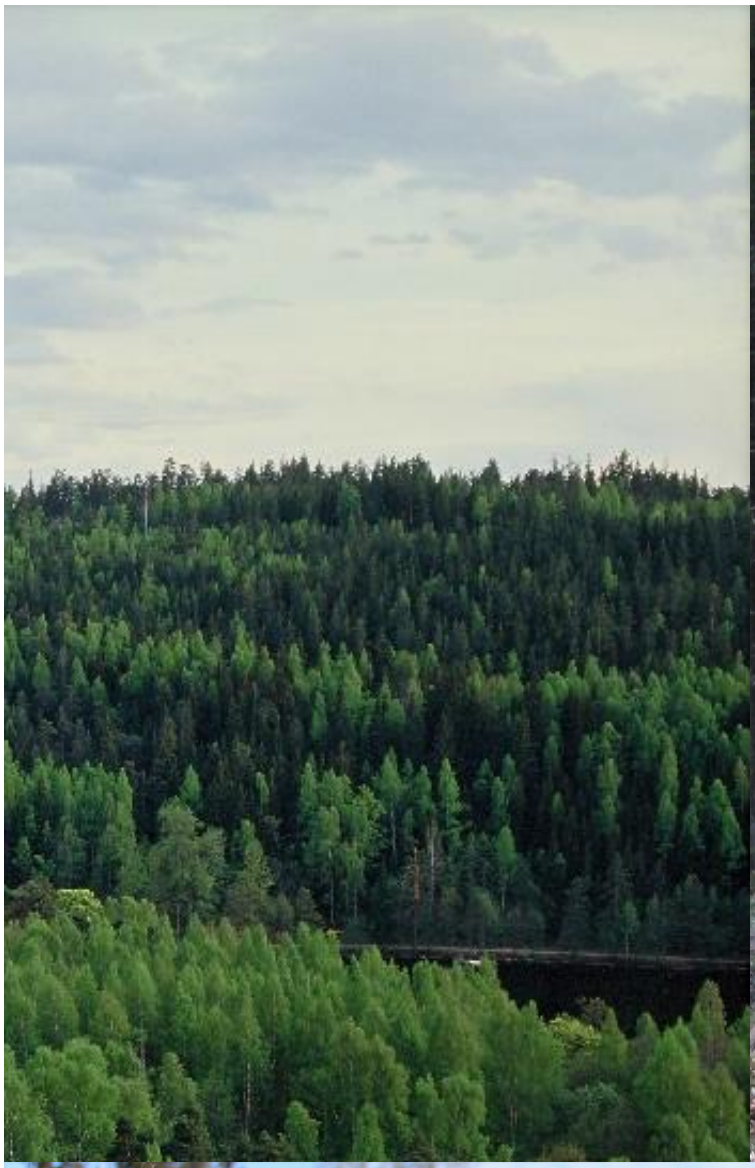
BASIC PRODUCTS FROM FORESTRY

PRODUCT CATEGORY CLASSIFICATION: UN CPC 031

PCR 2020:05
VERSION 1.0.1

VALID UNTIL: 2024-10-27



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1 INTRODUCTION

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD® System: a programme for type III environmental declarations[1] according to ISO 14025:2006. Environmental Product Declarations (EPD) are voluntary documents for a company or organisation to present transparent information about the life cycle environmental impact for their goods or services.

The rules for the overall administration and operation of the programme are the General Programme Instructions, publicly available at www.environdec.com. A PCR complements the General Programme Instructions and the standards by providing specific rules, requirements and guidelines for developing an EPD for one or more specific product categories (see Figure 1). A PCR should enable different practitioners using the PCR to generate consistent results when assessing products of the same product category.

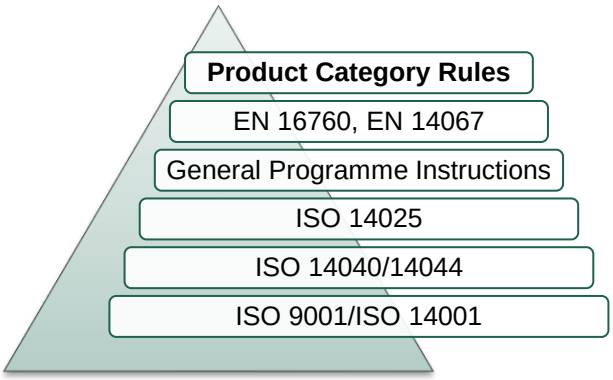

Figure 1 Illustration PCR in relation to the hierarchy of standards and other documents.

Within the present PCR, the following terminology is adopted:

- The term “shall” is used to indicate what is obligatory.
- The term “should” is used to indicate a recommendation, rather than a requirement.
- The term “may” or “can” is used to indicate an option that is permissible

For the definition of terms used in the document, see the normative standards.

A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. The latest version of the PCR is available via www.environdec.com. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR document may be given via the PCR Forum at www.environdec.com or sent directly to the PCR moderator during its development or during the period of validity.

Any references to this document should include the PCR registration number, name and version.

The programme operator maintains the copyright of the document to ensure that it is possible to publish, update when necessary, and available to all organisations to develop and register EPDs. Stakeholders participating in PCR development should be acknowledged in the final document and on the website.

[1] Type III environmental declarations in the International EPD® System are referred to as EPD, Environmental Product Declarations.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Basic products from forestry
Registration number and version:	2020:05, Version 1.0.1
Programme:	The International EPD® System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
PCR moderator:	No assigned PCR Moderator
PCR Committee:	SIS Swedish Standards Institute, IVL Swedish Environmental Research Institute, Skogforsk Forestry Research Institute of Sweden, RISE Research Institutes of Sweden, Bergvik skog AB, BillerudKorsnäs AB, Domsjö Fabriker AB, Swedenergy AB, Essity AB, Holmen AB, The Federation of Swedish Farmers LRF, Mondi, Riksbyggen AB, SCA, SEKAB Biofuerls & Chemicals, Setra Group AB, Swedish Forest Industries Federation, Sveaskog AB, Södra Skogsägarna ekonomisk förening, The Swedish National Agency for Public Procurement *The development of this PCR was funded through the research programmes BioInnovation and Mistra Digital Forest.*
Date of publication and last revision:	2022-03-21 (Version 1.0.1) A version history is available in Section 8.
Valid until:	2024-10-26
Schedule for renewal:	A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. When the PCR is about to expire the PCR moderator shall initiate a discussion with the Secretariat how to proceed with updating the document and renewing its validity. A PCR document may be revised during its period of validity provided significant and well-justified proposals for changes or amendments are presented. See www.environdec.com for up-to-date information and the latest version.
Standards conformance:	▪ General Programme Instructions of the International EPD® System, version 3.01, based on ISO 14025 and ISO 14040/14044
PCR language(s):	This PCR was developed and is available in English. In case of translated versions the English version takes precedence in case of any discrepancies.

2.2 SCOPE OF PCR

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of "Basic products from forestry" and the declaration of this performance by an EPD. The product category corresponds to UN CPC 031 Wood in the rough.

The product category concerned with this PCR includes intermediate products from silviculture and forestry activities in forests and plantations. This includes mainly the products and raw materials obtained from forestry activities as timber or lumber, pulpwood and fuel wood/ firewood; as well as by-products from forestry activities with economic value such as biomass branches and tops from harvesting used for energy production. There is a large spectrum of applications where these intermediate products can be used as raw materials. Therefore, an non-exhaustive, illustrative list of examples of products that are referred to in this PCR is provided in Annex A. The purpose of this PCR is then to provide common rules for how to carry out EPDs for forest intermediate products, EPDs that can be used to develop EPDs in a wide variety of consumer products.

The International EPD® System uses the UN CPC classification for its PCRs. As this PCR covers a very broad product category with potential uses in many different industrial sectors, it is challenging to classify it according to UN CPC code. The following list presents examples of groups, underlying classes and sub-classes covered by this document. The UN CPC given below are a non-exhaustive list and other CPC codes may also be relevant for this PCR.

Division 03	Forestry and logging products		
031	Wood in the rough		
	0311	03110	Logs of coniferous wood
	0312	03120	Logs of non-coniferous wood
	0313	Fuel wood, in logs, in billets, in twigs, in faggots or in similar forms	
		03131	Fuel wood of coniferous wood
		03132	Fuel wood of non-coniferous wood

2.2.2 GEOGRAPHICAL REGION

This PCR is applicable to be used globally.

2.2.3 EPD VALIDITY

An EPD based on this PCR shall be valid from its registration and publication at www.environdec.com and for a five year period starting from the date of the verification report ("approval date"), or until the EPD has been de-registered from the International EPD® System.

An EPD shall be updated and re-verified during its validity if changes in technology or other circumstances have led to:

- an increase of 10% or more of any of the indicators listed in Section 5.4.5.1,
- errors in the declared information, or
- significant changes to the declared product information, content declaration, or additional environmental information.

If such changes have occurred, but the EPD is not updated, the EPD owner shall contact the Secretariat to de-register the EPD.

3 PCR REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the process described in the General Programme Instructions of the International EPD® System, including PCR review and open consultation.

