT) = The deadweight of a ship is the difference in tonnes between the displacement of a ship on summer load-line in water with a specific gravity of 1,025 and the total weight of the ship, i.e. the displacement in tonnes of a ship without cargo, fuel, lubricating oil, ballast water, fresh water and drinking water in the tanks, usable supplies as well as passengers, crew and their possessions.
- Gross tonnage (GT) = Gross tonnage is a measure of the size of a ship determined in accordance with the provisions of the International Convention on Tonnage Measurement of Ships, 1969.
- Tare Weight = The weight of a transport unit (e.g. containers, swap-bodies and pallets for containing goods as well as road goods vehicles, wagons or barges carried by sea) before any cargo is loaded.
- Storo= stowed cargo on roll off

Type of equipments

From UN Glossary- The principal categories are : i) Liquid bulk; ii) Dry bulk; iii) Containers; iv) Roll-on/Roll-off (self-propelled); v) Roll-on/Roll-off (non-self-propelled); vi) Other general cargo

From Ademe – Bilan Carbone (examples)

For container cargo: 1st column: 20 Foot ISO container (length of 20 feet and width of 8 feet) equivalent; 2nd column: capacity; 3: speed; 4 and 5: Energy consumption/day; 6: Emissions/day

Capacité en "équivalent vingt pied"	Capacité en m^3	Vitesse commerciale (nœuds)	Consommation en mer en tonnes de fioul lourd par jour	Consommation tertiaire en tonnes de gasoil par jour	Emissions par jour de mer en tonnes équivalent carbone
500	18 300	16	20	1,5	21,5
1 000	36 600	17,5	30	1,5	31,5
1 500	54 900	20	50	2	52
2 500	91 500	20,5	70	2	72
3 500	128 100	22,5	110	2	112
5 000	183 000	22,5	150	3	153

Tableau 100 : Facteurs d'émission des porte-conteneurs

For dry bulk (1st column: put into service year)

[4] STORO - Vessels with RoRo access to the main deck, but also with side door access and lifts to upper and lower decks for loading palletised cargo to deck.

Modèle de navire	Années de mise en service	Port en lourd (tonnes)	vitesse (nœuds)	Tonnes de fioul brûlées par jour	Tonnes de gasoil brûlées par jour	parcours quotidien (km)	consommation par tonne.km (grammes)	émissions par tonne.km (kg. équ. C)
handysize	1970	20 000	13	30	1,5	578	2,7	0,00264
	1980	20 000	13	29	1,5	578	2,6	0,00255
	1990	20 000	13	21	1,5	578	1,9	0,00188
handymax	1980	40 000	15	30	1,5	667	1,2	0,00114
	1990	40 000	15	22,5	1,5	667	0,9	0,00087
panamax	1970	70 000	15	50	2	667	1,1	0,00108
	1980	70 000	15	36	2	667	0,8	0,00079
	1990	70 000	15	32	2	667	0,7	0,00070
capesize	1970	150 000	15	65	2	667	0,7	0,00065
	1980	150 000	15	50	2	667	0,5	0,00050
	1990	150 000	15	47,5	2	667	0,5	0,00048

Tableau 101 : Facteurs d'émission des vraquiers

Inlandwater ways

- Canal barges used in Germany for instance. Net load is ~4 000 tonnes.

References:

M3: PD 3.3.2
M3/M4/M5: http://lca.jrc.ec.europa.eu/lcainfohub/datasetArea.vm
M3/M4/M5: UN Glossary for Transport Statistics
M3/M4/M5: ADEME – Bilan Carbone
M3/M4/M5: PINE project

Definitions from UN Glossary :

C.II-21. Carrying capacity
Maximum permissible weight of goods, expressed in tonnes, which a vessel may carry in accordance with its documents.