3.1 PCR REVIEW

3.1.1 VERSION 1.0

PCR review panel:	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee, and were excused from the review.
Chair of the PCR review:	Gorka Benito Alonso
Review dates:	2020-07-07 until 2020-09-06

3.2 OPEN CONSULTATION

3.2.1 VERSION 1.0

This PCR was available for open consultation from 2020-03-24 until 2020-05-24, during which any stakeholder was able to provide comments by posting on the PCR forum on www.environdec.com or by contacting the PCR moderator.

Stakeholders were invited via e-mail or other means to take part in the open consultation, and were encouraged to forward the invitation to other relevant stakeholders. The following stakeholders provided comments during the open consultation, and agreed to be listed as contributors to the PCR and at www.environdec.com:

- Tarmo Räty and Ilkka Leinonen, Natural Resources Institute of Finland (LUKE)
- Eva Gustafsson, Södra Skogsägarna ekonomisk förening
- Pooja Yadav, Swedish University of Agricultural Sciences
- Estelle Vial and Juliette Maquet, FCBA
- Malin Johansson, RISE AB

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs were considered in order to avoid overlaps in scope. The existence of such documents was checked in the public PCR listings of the following programmes based on ISO 14025 or similar:

- International EPD® System. www.environdec.com.

The following existing PCRs have been identified:

PCR NAME	PROGRAMME	REGISTRATION NUMBER (if applicable)	SCOPE
CPC 031 - Module for Roundwood	SCS Global	N/A	Roundwood
Sub-PCR-E Wood and wood-based products for use in construction (EN 16485)	EPD International	PCR 2012:01-Sub-PCR-E	All wood and wood-based construction products as well as related construction services for buildings and other construction works

3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed in order to enable publication of Environmental Product Declarations (EPD) for this product category based on ISO 14025, ISO 14040/14044 and other relevant standards to be used in different applications and target audiences.

3.5 UNDERLYING STUDIES

No underlying studies have been used for reference while developing this PCR.

4 GOAL AND SCOPE, LIFE CYCLE INVENTORY AND LIFE CYCLE IMPACT ASSESSMENT

The goal of this section is to provide specific rules, requirements and guidelines for developing an EPD for the product category as defined in Section 2.2.1.

4.1 DECLARED UNIT

The declared unit shall be 1000 kg in dry matter of basic products from forestry delivered to primary mill or terminal gate. The declared unit shall be supplemented with additional information including density, moisture content and carbon content, all related to dry matter. The declared unit shall also be supplemented with information regarding the bark weight for those products where it is not included. This supplementary information shall be given for both wood and bark, and can be given as an interval, but the exact density and moisture content used in the calculations of the EPD must be specified.

This PCR uses a declared unit instead of a functional unit because the products included in the scope of the PCR are intermediate products with unknown and undeclared final use. These aspects should be taken into consideration when comparing EPDs based on this PCR.

4.2 REFERENCE SERVICE LIFE (RSL)

Not applicable for this product category.

4.3 SYSTEM BOUNDARY

The International EPD® System uses an approach where all attributional processes from “cradle to grave” should be included using the principle of “limited loss of information at the final product”. This is especially important in the case of business-to-consumer communication.

The scope of this PCR and EPDs based on it is cradle-to-gate.

4.3.1 LIFE CYCLE STAGES

For the purpose of different data quality rules and for the presentation of results, the life cycle of products is divided into two different life-cycle stages:

- Upstream processes (from cradle-to-gate)
- Core processes (from gate-to-gate)

In the EPD, the environmental performance associated with each of the life-cycle stages above shall be reported separately. The processes included in the scope of the PCR and belonging to each life cycle stage are described in Sections 4.3.1.1–4.3.1.2.

4.3.1.1. Upstream processes

The following processes are part of the product system and classified as upstream processes:

- Production of plants, seeds or cuttings for the cultivation
- Production of electricity and fuels used in the upstream module
- Production of electricity and fuels used in the core module
- Production of fertilizers and pesticides used in the forestry
- Production of auxiliary substances used in the forestry
- Transport of input materials from the upstream processes to the core processes
- Production of auxiliary materials used in the forestry, e.g. barriers, straps, sacks

Upstream processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.2. Core processes

The following attributional processes are part of the product system and classified as core processes:

- Forestry activities using energy wares such as:
  - soil preparation,
  - forest regeneration activities (planting, seed sowing, natural regeneration (in case these include soil preparation or planting),
  - thinning (and pre-commercial thinning),
  - application of fertilizers,
  - crop protection (herbicide, pesticides, barriers),
  - felling and harvesting,
  - post-felling processes e.g. reprocessing of biomass at the side of the forest road, chipping in forest
  - forwarding and loading onto trucks,
- Biogenic carbon dioxide emissions and removals to and from the atmosphere caused by changes in the forest carbon stocks during forest management activities (based on forest inventory and changes in forest inventory with a landscape perspective)
- Construction and maintenance of roads dedicated for forestry (in case these cannot be separated, they can be modelled together as one single process)
- Transportation from preparation to industry facility (which could be a factory gate or terminal gate). Transport from terminal to further stages shall not be included.
- Chipping of biomass, if relevant. In case it takes place directly after harvesting (e.g. at the road by the harvested forest) and outside the core modules, e.g. in terminals
- Terminal management and activities related to logistics (if relevant), e.g. fuel use for internal transports, climate control of terminals.

A minimum of 99% of the total weight of the declared product including packaging shall be accounted for in the system. Manufacturing processes not listed may also be included.

The technical system shall not include:

- Manufacturing of production equipment, buildings and other capital goods
- Business travel of personnel
- Travel to and from work by personnel
- Research and development activities

4.3.2 OTHER BOUNDARY SETTING

4.3.2.1. Boundaries towards nature

Boundaries to nature are defined as where flows of material and energy resources leaves from and enters the technical nature into the system, i.e. the part of the environment that is made or modified by humans. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system. Only net interventions related to human land management activities should be inventoried (e.g. those impacts from activities directly caused by human activities), except for natural carbon uptake during forest growth as required for the calculation of $GWP_{biogenic}$ and GWP_{LULUC}. Of the substances applied on site, the outputs to nature should be inventoried as emissions to air, soil or water.

4.3.2.2. Boundaries in the life cycle

See Section 4.3.1. The EPD may present the information divided into additional sub-divisions.

4.3.2.3. Boundaries in time

The boundaries in time correspond to the period during which inventory data is gathered for the processes and activities within the studied system. The following time boundaries shall be applied to the system:

- Biogenic carbon dioxide emissions and removals to and from the atmosphere caused by changes in the forest carbon stocks during forest management activities (e.g. thinning, removal of branches and tops from the soil, etc., those accounted for in GWP $_{LULUC}$ calculations) shall be representative of the current situation at the forest that is harvested and shall be calculated as at least 4-5 years and maximum 20 years average values.
- All other impacts related to land-use transformation and occupation shall be accounted maximum for a period of 20 years before harvesting.
- All other processes (upstream, core,) shall be representative of the current situation at the forest that is harvested and shall be calculated with maximum 5 years average values.

4.3.2.4. Spatial boundaries

Accounting for the environmental impacts of forestry requires a clear spatial delimitation for data collection and environmental impact results. Forests are in principle managed in regions or landscapes, which is essential to estimate elementary flows appropriately. The spatial boundaries for this PCR are flexible in terms of magnitude of the forest area covered by the data collection. However, the spatial boundary applied shall:

- Apply a landscape perspective, especially for the biogenic carbon balance calculation. A landscape is defined as an extension of forest land that considers the forest as a whole system, including all possible age classes. Forests are in principle managed in a region or landscape which is essential to estimate elementary flows properly (as stated in EN 16760:2015).
- Represent the forestry practices of the organisation that owns the EPD, at the site where the product declared in the EPD is harvested. If the product is harvested at several sites, the results for each site shall be presented separately if the variation in environmental impact is higher than 15% among the sites included.
- The landscape shall represent the catchment area where the declared product is normally harvested
- Voluntary set-asides (whenever they are used) are included in the forest landscape and have an effect on forest carbon balance, even if it is not harvested. Therefore, they shall be included in the spatial boundaries of the LCA.

4.3.2.5. Boundaries towards other technical systems

See Section 4.6.2.

4.3.2.6. Reference situation and land-use baseline

The indicators required by this PCR should be calculated by inventorying only absolute (observable and/or modelled) flows, with no baseline, except for GWP_{LULUC}, which requires the definition of a baseline concerning the biogenic flows at the forest caused by land use and land-use changes. For this indicator, a business-as-usual baseline shall be applied, meaning the continuation of current practice. The modelling of this current practice should be based on historic data, considering a time period that is similar in extent and conditions to the time period selected for analysis. The temporal and spatial boundaries for the business-as-usual baseline scenario shall be established according to the same principles as stated in sections 4.3.2.4. and 4.3.2.5. In cases where forests have been intensively managed over at least one full harvesting cycle, the business-as-usual baseline and the current practices can be assumed to be equivalent and therefore GWP $_{LULUC}$ shall be equal to zero.