Type of equipments

From Pine project (examples)

Vessel type	Dimensions (L x B)	Tonnage capacity at a draught of				
		1,50m	2,00m	2,50m	2,80m	3,50m
Large river motor ship	110,00 m x 11,40 m	600 t	1200 t	1800 t	2100 t	3000 t
Europe ship	85,00 m x 9,50 m	570 t	930 t	1350 t	-	-
'Johann Welker'**	80,00 m x 9,50 m	600 t	940 t	1280 t	-	-
'Gustav Koenigs' (extended)	80,00 m x 8,20 m	500 t	800 t	1100 t	-	-
'Gustav Koenigs'	67,00 m x 8,20 m	420 t	670 t	1000 t	-	-
'Kempenaar'	50,00 m x 6,60 m	400 t	600 t	650 t	-	-
Peniche	38,50 m x 5,00 m	250 t	300 t	400 t*	-	-
BM-500	56,50 m x 7,60 m	415 t	475 t	-	-	-

Table 6. Standard sizes of self-propelled river ships in Europe
**) with a maximum draught of 2.20 m*
***) names adopted in Germany, in other countries with high tradition in inland navigation similar size vessels are given other 'class notification' names*

Barge type	Dimensions (L x B)	Tonnage capacity at a draught of				Area of use
		2,00m	2,50m	2,80m	4,00m	River or corridor
Europe Type I	70,00 m x 9,50 m	940 t	1240 t	-	-	Rhine, MLK
Europe Type II	76,50 m x 11,40 m	1250 t	1660 t	1850 t	-	Rhine, MLK, Danube
Europe Type IIa	76,50 m x 11,40 m*	1140 t	1530 t	1800 t	2800 t	Rhine
Europe Type IIb	76,50 m x 11,00 m	1100 t	1500 t			Danube
GSP-54	54,00 m x 11,00 m	900 t				Elbe, Oder
SP-65	65,00 m x 8,20 m	900 t				Elbe, Oder
SP-35	32,50 m x 8,20 m	415 t				Elbe, Oder
LASH**	18,70 m x 9,50 m	250 t	335 t	385 t		Weser, Rhine
See-Bee**	29,75 m x 10,70 m	490 t	640 t	730 t		Weser, Rhine
Interlichter**	38,25 m x 11,40 m	585 t	775 t	900 t		Danube
OBP-500	45,50 m x 9,60 m	480 t	-	-	-	Oder

Table 7. Standard sizes of pushed barges in Europe
**) increased depth*
***) various special barges for combined overseas transport aboard a sea-going mother-ship*

From ADEME Bilan Carbone (for self propelled barge and self-propelled pusher barge) (examples)

		Consommation unitaire d'énergie (gep/t.km)	Facteurs d'émissions (gCO2/t.km)	Facteur d'émissions (Kg eqC/t.km)
Equipements				
Automoteurs	< 400t	14.0	44.3	0.0121
	400 – 650 t	13.8	43.4	0.0118
	650 – 1000 t	12.3	38.8	0.0106
	1000 – 1500 t	11.5	36.3	0.0099
	> 1500 t	9.5	30.0	0.0099
Pousseurs	295 – 590 kW	8.6	27.1	0.0074
	590 – 880 kW	7.8	24.4	0.0067
	> 880 kW	6.8	21.5	0.0059
Bassin				
Seine		9.5	30.1	0.0082
Rhône		9.3	29.4	0.0080
Nord Pas de Calais		13.6	42.9	0.0117
Rhin		11.5	36.2	0.0099
Moselle		12.0	37.9	0.0103
Interbassin		12.1	38.2	0.0104
Total		**10.8**	**34.0**	**0.0093**

Tableau 102 : Indicateurs de consommation énergétique et facteurs d'émission. Données agrégées par type d'équipement et par bassin de navigation. (ADEME, VNF, T&L Associés, 2005)

Annex 2 Socio Economic

Production cost

1. Shouldn't the NTFP and marketed services be included as processes/process-chains? - If in M2 we have processes defining a silvicultural system, these processes should include also income and costs from NTFP's where important, e.g. hunting rents, berries, etc.
2. How should the costs associated with the services and processes not directly related to a product (e.g. administration of companies, maintenance of machinery, etc.) be related to the process (monetary value, production in tonnes, other?) - Costs are monetary values. An approximation could be that selling and administrative costs were some percentage of the turnover, e.g. 10%, because that method would yield to a some extent a fair estimate. This would add no segregation between the processes, but would be needed to come up with realistic "gross value added". The maintenance costs are typically included in reported production costs, but that may of course vary depending on the source, and that should be checked prior to using the data source.

Annex 3 PPP and Earnings Indicator 11.2

EUROSTAT - Purchasing power parities (PPP) and comparative price level indices, national currency, for the ESA 95 aggregates

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eu27	European Union (27 countries)	1
be	Belgium	1,07162
bg	Bulgaria	0,718807
cz	Czech Republic	16,0709
dk	Denmark	10,5642
de	Germany	1,05952
ee	Estonia	8,90135
ie	Ireland	1,25119
gr	Greece	0,848398
es	Spain	0,89818
fr	France	1,07132
it	Italy	1,05742
cy	Cyprus	0,513092
lv	Latvia	0,346422
lt	Lithuania	1,66434
lu	Luxembourg (Grand-Duché)	1,12364
hu	Hungary	144,357
mt	Malta	0,297757
nl	Netherlands	1,04286
at	Austria	1,0342
pl	Poland	2,21414
pt	Portugal	0,867277
ro	Romania	1,72537
si	Slovenia	0,745804
sk	Slovakia	19,3431
fi	Finland	1,22917
se	Sweden	11,0581
uk	United Kingdom	0,76506
hr	Croatia	4,70814
mk	Macedonia, the former Yugoslav Republic of	23,8675
tr	Turkey	1,05303
is	Iceland	118,396
no	Norway	11,367
ch	Switzerland	2,16703
al	Albania	58,455
ba	Bosnia and Herzegovina	0,895817
me	Montenegro	0,491915
rs	Serbia	34,0134

Purchasing Power Parities (PPPs) are currency conversion rates that both convert to a common currency and equalise the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion.

EUROSTAT- Average Wages 2005

Average gross annual earnings in industry and services of full-time employees in enterprises with 10 or more employees (ECU/EUR)	2005		
EU (27 countries)	29246.8		
Belgium	36672.7		
Bulgaria	1977.7		
Czech Republic	7404.5		
Denmark	47529.3		
Germany	41694.0		
Estonia	:	no data	
Ireland	:	no data	
Greece	:	data for 2003 only	16738.5
Spain	20438.8		
France	30520.9		
Italy	:	no data	
Cyprus	20548.5		
Latvia	4246.0		
Lithuania	:	data for 1999 only	3016.9
Luxembourg	42135.0		
Hungary	7797.8		
Malta	11180.3		
Netherlands	38700.0		
Austria	36032.0		
Poland	6269.9		
Portugal	14715.0		
Romania	3155.0		
Slovenia	:	no data	
Slovakia	6373.6		
Finland	33290.0		
Sweden	34049.3		
United Kingdom	42866.3		
Iceland	:	data for 2003 only	36764.2
Norway	45485.2		
Switzerland	:	data for 2004 only	45759.8

source: EUROSTAT

http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/C/C4/C43&language=de&product=Yearlies_new_population&root=Yearlies_new_population&scrollto=0

Annex 4 Investment and research & development

1. Gross fixed capital formation can be estimated in country by level for forest, pulp and paper, but data is not public. More rough estimates can also be made for e.g. pellet and chair, etc. sub-modes. Actual data strictly speaking does not exist, as assets are depreciated according to each company's own customs. Estimated data on the asset base by age and volume should be gathered (not publicly available), and uniform depreciation should be applied to yield current capital employed in fixed assets.

   Future data provider: Capital employed could be assumed to stay the same year after year, as new capacity can be assumed to replace obsolete capacity 1- to- 1 at least in medium term (implying that the industry structure does not change).

2. If the change in the industry structure is to be measured, what about the future data provider?

   New investments at least for pulp, paper and to some extent to pellets, panels, sawlogs etc. should be public. So this data could be gathered to keep track on that in the future. But the problem is that the equipment are also upgraded gradually, and this amount of money shows only in the companies' annual reports as capital expenditure. And if it is a multiproduct company, the allocation of capital expenditure on the specific business is very hard and time consuming.

   One solution could be to choose a group of preferably public companies, the capital expenditure levels of which would be kept track on (these should be cleaned from acquisition expenditures, though). Then if it would show that e.g. 2012 the capital expenditure have been only 70% of that of in year 2011, the gross fixed capital formation would be lowered in the following way: Assume assets are depreciated in 15 years. If the initial gross fixed capital formation is 100, then a depreciation corresponding to one year is 100/15. If the capital expenditure stays the same as it has been for recent years, then the next year's gross fixed capital formation would still be 100. But now that it has been decreased by 30% during one year, the net depreciation would be 0,3*100/15, so that the gross fixed capital formation for 2012 would be 100-0,3*100/15=98.

   If this approach was to be used, the tracked companies should be agreed upon, or this information could be gathered via expert opinion (the group of leading indicator companies could change over time). A yet better way would be is there existed a statistic on the industry investments, which could then be used instead, as described above.See also remark 3.