4.4 SYSTEM DIAGRAM

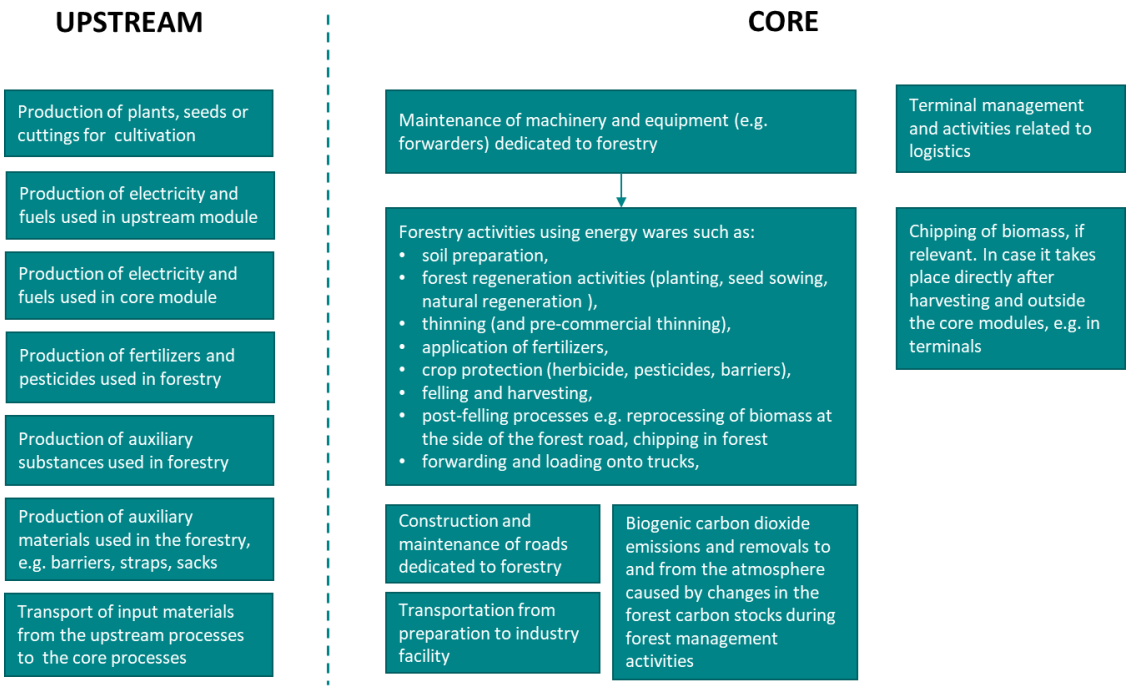

Figure 2 System diagram illustrating the processes that are included in the product system, divided into upstream and core processes.

4.5 CUT-OFF RULES

Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included (not including processes that are explicitly outside the system boundary as described in Section 4.3).

The check for cut-off rules in a satisfactory way is through the combination of expert judgment based on experience of similar product systems and a sensitivity analysis in which it is possible to understand how the un-investigated input or output could affect the final results.

4.6 ALLOCATION RULES

4.6.1 CO-PRODUCT ALLOCATION

The procedure in Table 1 shall be applied for multifunctional products and multiproduct processes.

PROCESS	MAIN PRODUCT AND CO-PRODUCTS	ALLOCATION INSTRUCTION
Forestry	Sawlogs, pulpwood, branches and logs, fuelwood	In those cases when the intended use of the intermediate product is known, the allocation rules stated by the PCR or standard applicable to the intended downstream processes shall be applied. If more than one use is intended, each intended use shall be presented in separate EPDs. In those cases when the intended use of the intermediate product is not known, the three-step allocation procedure established below for all other processes shall be applied.
All other processes	All processes except forestry	1. Allocation shall be avoided, if possible, by dividing the unit process into two or more sub-processes and collecting the environmental data related to these sub-processes. 2. If allocation cannot be avoided, the inputs and outputs of the system shall be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system. Material flows carrying specific inherent properties, e.g. energy content, elementary composition (e.g. biogenic carbon content), shall be allocated reflecting physical flows. 3. If physical relationships cannot be established, allocation using economic relationships (e.g. economic value or revenue) shall be applied.

Table 1 Allocation procedure for key processes in the product system

4.6.2 REUSE, RECYCLING, AND RECOVERY

In the framework of the International EPD® System, the methodological choices for allocation for reuse, recycling and recovery have been set according to the polluter pays principle (PPP). This means that the generator of the waste shall carry the full environmental impact until the point in the product's life cycle at which the waste is transported to a scrapyard or the gate of a waste processing plant (collection site). The subsequent user of the waste shall carry the environmental impact from the processing and refinement of the waste but not the environmental impact caused in the "earlier" life cycles. See General Programme Instruction for further information and examples.

Material flows carrying specific inherent properties, e.g. energy content, elementary composition (e.g. biogenic carbon content), shall always be allocated reflecting the physical flows, irrespective of the allocation chosen for the process.

4.7 DATA QUALITY REQUIREMENTS

An LCA calculation requires two different kinds of information:

- data related to the **environmental aspects** of the considered system (such materials or energy flows that enter the production system). This data usually comes from the company that is performing the LCA calculation.
- data related to the **life cycle impacts** of the material or energy flows that enter the production system. This data usually comes from databases.

Data on environmental aspects shall be as specific as possible and shall be representative of the studied process.

Data on the life cycle of materials or energy inputs are classified into three categories – specific data, selected generic data, and proxy data, defined as follows:

- **specific data** (also referred to as "primary data" or "site-specific data") – data gathered from the actual manufacturing plant where product-specific processes are carried out, and data from other parts of the life cycle traced to the specific product

system under study, e.g. materials or electricity provided by a contracted supplier that is able to provide data for the actual delivered services, transportation that takes place based on actual fuel consumption, and related emissions, etc.,

- **generic data** (sometimes referred to as “secondary data”), divided into**:**
  - **selected generic data** – data from commonly available data sources (e.g. commercial databases and free databases) that fulfil prescribed data quality characteristics for precision, completeness, and,
  - **proxy data** – data from commonly available data sources (e.g. commercial databases and free databases) that do not fulfil all the data quality characteristics of “selected generic data”.

As a general rule, specific data shall always be used, if available, after performing a data quality assessment. It is mandatory to use specific data for the core processes as defined above. For the upstream processes, generic data may also be used if specific data are not available.

Any data used should preferably represent average values for a specific reference year, except for data the changes in forest carbon stocks which may be an average of 4-5 years. However, the way this data is generated could vary, e.g. over time. In such cases, this data should have the form of a representative annual average value for a specified reference period. Such deviations should be declared and clearly stated.

4.7.1 RULES FOR USING GENERIC DATA

The attributional LCA approach in the International EPD® System forms the basic prerequisites for selecting generic data. To allow the classification of generic data as “selected generic data”, they shall fulfil selected prescribed characteristics for precision, completeness, and representativeness (temporal, geographical, and technological), such as:

- the reference year must be as current as possible and preferably assessed to be representative for at least the validity period of the EPD,
- the cut-off criteria to be met on the level of the modelled product system are the qualitative coverage of at least 99% of energy, mass, and overall environmental relevance of the flows,
- completeness in which the inventory data set should, in principle, cover all elementary flows that contribute to a relevant degree of the impact categories, and
- the representativeness of the resulting inventory in the given temporal, technological, and geographical reference should, as a general principle, be better than ±5% of the environmental impact of fully representative data.

Section 4.8 provides a list of recommended databases/data sets to be used for generic data.

If selected generic data that meets the requirements of the International EPD® System are not available as the necessary input data, proxy data may be used and documented. The environmental impacts associated with proxy data shall not exceed 10% of the overall environmental impact from the product system.

The EPD may include a data quality declaration to demonstrate the share of specific data, selected generic data and proxy data for the environmental impacts.

4.8 RECOMMENDED DATABASES FOR GENERIC DATA

Table 2 lists recommended databases for generic data. Please note that this listing does not imply that other data that fulfil the data quality requirements may not be used and that data quality assessment shall also be performed for the data sets in the recommended database by an LCA practitioner.

PROCESS	GEOGRAPHICAL SCOPE	RECOMMENDED DATASET	DATABASE
Road transportation, off road vehicles and working machines.	Finland	Lipasto dataset according vechicle, route, average in Finland	LIPASTO unit emission database (VTT, 2020)
Fuels	Europe	ELCD -fuels at refinery	ELCD database (EC, 2018)
Allocation of NMVOC emissions	Europe	Heavy duty vehicles > 3.5 t and buses, Light commercial vehicles <3.5 t	EMEP EEA guidebook (EEA, 2019)

Table 2 Recommended databases for generic data.

4.9 IMPACT CATEGORIES AND IMPACT ASSESSMENT

The EPD shall declare the default impact categories as described in the General Programme Instructions. The characterisation models and factors to use for the default impact categories are available on www.environdec.com/impact-categories shall be updated on a regular basis based on the latest developments in LCA methodology and ensuring the market stability of EPDs. The source and version of the characterisation models and the factors used shall be reported in the EPD. Alternative regional life cycle impact assessment methods and characterisation factors shall be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

4.10 OTHER CALCULATION RULES AND SCENARIOS

4.10.1 UPSTREAM PROCESSES

The following requirements apply to the upstream processes:

- Data referring to processes and activities upstream in a supply chain over which an organisation has direct management control shall be specific and collected on site.
- In case specific data is lacking, selected generic data may be used. If this is also lacking, proxy data may be used.
- For the electricity used in the upstream processes, electricity production impacts shall be accounted for in this priority when specific data are used in the upstream processes:

  1. Specific electricity mix as generated, or purchased, from an electricity supplier, demonstrated by a Guarantee of Origin (or similar, where reliability, traceability, and the avoidance of double-counting are ensured) as provided by the electricity supplier. If no specific mix is purchased, the residual electricity mix from the electricity supplier shall be used.[2]
  2. National residual electricity mix or residual electricity mix on the market
  3. National electricity production mix or electricity mix on the market.

  The mix of electricity used in upstream processes shall be documented in the EPD, where relevant.

4.10.2 CORE PROCESSES

The following requirements apply to the core processes:

- Specific data shall be used for forestry operations
- For the electricity used in the core processes, electricity production impacts shall be accounted for in this priority:

[2] The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix of the electricity supplier.

1. Specific electricity mix as generated, or purchased, from an electricity supplier, demonstrated by a Guarantee of Origin (or similar, where reliability, traceability, and the avoidance of double-counting are ensured) as provided by the electricity supplier. If no specific mix is purchased, the residual electricity mix from the electricity supplier shall be used.[3]
2. National residual electricity mix or residual electricity mix on the market
3. National electricity production mix or electricity mix on the market.

The mix of electricity used in the core processes shall be documented in the EPD, where relevant.

- Transport from the final delivery point of raw materials, chemicals, main parts, and components (see above regarding upstream processes) to the manufacturing plant/place of service provision should be based on the actual transportation mode, distance from the supplier, and vehicle load, if available.
- The transport of the product to industry shall be described in the reference PCR, which should reflect the actual situation to the best extent possible. The following priority should be used:
    1. Actual transportation distances, weights and types.
    2. Calculated as the average distance of a product of that product type transported by different means of transport modes.
    3. Calculated as a fixed long transport, such as 1 000 km transport by lorry or 10 000 km by airplane, according to product type.

4.10.3 SPECIAL CALCULATION RULES

4.10.3.1. General considerations: Land use

Forestry uses land and at the same time influences the land used. Land use is an important aspect of the life cycle of bio-based products. Land use has two aspects: land occupation and land transformation; these can both have positive or negative environmental effects. To determine the environmental impact of a given land use it is necessary to know for what activity the land is used and the time during which it is used for that purpose. The area used to source the product or raw material is usually defined as land use, which in the case of the EPDs calculated using this PCR shall be the landscape area established as the spatial boundaries used in the calculations (see 4.3.2.4).

Land use transformation addresses the irreversibly quality change which is induced by changing land use type and the environmental effects of this transformation. This quality change can be directly determined if the land use before transformation is known. The same holds true for the transformation after the occupation period ends. For this PCR, only transformation impacts that have occurred during the last 20 years shall be accounted for. Land use occupation is defined as the occupation of an area during the time of its use, and the environmental effects that are caused by the activities caused by this occupation.

If the scope of the EPD include multiple forests in separate landscapes, the EPD results shall be assessed and reported independently for forests in each landscape.

4.10.3.2. Forest site productivity (yield)

Site harvest productivity shall be measured in kilograms of dry matter per hectare and year. Site harvest productivity shall be calculated considering average production averaged over at least four to five years, and one forest landscape according to the spatial and temporal boundaries defined in sections 4.3.2.3 and 4.3.2.4. Default calculation factors for dry weight and densities of different species are provided in Annex B, which may differ between different countries and ecosystems.

4.10.3.3. Global warming potential (GWP) - biogenic

Biogenic GWP is one of three sub-categories of GWP as a climate change indicator, the others being fossil GWP and LULUC GWP (see 4.10.4.5). Biogenic GWP refers to carbon emissions or removals in the form of carbon dioxide (CO_2), carbon monoxide (CO), nitrous oxide (N_2O) and methane (CH_4) that are created form oxidation and/or reduction of biomass, as well as removal of carbon dioxide from the atmosphere through photosynthesis during biomass growth. Biogenic GWP emissions and removals shall be calculated and reported separately from fossil GWP. For biogenic methane and CO, the characterization factors in accordance with

[3] The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix of the electricity supplier.

the methods established in www.environdec.com/impact-categories. The emissions or removals resulting from changes in biogenic carbon stocks during forest growth caused by land-use changes shall not be accounted as GWP biogenic and shall be accounted as GWP_{LULUC} (see section 4.10.4.4).

The biogenic carbon content of the product shall be documented and reported separately from the GWP indicators and is equal to the carbon removal during plant growth at the forest.

Based on the principle of mass balance, any transfer of biomass and biogenic carbon from previous product systems shall be characterized as -1 kg CO_2 equivalents per kilogram of biogenic carbon dioxide, and any transfer of biomass and biogenic carbon into subsequent product systems shall be characterized as +1 kg CO2 equivalents per kilogram of biogenic carbon dioxide. This way, the carbon removal during plant growth and the biogenic carbon emissions after transference to the subsequent product system will result in a net zero contribution to the GW-biogenic results for the end product, when all life-cycle stages are summed up, except for any biogenic carbon share that is converted to methane, CO or N_2O.

4.10.3.4. Global warming potential (GWP) – land use and land-use change (LULUC)

Climate impact from land-use and from land-use change is another subcategory of GWP as a climate change indicator. It refers to greenhouse gas uptakes and emissions that originate from carbon stock changes caused by:

- Land use, for example GHG emissions and removals (e.g. due to thinning, harvesting, net growth) due to management activities such as pre-commercial thinning, fertilizing, harvesting and leaving branches and tops in the forest, etc. Here, it is important to consider the reference situation or land use baseline, so only differences in forest management in comparison with a business as usual scenario should be accounted for.
- Land-use changes (and not to long-term management practices) such as deforestation, road construction, conversion from crop land to forest land or other soil activities.

Land use and land-use change GWP shall be calculated and reported. Indirect land-use change, which refers to conversions of land because of changes in land use somewhere else, shall be excluded.

Land-use change GWP can be assumed to be zero if the forest area where the product is harvested is certified under a forest management certification scheme that includes performance-based measurement criteria, or if the product has origin within the European Union, where forestry laws guarantee that the harvesting of forest biomass do not cause deforestation. If this is the case, then the forest carbon stocks may be assumed to be in balance and therefore a net zero. This means that the emissions and removals of biogenic carbon dioxide to and from the forest carbon stocks caused by forest management activities are assumed to have the same magnitude, and therefore the net biogenic carbon dioxide emissions would be zero. This alternative would simplify calculations by avoiding forest carbon stock modelling, but the EPD owner would not be able to attribute negative climate impacts to the product due to biogenic carbon sequestration during forest growth.

Land-use change:
In case the forest area where the product is harvested is not certified under any performance-based forest management certification scheme or if it is not located within the European Union, the GWP caused by changes in forest carbon stocks due to land use and land-use changes that shall be calculated and reported following requirements as well as the boundary conditions established in section 4.3.2:

- Land-use changes that occurred longer than 20 years prior to the assessment are not included.
- Construction of forest roads is not considered as land-use change.
- When the previous land use is not known but the country is known, the GHG emissions arising from land-use change must be the estimate of average emissions from the land-use change for that activity in that country.
- When neither the country of origin nor the former land use is known, the GHG emissions arising from land-use change shall be the weighted average of the average land-use change emissions of that commodity in the countries in which it is grown.

Land use:
The calculation of land use biogenic carbon dioxide emissions or removals shall be carried out using site-specific data whenever possible. If specific data from forest carbon models is not available, local parametric models at the landscape level can be used to estimate carbon flows in the forest. In case such type of model is applied, all data sources and assumptions must be clearly supported. The following assumptions shall be used as a default:

- The net forest regrowth and the atmospheric CO_2 removals from the atmosphere must follow the temporal and spatial boundaries established in sections 4.3.2.3 and 4.3.2.4; represent current conditions, average values of at least four to five and maximum 20 years and a landscape that includes the entire forest system with all the age classes.
- Parameters such as tree species, rotation period, wood density, carbon content, thinning intensity, shares of above and below ground debris harvested must be case-specific for the forest harvested to produce the biomass.
- For other parameters and assumptions, literature values can be used but they must be clearly justified.
- The estimation should include above-ground and below-ground biomass carbon stocks.
- If no specific data is available, it must be assumed that above-ground logging residues (i.e., branches and tops) combust or decay immediately, with all the carbon assumed to be converted into emissions of CO_2.
- If no specific data is available, biomass stored in tree roots left behind after harvest are assumed to decay and be converted entirely into emissions of CO_2 immediately, with all the carbon assumed to be converted into emissions of CO_2.
- If the timing of the land use is unknown, it shall be assumed that it occurred in the year when the assessment is being carried out.
- When modelling forestry systems on landscape level, the biogenic carbon content of harvested wood shall be considered a material inherent property, resulting from the uptake and storage of carbon dioxide from the atmosphere.
- In the case that site-specific data for changes in forest carbon stocks is not available, the default calculation rules established by ISO 14067 and the emission factors provided by the IPCC Guidelines for National Greenhouse Gas Inventories shall be applied.