3. The capital within companies is allocated to different assets according to the assets' actual "replacement" cost, that is, what it would cost to replace the existing machines, buildings etc. by others of equal condition. This is called the book value of the assets. On top of this, according to IFRS, a current market value has to be assigned to the assets. The difference of these values is written into company's assets as goodwill, and it changes when the market value of the assets change.

Both book value and goodwill are depreciated, but separately. And what matters in our analysis is the book value part, because it is intended to compensate for the required maintenance caused by the wearing out of the machines, buildings etc. The custom of how an individual company depreciates its assets is to some extent up to the company's internal decision, and it often ends up being one that e.g. minimizes taxes. Thus the reported depreciation does not necessarily be an accurate description of the assets' wearing out.

So if we knew the depreciation (from the company's annual financial statement), we could very roughly estimate the book value of capital employed. But as is questioned, allocation of thus estimated capital to different operations within an individual company is not doable if the operations are not divided into separately reported divisions, which sometimes is the case, but sometimes is not. Due to the several difficulties related to the depreciation based approach described above, it may not be optimal way of doing the assessment. Furthermore, if the depreciation for the company's assets is stated somewhere (e.g. annual report), so should be the value of fixed assets as well.

There are basically two ways how the gross capital formation can be estimated for the sectors in scrutiny. The compromise that has to be made when deciding which one to use has to do with **estimation difficulty** and **co-measurability of the results between different sectors along the chain**. The two alternatives are:

a) From the annual report of Company X, take the 'Magazine Papers', 'Newsprint', 'Wood Products' etc. divisions 'Capital employed', 'Total assets' or 'Fixed assets' (The company may report which ever of these, but normally just one of these, so we would have to settle for what ever is reported). Thus e.g. for 'Newsprint' we would get 'Capital Employed' = 1878 MEUR. From the Company X's annual report (or from the company's web pages) we would also see that the newsprint capacity for Company X is some 2 400 000t/a. Thus we would get that Capital employed per tonne of newsprint would be 1 878 000 000EUR / 2 400 000t = 783 EUR/t. We would use this number as the reference for all newsprint in Europe. So for a given area, which has production of newsprint of, say, 10 000 000t, the estimated gross fixed capital formation would be 10 000 000t * 783 EUR/t = 7 830 000 000EUR. The same procedure would be made for all the products in the chain, and it could be done provided that there were a (preferably) listed company that reports its divisional figures in its annual report. This would be the easier way, but the problem would then be the co-measurability at least with forestland's figures; The above procedure would result in a figure describing the book value of assets (explained earlier). For forestland, there exists no easy way of telling the book value. What can be done there is to estimate the market value e.g. by selecting a reference amount of m3 per hectare for a reference wood species and multiplying this by the wood's price (EUR/m3). But, as the market value would (typically) be higher than the book value (sometimes it's quite equal but sometimes very much above), we would end up showing that forestland had much more gross fixed capital formation

than other sectors, even though this would necessarily not be the case, and the results would be somewhat skewed to disfavour forestland.

b) The second somewhat more demanding method would then be to use the marker value for all the sectors. The difficulty is that it is not reported anywhere separately for different divisions (i.e. Newsprint, wood products etc.). But it could be estimated by first calculating the market value of some company, e.g. now Company X, and then allocating the market value according to the book values of different divisions. The market value (or enterprise value) of a listed company (it cannot be calculated for unlisted company) is the *share price* * *number of shares* + *net debt*. For the Company X it would be something like 17 000 MEUR. The total capital employed for Company X is roughly 12 000 MEUR. Thus for Newsprint division we would get a market value of assets/tonne to be (17 000/12 000)* 783 EUR/t = 1110 EUR/t. So 40% higher than by the first method above. But now it would be commeasurable with the forestland figures.

In either case, if there is a listed company that has only one product, using that company as the reference company would be recommendable, as then one could directly use the company total figures without the need to allocate the items to the divisions.
But all in all, it should be decided which one of the proposed approaches will be used.

4. What happens if the budget is in Country A and the research in country B? See definition: **R&D expenditures** include all expenditures for R&D performed within the business enterprise sector (BERD) on the national territory during a given period, regardless of the source of funds.

5. If R&D is performed by an external R&D company in another country, this expenditure will be set to zero? According to the current definition, in this case it will be counted as R&D in another country.