The figure below presents a summary of all the different types of GWP impacts and how they are handled in this PCR:

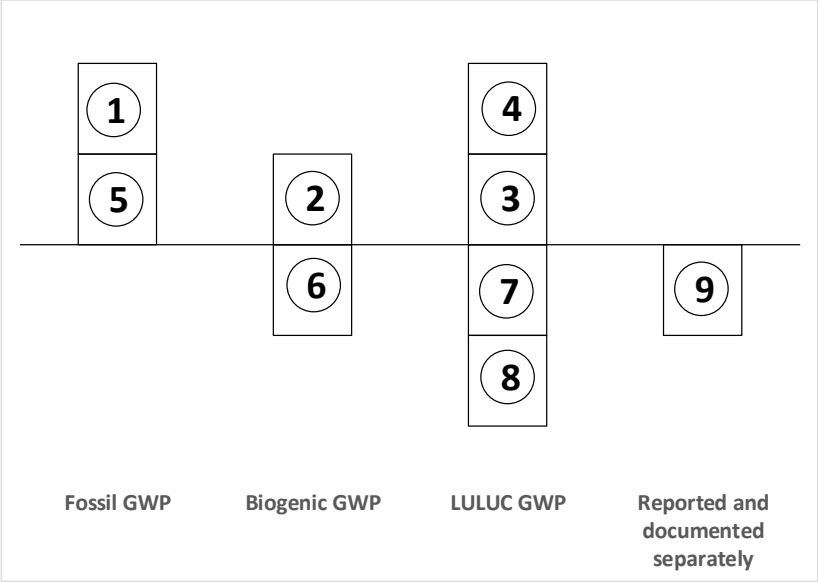

Figure 3 Illustration of the different components of GWP and the way they are handled in this PCR. The boxes above the x-axis represent emissions and the boxes below the x-axis represent uptakes

The different components of GWP illustrated in the figure above are described below:

1. *GHG emissions other than specified*. Emissions with unknown origin; e.g.: unspecified GHG emissions from production of energy wares.
2. *Biogenic GHG emissions*. From combustion of fuels of biogenic origin, including biogenic carbon transfer of biogenic carbon content in the product (as stated in section 4.10.4.4); e.g. combustion of biodiesel (only the biogenic share).
3. *Emissions from direct LUC and change in the management of land*. Net emissions due to difference in biogenic carbon uptake in the forest after land transformation.

4. *Emissions from land use excluding changes in the management of land*. GHG net emissions due to forest management; e.g. biogenic carbon emissions from the decay of branches and tops.
5. *Net fossil GHG emissions and removals*. Fossil emissions of known origin; e.g. emissions from combustion of fossil fuels in forest machines and vehicles.
6. *Biogenic GHG removal*. CO_2 uptake in trees by photosynthesis corresponding to the content in the product.
7. *Removals from direct LUC and change in the management of land*. Net removals due to the difference in biogenic carbon uptake in the forest after land transformation, excluding the biogenic carbon content in the product excluding the biogenic carbon content in the product and considering the land use baseline scenario (see section 4.3.2.6).
8. *Removals from land use excluding change in the management of land*. GHG net removals due to forest management; e.g. biogenic carbon uptake due to annual tree growth, excluding the biogenic carbon content in the product and considering the land use baseline scenario (see section 4.3.2.6).
9. *Biogenic carbon storage in the product*. Effects from temporary biogenic carbon storage in products, not relevant for intermediate products, excluding the biogenic carbon content in the product.

4.10.3.5. Water scarcity footprint

The Water scarcity footprint shall be calculated and reported, following the methodology established at https://www.environdec.com/impact-categories. The non-agri AWARE characterisation factors should be applied.

5 CONTENT AND FORMAT OF EPD

EPDs based on this PCR shall contain the information described in this section. Flexibility is allowed in the formatting and layout provided that the EPD still includes the prescribed information. A generic template for EPDs is available via www.environdec.com

As a general rule, the EPD content:

- shall be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations - General principles),
- shall be verifiable, accurate, relevant and not misleading, and
- shall not include rating, judgements or direct comparison with other products.

An EPD should be made with a reasonable number of pages for the intended audience and use.

5.1 EPD LANGUAGES

EPDs should be published in English but may also be published in additional languages. If the EPD is not available in English, it shall contain an executive summary in English including the main content of the EPD. This summary is part of the EPD and thus subject to the same verification procedure.

5.2 UNITS AND QUANTITIES

The following requirements apply for units and quantities:

- The International System of Units (SI units) shall be used, e.g., kilograms (kg), Joules (J) and metres (m). Reasonable multiples of SI units may be decided in the PCR to improve readability, e.g., grams (g) or megajoules (MJ). The following exceptions apply:
  - Resources used for energy input (primary energy) should be expressed as kilowatt-hours (kWh) or megajoules (MJ), including renewable energy sources, e.g., hydropower, wind power and geothermal power.
  - Water use should be expressed in cubic metres (m^3)
  - Temperature should be expressed in degrees Celsius (°C),
  - Time should be expressed in the units most practical, e.g., seconds, minutes, hours, days or years.
- Three significant figures[4] should be adopted for all results, the number of significant digits shall be appropriate and consistent.
- The thousand separator and decimal mark in the EPD shall follow one of the following styles (a number with six significant figures shown for illustration):
  - SI style (French version): 1 234,56
  - SI style (English version): 1 234.56

  In case of potential confusion or intended use of the EPD in markets where different symbols are used, the EPD shall state what symbols are used for thousand separator and decimal mark.
- Dates and times presented in the EPD should follow the format in ISO 8601. For years, the prescribed format is YYYY-MM-DD, e.g., 2017-03-26 for March 26th, 2017.
- The result tables shall:
  - Only contain values or the letters “INA” (Indicator Not Assessed). It is not possible to specify INA for mandatory indicators. INA shall only be used for voluntary parameters that are not quantified because no data is available.[5]
  - Contain no blank cells, hyphens, less than or greater than signs or letters (except “INA”).

[4] Significant figures are those digits that carry meaning contributing to its precision. For example with two significant digits, the result of 123.45 shall be displayed as 120, and 0.12345 shall be displayed as 0.12. In scientific notation, these two examples would be displayed as $1.2*10^2$ and $1.2*10^{-2}$.

[5] This requirement does not intend to give guidance on what indicators are mandated (“shall”) or voluntary.

- Use the value 0 only for parameters that have been calculated to be zero.
- Footnotes shall be used to explain any limitation to the result value.

5.3 USE OF IMAGES IN EPD

Images used in the EPD, especially pictures featured on the cover page, may in themselves be interpreted as an environmental claim. Images such as trees, mountains, wildlife that are not related to the declared product should therefore be used with caution and in compliance with national legislation and best available practices in the markets in which the EPD is intended to be used.

5.4 EPD REPORTING FORMAT

The reporting format of the EPD shall include the following sections:

- Cover page (see Section 5.4.1)
- Programme information (see Section 5.4.2)
- Product information (see Section 5.4.3)
- Content declaration (see Section 5.4.4)
- Environmental performance (see Section 5.4.5)
- Additional environmental information (see Section 5.4.6)
- References (see Section 5.4.9)

The following information shall be included, when applicable:

- Information related to Sector EPDs (see Section 5.4.7)
- Differences versus previous versions (see Section 5.4.8)
- Executive summary in English (see Section 5.4.10)

5.4.1 COVER PAGE

The cover page shall include:

- Product name and image,
- Name and logotype of EPD owner,
- The text “Environmental Product Declaration” and/or “EPD”
- *Programme: The International EPD® System, www.environdec.com,*
- *Programme operator: EPD International AB*
- Logotype of the International EPD® System,
- EPD registration number as issued by the programme operator[6],
- *Date of publication (issue): 20XX-YY-ZZ,*
- *Date of revision: 20XX-YY-ZZ*, when applicable,
- *Date of validity; 20XX-YY-ZZ*
- A note that “*An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com*.”

[6] The EPD shall not include a “registration number” if such is provided by the certification body, as this may be confused with the registration number issued by the programme operator.

- A statement of conformity with ISO 14025,

5.4.2 PROGRAMME INFORMATION

The programme information section of the EPD shall include:

- Address of programme operator: *EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com*
- The following mandatory statement from ISO 14025: "*EPDs within the same product category but from different programmes may not be comparable*."
- A statement that the EPD owner has the sole ownership, liability and responsibility of the EPD
- Information about verification[7] and reference PCR in a table with the following format and contents:

Product category rules (PCR): *<name, registration number, version and UN CPC code(s)>*
PCR review was conducted by: *<name and organisation of the review chair, and information on how to contact the chair through the programme operator>*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☐ EPD verification
Third party verifier: *<name, organisation and signature of the third-party verifier>* *In case of certification bodies:* Accredited by: *<name of the accreditation body and accreditation number, if applicable>.* *In case of individual verifiers:* Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☐ No

5.4.3 PRODUCT INFORMATION

The product information section of the EPD shall include:

- Address and contact information to EPD owner,
- Description of the organisation. This may include information on products- or management system-related certifications (e.g. ISO 14024 Type I environmental labels, ISO 9001- and 14001-certificates and EMAS-registrations) and other relevant work the organisation wants to communicate (e.g. SA 8000, supply-chain management and social responsibility),
- Product identification by name, and an unambiguous identification of the product by standards, concessions or other means,
- Identification of the product according to the UN CPC scheme system. Other relevant codes for product classification may also be included, e.g.
  - Common Procurement Vocabulary (CPV),
  - United Nations Standard Products and Services Code® (UNSPSC),
  - Classification of Products by Activity (NACE/CPA) or

[7] If the EPD has been verified by an approved individual verifier who has received contractual assistance from a certification body that is not accredited, this certification body shall not be included in this table.

- Australian and New Zealand Standard Industrial Classification (ANZSIC),

- Description of the product, its potential applications and technical functions
- Geographical scope of the EPD, i.e., for which geographical location(s) of use and end-of-life the product's performance has been calculated,
- Declared unit,
- The following information concerning the forest landscape where the biomass is harvested from: species harvested, location, average site productivity and frequency of management activities (harvesting and thinning)
- Carbon dioxide stored in the product per unit of mass and density values. An interval may be provided,
- Declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years,
- Reference to the main database(s) for generic data and LCA software used, if relevant,
- System diagram of the processes included in the LCA, divided into the life cycle stages,
- Description if the EPD system boundary is "cradle-to-gate", "cradle-to-gate with options" or "cradle-to-grave",
- Relevant websites for more information or explanatory materials.
- The allocation approach applied, which flows has been allocated and in which processes

This section may also include:

- Name and contact information of organisation carrying out the underlying LCA study,
- Additional information about the underlying LCA-based information, such as assumptions, cut-off rules, data quality and allocation.

5.4.4 CONTENT DECLARATION

The content declaration shall have the form of a list of materials and chemical substances including information on their environmental and hazardous properties. The gross weight of material shall be declared in the EPD at a minimum of 99 % of one unit of product.

The biogenic carbon content of the product is of high relevance for the downstream use of the intermediate products that concern this PCR. Therefore, the EPD shall include a declaration of the biogenic carbon content of the product in kilograms of carbon dioxide per declared unit.

Information on the hazardous properties of materials and chemical substances should follow the requirements given in the latest revision of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[8], issued by United Nations or national or regional applications of the GHS.

As an example, the following regulations should be used for EPDs intended to be used in the European Union:

- Regulation (EC) No 1907/2006 of the European parliament and of the council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures

5.4.4.1. Information about recycled materials

Not relevant for this product category.

5.4.4.2. Information about packaging

Packaging is generally not relevant for basic forestry products, so it has been excluded from this PCR.

[8] The GHS document is available on www.unece.org.

5.4.5 ENVIRONMENTAL PERFORMANCE

5.4.5.1. Environmental impacts

The EPD shall declare the environmental impact indicators, per declared unit and per life cycle stage, using the default impact categories, characterisation models and factors available on www.environdec.com/impact-categories. The source and version of the characterisation models and the factors used shall be reported in the EPD. Alternative regional life cycle impact assessment methods and characterisation factors are allowed to be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

5.4.5.2. Use of resources

The indicators for resource use based on the life cycle inventory (LCI) listed in Table 3 shall be declared per declared unit, and per life cycle stage.

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value				
	Used as raw materials	MJ, net calorific value				
	TOTAL	MJ, net calorific value				
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value				
	Used as raw materials	MJ, net calorific value				
	TOTAL	MJ, net calorific value				
Secondary material		kg				
Land Use Occupation		m^2*a				
Land transformation from		m^2 of land use				
Land transformation to		m^2 of land use				
Renewable secondary fuels		MJ, net calorific value				
Non-renewable secondary fuels		MJ, net calorific value				
Net use of fresh water		m^3				

Table 3 Indicators describing use of primary and secondary resources.

Notes:

- In order to identify the primary energy used as an energy carrier (and not used as raw materials), the parameter may be calculated as the difference between the total input of primary energy and the input of energy resources used as raw materials.
- Energy content of biomass used for feed or food purposes shall not be considered.
- The General Programme Instructions include clarifications regarding the indicators for use of resources and waste, in the section for guidance on interpretation. The General Programme Instructions are available at www.environdec.com.
- The net use of fresh water does not constitute a “water footprint” as potential environmental impacts due to the water use in different geographical locations is not captured. For this indicator:

- Evaporation, transpiration, product integration, release into different drainage basins or the sea, displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water) is included.
- In-stream water use is not included.
- For water used in closed loop processes (such as cooling system) and in power generation only the net water consumption (such as reintegration of water losses) should be considered.
- Seawater shall not be included[9]
- Tap water or treated water (e.g. from a water treatment plant), or wastewater that is not directly released in the environment (e.g. sent to a wastewater treatment plant) are not elementary water flows, but intermediate flows from a process within the technosphere.
- Additional transparency in terms of geographical location, type of water resource (e.g. groundwater, surface water), water quality and temporal aspects may be included as additional information.

5.4.5.3. Waste production and output flows

Waste generated along the whole life cycle production chains shall be treated following the technical specifications described in the general program. When the amount of waste or the output flows is from the life cycle inventory (LCI) are declared, the indicators in Table 4 and Table 5 shall be reported per declared unit, and per life cycle stage.

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg				
Non-hazardous waste disposed	kg				
Radioactive waste disposed	kg				

Table 4 Indicators describing waste production.

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg				
Material for recycling	kg				
Materials for energy recovery	kg				
Exported energy, electricity	MJ				
Exported energy, thermal	MJ				

Table 5 Indicators describing output flows.

Notes:

- The parameters are calculated on the gross amounts leaving the system boundary of the product system in the LCI. If e.g. there is no gross amount of “exported energy, electricity” leaving the system boundary, this indicator is set to zero,
- The parameter “Materials for energy recovery” does not include materials for waste incineration. Waste incineration is a method of waste processing, when R1<60% (European Guideline on R1 energy interpretation), and is allocated within the system boundary.
- In case there are never any flows of these types leaving the system boundary for a product category, the indicators may be removed by the PCR.

[9] It may be relevant to include seawater if it is used to obtain energy from it, or it is the only source of water in a definite site. This may be displayed separately, e.g. as “seawater for desalinization”.

5.4.5.4. Other indicators

Environmental impact for impact categories that are not required by this PCR but are required by other standards may be calculated and reported in the EPD, standards such as Product Environmental Footprint (PEF) or EN 15804+A2. These categories are human toxicity (cancer & non-cancer), ecotoxicity, particulate matter, ionising radiation (human health), and separated indicators for eutrophication potential to terrestrial, marine and freshwater. The inclusion of these indicators would facilitate the use of the EPDs for studies following such standards.

5.4.6 ADDITIONAL INFORMATION

The EPD should report the following information concerning the forest landscape where the biomass is harvested from:

Shall:

- Carbon stored in the product shall be reported

Should:

- Species harvested
- Location and average site productivity in the forest where the product is harvested
- Management activities (frequency of harvesting and thinning)

5.4.6.1. Biodiversity impacts and forest management

Biodiversity impacts are very relevant for forest products globally. Currently there is no robust impact assessment methodology for biodiversity impacts that is possible to apply for this PCR. However, EPDs covered by this PCR should report actions taken in order to maintain enough biodiversity in accordance to forest management certification scheme.

If the declared product is not 100% sourced from certified forest (by the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC)), the source of the remaining percentage that is not sourced from certified forests should be reported.

5.4.7 INFORMATION RELATED TO SECTOR EPDS

For sector EPDs, the following information shall also be included:

- a list of the contributing manufacturers that the Sector EPD covers,
- a description of how the selection of the sites/products has been done and how the average has been determined, and
- a statement that the document covers average values for an entire or partial product category (specifying the percentage of representativeness) and, hence, the declared product is an average that is not available for purchase on the market.

5.4.8 DIFFERENCES VERSUS PREVIOUS VERSIONS

For EPDs that have been updated, the following information shall also be included:

- a description of the differences versus previously published versions, e.g. a description of the percentage change in results and the main reason for the change;
- a revision date on the cover page

5.4.9 REFERENCES

This section shall include a list of references, including the General Programme Instructions (including version number), standards and PCR (registration number, name and version).

5.4.10 EXECUTIVE SUMMARY IN ENGLISH

For EPDs published in another language than English, an executive summary in English shall be included.

The executive summary should contain relevant summarised information related to the programme, product, environmental performance, additional information, information related to sector EPDs, references and differences versus previous versions.

6 GLOSSARY AND DEFINITION

6.1 ABBREVIATIONS

CO_2	Carbon dioxide
CO	Carbon monoxide
CH_4	Methane
CPC	Central product classification
EPD	Environmental product declaration
ISO	International Organization for Standardization
kg	kilogram
LCA	Life cycle assessment
LUC	Land-use change
LULUC	Land use and land-use change
MJ	Mega Joules
m^3	Cubic meters
N_2O	Nitrous oxide
PCR	Product Category Rules
PEF	Product Environmental Footprint
RSL	Reference Service Life
SI	The International System of Units
UN	United Nations

6.2 IMPORTANT DEFINITIONS

This section contains definitions of key concepts that are used throughout the PCR.

- Business-as-usual baseline = A land-use baseline that represents the continuation of forestry practices that have been applied for the last harvesting period.
- Current practices = Forestry activities that represent the present practices at the site where the product is harvested.
- Growth cycle = The time period required to obtain the highest economic value from a growing tree stand.
- Historic practices = Forestry activities that represent the average practices for at least one full growth period.
- Landscape = An extension of forest land that considers the forest as a whole system, including all possible age classes.
- Land-use baseline = A baseline is a situation that serves as a base for measurement or calculations. In this context, the land use baseline is the land use situation that serves as baseline for the measurement of the land use impacts. Therefore, the impact results would be the difference between the current practices and the practices defined as baseline.

7 REFERENCES

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ISO (2004) ISO 8601:2004 Data elements and interchange formats – Information interchange – Representation of dates and times

ISO (2006a) ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO (2006b) ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

ISO (2006c) ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines

ISO (2013) ISO/TS 14067:2013, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication

ISO (2014) ISO 14046:2014, Environmental management – Water footprint – Principles, requirements and guidelines

ISO (2017) ISO 21930:2017, Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services

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8 VERSION HISTORY OF PCR

VERSION 1.0, 2020-10-27

Original version of this PCR.

VERSION 1.0.1, 2022-03-21

Editorial change: removal of name and contact information for PCR Moderator, due to his resignation as moderator.

9 ANNEX A: EXAMPLES AND ILLUSTRATIONS

The following is an non-exhaustive list of examples of products that are referred to in this PCR and within its scope:

- Wood logs to be processed at a sawmill
- Wood logs to be processed at a pulp and/or paper mill
- Wood logs to be incinerated for energy production
- Wood chips from forestry residues to be processed at a pulp mill
- Wood chips from forestry residues to be processed for particle board production
- Wood chips from forestry residues to be incinerated for energy production
- Branches and tops from thinning to be incinerated for energy production
- Branches and tops from harvesting to be incinerated for energy production

The following photos illustrates the types of products and some of the processes that are included within the scope of this PCR. All the photos have been provided by Skogforsk Forestry Research Institute of Sweden and are subject to copyright:

Harvesting at the forest, for timber, pulpwood and fuel wood /firewood

Spruce harvesting example: timber, pulpwood, small logs and tops and branches

Pulpwood harvested from Spruce

Forwarding, off-road transport of timber logs

Forwarding, off-road transport of tops and branches

Timber logs in transit, by forest road, waiting for pick up by lorry

Pick up of timber logs by lorry for transport

Shredding and refinement of tops and branches at truck shed

10 ANNEX B: GUIDANCE FOR CALCULATION OF DENSITY AND CARBON CONTENT OF SPECIFIC TREE SPECIES

The net carbon sequestration of growing and sustainably utilized forests, and real losses of unutilized biomass emissions both have large impacts on the LCA results of the produced log and biomass products delivered to industry. For this reason, a firm declaration of the real carbon content in products and real effects of net growth in the forest landscape are crucial parts of an unbiased product EPD. Therefore, it is not possible to use or provide general default values from one region and apply it, out of range, to other. The methodology used for estimating and predicting carbon content is also of great importance. As the binding of carbon by net growth probably accounts for 50 to 100 times more sequestrated CO_2 than the total emissions of fossil CO_2 from all forestry and forestry to industry processes under the scope of this EPD, the importance of highest possible accuracy of these figures is evident.

Why are default values for carbon sequestration insufficient and likely inaccurate when used out of range?

The detailed analyses of real carbon content made by Lamlom and Savage 2003 (between and within 41 American tree species) clearly shows that a general simplification of carbon content in wood by 50% is insufficiently accurate in relation to its impact on the entire LCA. E.g. In general, conifers contain more lignin than broadleaves and lignin contain more carbon by weight than cellulose. Furthermore, in e.g. conifer species earlywood contains more lignin than latewood. Simultaneously, shown by e.g. Wilhelmsson et al 2002, differences in basic density by length of growing seasons, site fertility, silvicultural management, as well as tree age at harvesting considerably affects the average basic densities in a woof flow. Furthermore, based on these (and other) findings a variation can be expected in carbon content and basic density, which are somewhat negatively correlated within species. More high-quality investigations paying attention on this subject may be motivated to improve knowledge. When multiplied with large amounts of forestry products (Sawlogs, pulpwood, energy roundwood and branches and tops), high precision data will be appreciated as minor changes in these figures may have larger impact on the entire CO_2 balance than all fossil emissions from the sum of all forestry activities (transport to industry and roads, harvesting, silviculture, nursery etc.).

Basic density and carbon content can be affected by different factors such as climatic conditions, genetic origins, silviculture regimes, parts of stems, wood samples or the methodology used for measurements of wood density. Moreover, basic density does not correspond with air-dry density, which includes moisture and the volume measurements must reflect water saturated volume. Similar inaccuracies will be included if volatile substances in the wood samples are included or not, as is the effect of too high or too low temperatures during drying procedure. Finally, drying at too low temperature and too short time mat lead to lower carbon estimates as the total weight includes water.

Basic density and carbon content are also both functions of growth rates in relation to physiology which is a function of genotype and environment (including several regulating factors). The consequence of this is that there will be variations between and within species along the stem both in both longitudinal and radial directions as well as within trees, between trees, between stands, between regions and over time as trees grow. Lamlom and Savage (2003) show and discuss different sources of variation in carbon content and present average results from 41 American species of which many are principally comparable with relatives over the world. Finally, the methodology for estimating the carbon content in relation to dry matter varies from direct sample averages to models of variable validity for regional and product specific use. Concerning basic density, models exist for variation among products from stemwood of Norway spruce and Scots pine growing in Sweden (Wilhelmsson et al 2002) and for predicting the number of annual rings, (Wilhelmsson, 2006). These models applied on data from sample trees by the Swedish National Forest Inventory and cross-cutting of stems into sawlogs and pulpwood formed the basis for the basic density (average) maps of sawlogs and pulpwood over Sweden.

As a concluding remark, general tables are not sufficient, and the validity of the values provided below should be reflected upon but can be regarded as valid and representative for local practices for the specific:

- climate (growth season, temperature, sunlight, precipitation, wind), soil(water, nutrients etc) and other environmental conditions,
- genetic variation within species, between origins, individual trees within origins,
- silvicultural regimes, cutting ages,
- longitudinal variation in stems. Frequency of different parts affects properties of each assortment,
- the wood sampling methodology (origin and environment of wood samples),
- wood density measurements (e.g. basic density (oven dry weight divided by water saturated volume). For species with large amounts of extractives the handling of volatile wood substances in the measurement procedure may also have impact on the results, and
- the method for determination/calculation of carbon content should be described.

As these details may have considerable impact on the total results, it is important to specify them.

The tables presented below originates from recent and transparent publications focusing on specific local conditions. However, based on arguments given above, wood density and carbon content must reflect the actual conditions of importance and allocation to valid products (e.g. parts of stems in cut-to-length systems). Default values, like regional or general averages should not be regarded as sufficiently valid for other regions without validation or knowledge-based adjustments. However, when comparing wood materials by kg of wood dry substances, the effect of differences in wood density will not be seen directly as these calculations will utilize the figures for carbon content only. Based on the reviewed findings of Lamlom and Savage (2003), wood from regions where the carbon content per kg wood is unknown, no valid reference data are available, and no scientifically based model approaches are presented, a 50% carbon content for conifers and 47% for broadleaves may be used. Then, it must be clearly declared if and why such default values are used. General figures for basic wood density by species not reflecting relevant origin and silviculture regimes should be avoided.

Values for French conditions:

Common name	Wood density (ton/m^3)	Carbon content (C/ton)
Douglas fir	0.4533	0.5280
Norway spruce	0.3700	0.4980
Maritime pine	0.4140	0.5212
Silver fir	0.3530	0.4750
Scotts pine	0.4219	0.5036
Other conifers	0.4024	0.5052
Sweet chestnut	0.4400	0.5010
Hornbeam	0.7056	0.4899
Ash	0.5597	0.4918
European beech	0.5955	0.4709
Sessile oak	0.5597	0.4970
English oak	0.5597	0.5016
White oak	0.5597	0.4948
Other broad-leaved	0.5672	0.4924

Source: Albers, A., Collet, P., Benoist, A. & Hélias, A. (2019). Data and non-linear models for the estimation of biomass growth and carbon fixation in managed forests. Data in brief 23, April 2019, 10841. Specifications for the data can be found at the source.

Values for Swedish conditions:

Below, the background for Swedish forestry, divided into three species groups by 4 assortments each and by four regions are presented. The suggested data sources for Basic wood density and carbon content averages of sawlogs, pulpwood and energy assortments of Picea abies, Pinus sylvestris and Betula pendula from managed forests in four different regions (Northern North Sweden, Southern North Sweden, Svealand (Central Sweden) and Gotaland (Southern Sweden).

BASIC PRODUCTS FROM FORESTRY

PRODUCT CATEGORY CLASSIFICATION: UN CPC 031

Basic density (Oven dry weight/water saturated volume under bark, kg/m3sub)

Products	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland
Saw logs	Pine	kg /m3sub	410	419	431	433
Saw logs	Spruce	kg /m3sub	380	382	387	388
Saw logs	Birch/broad leafs	kg /m3sub	480	480	480	480
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**
Pulpwood	Pine	kg /m3sub	376	384	391	409
Pulpwood	Spruce	kg /m3sub	366	381	388	389
Pulpwood	Birch/broad leafs	kg /m3sub	480	480	480	480
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**
Fuel roundwood	Pine	kg /m3sub	376	384	391	409
Fuel roundwood	Spruce	kg /m3sub	366	381	388	389
Fuel roundwood	Birch/broad leafs	kg /m3sub	480	480	480	480

Used for calculating mass of wood products and for Carbon content per volume unit in products

Used m3sub=Cubic metare solid under bark (no bark)

Extracted from basic density maps by Moberg & Wilhelmsson, 2003; 2004. These maps are based on models for predicting basic density of Scots pine and Norway spruce (Wilhelmsson et al 2002), Input data from harvestable sample trees measured by the Swedish National forest Inventory (1997-2001) and within tree (but to top) annual ring pattern by (Wilhelmsson 2006)

Average figure for birch based on Tamminen (1970)

Extracted from basic density maps by Moberg & Wilhelmsson, 2003; 2004. These maps are based on models for predicting basic density of Scots pine and Norway spruce (Wilhelmsson et al 2002), Input data from harvestable sample trees measured by the Swedish National forest Inventory (1997-2001) and within tree (but to top) annual ring pattern by (Wilhelmsson 2006)

Average figure for birch based on Tamminen (1970)

Wilhelmsson 2001, Moberg /& Wilhelmsson 2003;2004. Fuel roundwood holds the same basic density as pulpwood

Wilhelmsson 2001, Moberg /& Wilhelmsson 2003;2004

Wilhelmsson 2001, Moberg /& Wilhelmsson 2003;2004

Basic density (Oven dry weight/water saturated volume under bark, kg/m3solid

Products	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland	
Branches & needles	Pine	kg /m3solid	400	400	400	400	Hakkila 1989, branches with bark, Supported by WeCalc. (Density including bark fraction)
Branches & needles	Spruce	kg /m3solid	500	500	500	500	Hakkila 1989, branches with bark, Supported by WeCalc
Branches & needles	Birch/broad leafs	kg /m3solid	480	480	480	480	Hakkila 1989, branches with bark, Supported by WeCalc
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**	
Bark	Pine	kg /m3f	290	290	290	290	Tamminen 1962 referred to by Hakkila 1989 **(**Bark should be added to all stemwood declared in m3sub to get m3spb for C calulations)
Bark	Spruce	kg /m3f	350	350	350	350	Tammienn 1964 and referred to by Hakkila 1989
Bark	Birch/broad leafs	kg /m3f	480	480	480	480	Tamminen 1970 and referred to by Hakkila 1989

Used for calculating mass of wood products and for Carbon content per volume unit in products

Fresh (Green) density (weight of wood and bark) volume under bark kg/m3sub+ bark)

Products	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland
Saw logs	Pine	kg /m3sub+bark	883	902	928	932
Saw logs	Spruce	kg /m3sub+bark	861	866	877	879
Saw logs	Birch/broad leafs	kg /m3sub+bark	1010	1010	1010	1010
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**
Pulpwood	Pine	kg /m3sub+bark	944	964	982	1027
Pulpwood	Spruce	kg /m3sub+bark	907	944	961	963
Pulpwood	Birch/broad leafs	kg /m3sub+bark	1010	1010	1010	1010
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**
Fuel roundwood	Pine	kg /m3sub+bark	913	828	842	877
Fuel roundwood	Spruce	kg /m3sub+bark	809	838	852	854
Fuel roundwood	Birch/broad leafs	kg /m3sub+bark	960	960	960	960

Used for calculating transport work per kg dry substance (truckloads forest to industry/terminal)

Source: Skogforsk, Wilhelmsson & Moberg 2004, arbetsrapport 569

Note: Fresh density of Norra and Södra Norrland and Götaland calculated by the same moisture content in percent

in percent (dry mass/fresh mass) as was used for Svealand according to Wilhelmsson & Moberg 2004

Source: Skogforsk, Wilhelmsson & Moberg 2004, arbetsrapport 569

Note: Fresh density of Norra and Södra Norrland and Götaland calculated by the same moisture content in percent

in percent (dry mass/fresh mass) as was used for Svealand according to Wilhelmsson & Moberg 2004

Basic density as pulpwood + bark 12% (350kg/m3f)+ Moisture content 55% (Ref Wilhelmsson et al 2001;Wilhelmsson & Moberg 2004, Hakkila 1989)

Basic density as pulpwood + bark 12% (350kg/m3f)+ Moisture content 55% (Ref Wilhelmsson et al 2001;Wilhelmsson & Moberg 2004, Hakkila 1989)

Basic density and bark have basic density as pulpwood. Moisture content 50% (ref. Hakkila, 1989)

Fresh (Green) density (weight of wood and bark) volume kg/m3solid)

Products	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland	
Branches & needles	Pine	kg /m3solid	730	730	730	730	Basic density + Moisture content 45%
Branches & needles	Spruce	kg /m3solid	500	500	500	500	Basic density + Moisture content 40%
Branches & needles	Birch/broad leafs	kg /m3solid	480	480	480	480	Basic density + Moisture content 39%
Products	**Assortment**	**Unit**	**Norra Norrland**	**Södra Norrland**	**Svealand**	**Götaland**	
Bark	Pine	kg /m3solid	544	644	644	644	Tamminen 1962, Hakkila, 1989 + 55% moisture content
Bark	Spruce	kg /m3solid	778	778	778	778	Tamminen 1964, Hakkila, 1989 + 55% moisture content
Bark	Birch/broad leafs	kg /m3solid	960	960	960	960	Tamminen 1970, Hakkila, 1989, 50% moisture content

Values for carbon flows and carbon content

Molar mass of carbon	12
Molar mass of carbon dioxide	44
Ratio Carbon dioxide/Carbon	3,67

Carbon pool	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland	Sweden	Source
C content in wood - %	Pine	%	52%	52%	52%	52%		Sources: Analyses by Lars Wilhelmsson, based on Lamlom & Savage 2003, Joosten & Schulte 2002, Tolunay 2006, Albers et al 2019.
Roundwood under bark	Spruce	%	50%	50%	50%	50%		
	Broad leaves	%	47%	47%	47%	47%		
C content in GROT - %	Pine	%	50%	50%	50%	50%		
including bark	Spruce	%	50%	50%	50%	50%		
	Broad leaves	%	47%	47%	47%	47%		
C content in bark - %	Pine	%	50%	50%	50%	50%		
	Spruce	%	50%	50%	50%	50%		
	Broad leaves	%	50%	50%	50%	50%		
C flows in ground (markkol)			In a landscape perspective the C flows to and from ground are in equilibrium with +/- 10 %. This is only valid for Nordic boreal forests which are more resilient than forests in other places in the world.					Lars Högbom (2020)
C in product excl bark - roundwood	Pine	kg C/kg dry product	0,52	0,52	0,52	0,52		
	Spruce	kg C/kg dry product	0,50	0,50	0,50	0,50		
	Broad leaves	kg C/kg dry product	0,47	0,47	0,47	0,47		
Corresponding sequstration of CO_2	Pine	kg CO2/kg dry product	1,91	1,91	1,91	1,91		
	Spruce	kg CO2/kg dry product	1,83	1,83	1,83	1,83		
	Broad leaves	kg CO2/kg dry product	1,72	1,72	1,72	1,72		

Carbon pool	Assortment	Unit	Norra Norrland	Södra Norrland	Svealand	Götaland	Sweden	Source
C in product - Bark on roundwood	Pine	kg C/kg dry product	Carbon content per kg dry product depends on amount of bark on product. This information can be found in the respective LCA dataset used.					
	Spruce	kg C/kg dry product						
	Broad leaves	kg C/kg dry product						
Corresponding sequestration of CO_2	Pine	kg CO2/kg dry product						
	Spruce	kg CO2/kg dry product						
	Broad leaves	kg CO2/kg dry product						
C in product - GROT	Pine	kg C/kg dry product	0,5	0,5	0,5	0,5		
	Spruce	kg C/kg dry product	0,5	0,5	0,5	0,5		
	Broad leaves	kg C/kg dry product	0,47	0,47	0,47	0,47		
Corresponding sequestration of CO_2	Pine	kg CO2/kg dry product	1,83	1,83	1,83	1,83		
	Spruce	kg CO2/kg dry product	1,83	1,83	1,83	1,83		
	Broad leaves	kg CO2/kg dry product	1,72	1,72	1,72	1,72		

BASIC PRODUCTS FROM FORESTRY

PRODUCT CATEGORY CLASSIFICATION: UN CPC 031

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