

# ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025, ISO 21930 and EN 15804+A2



A specific EPD for  
**Cross laminated timber (CLT) made of spruce, u 12%**

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**HOLMEN**

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**Owner of the declaration:**  
Holmen Wood Products AB  
937 90 Bygdsiljum  
[www.holmen.com](http://www.holmen.com)

**Product category /PCR:**  
Wood and wood-based products

**EPD Software:**

This EPD is based on IVL EPD Generator for the Sawmill products (NEPDT26) and follow the approved background database verification

**Program holder and publisher**  
The Norwegian EPD Foundation

**Declaration number:**  
NEPD-8262-7934-EN

**Issue date:** 04.12.2024  
**Valid to:** 04.12.2029

# General information

**Product:**

Cross laminated timber made of spruce, u 12%

**Program Operator:**

The Norwegian EPD Foundation  
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**Declaration Number:**

NEPD-8262-7934-EN

**This declaration is based on Product****Category Rules:**

CEN Standard EN 15804 A2 serves as core PCR and PCR Part B for wood and wood-based products for use in construction (NPCR 015 07.10.2021).

**Statement of liability:**

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

**Declared unit:**

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**Declared unit with option:**

1 m<sup>3</sup> CLT  
A1-A5, C1-C4 and D

**Functional unit:**

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**Verification:**

Independent verification of the declaration and data, according to ISO14025:2010.

Internal  External

Third party verifier:



Linda Høibye, Life Cycle Assessment Consulting  
Independent verifier approved by EPD Norway

**Owner of the declaration and manufacturer:**

Holmen Wood Products AB  
Contact person: Marit Bohlin  
Phone: +46 650 280 00  
Email: [marit.bohlin@holmen.com](mailto:marit.bohlin@holmen.com)

**Place of production:**

Bygdsiljum sawmill  
Sverige

**Management system etc:**

ISO 14001, 50001, 45001. FSC, PEFC

**Organisation no:**

556099-0672

**Issue date:**

04.12.2024

**Valid to:**

04.12.2029

**Year of study:**

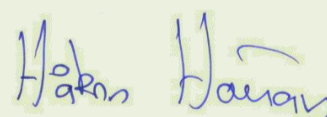
2022

**Comparability:**

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

**The EPD has been worked out by:**

Lundgren P, Bohlin M, Gabriellsson A  
Holmen Wood Products AB

**Approved by:**

Håkon Hauan  
(Managing Director EPD Norway)

# Product

## Product description:

CLT is a solid wood panel made from planed timber that is glued together, with every other layer rotated 90 degrees. The result is a structural element with high strength and transverse stiffness in relation to its low weight. This creates opportunities for large spans and efficient methods of

## Product specification:

CLT is produced in different sizes and the declared product is representative for the average Cross laminated timber produced by the sawmill made of spruce.

### Materials, product

	kg/m <sup>3</sup>	weight-%
Spruce/whitewood	459	99%
Resin, Methylene Diphenyl Disocyanate (MDI) and Melamine Urea Formaldehyde (MUF)	3.6	1%
Sum	463	100%

### Packaging materials

	kg/m <sup>3</sup>	weight-%
Wood	0	0%
Polyethene film	0.71	86%
Plastic strap	0.12	14%
Steel strip	0	0%
Cardboard	0.35	42%
Sum	0.83	100%

## Technical data:

Cross laminated timber is delivered according to customer specifications where the sizes are completely customised. For the European market, the European EN standard EN 16351 Timber structures - Cross laminated timber - Requirements is applicable.

The raw dry mass for spruce is 384 kg/m<sup>3</sup> as a Swedish average and used here to calculate biogenic carbon content and the delivery density including water according to the current moisture content.

## Market:

Main markets are Sweden and Northern Europe.

## Reference service life:

Reference service life is normally the same as the building when not exposed for weathering, which is typically set to 50 or 60 years.



Use QR code for fact sheet on Swedish wood products.

# LCA: Calculation rules

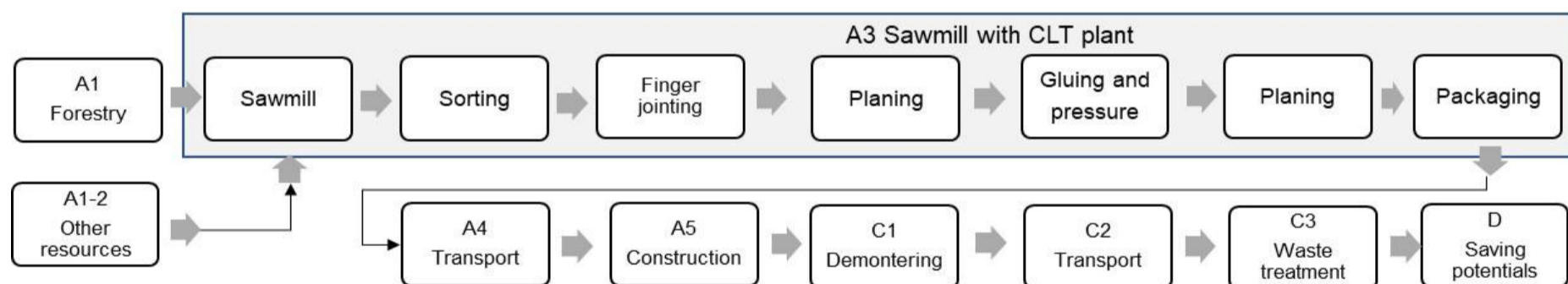
## Declared unit:

1 m<sup>3</sup> CLT

## System boundary:

Flow chart over production (A3) of the declared product and all other modules is shown below. Module A4 to D is further explained in the scenario section.

Figure 1 Declared product manufacturing and transport to a customer and the remaining lifecycle.



## Data quality:

The sawmill including planing and the CLT process and transport use specific LCA data and national representative figures is used for the forestry. Generic upstream data are used for the resin, energy wares and a small amount of auxiliary materials that are mainly from Gabi version 2017.1 to 2023.2. LCA data for diesel is based on European average (6% biobased components).

## Allocation:

The allocation is made in accordance with the provisions of EN15804. All impacts from the planing of boards are allocated to the main product. The shavings are sold and attributed to its upstream impact from its previous processes. The sawmill and its multiple co-products are allocated based on their different economic values, except the drying process that is attributed to the intermediate product on physical premises representative for the final product moisture content. The economic value of the different parts of the input round timber are attributed using the market value of its final products/co-products.

A conservative approach is used for transport (module A2) of round timber to the sawmill based on economic allocation factors as outlined in cPCR EN16485. A conservative economic allocation approach is used for forestry products, where no impact is allocated to the tops and branches (GROT), except forestry operations aimed for GROT (forwarding and shipping). Indicator result on potential soil quality (SQP) is assessed based on national characterisation factors for Swedish forestry (Horn et al 2021).

## Cut-off criteria:

All major raw materials and all the essential energy used are included. All production processes are included, hence the few limited cut-off that occurs (<<1%): Packaging materials are not substituted in module D. This cut-off rule does not apply for hazardous materials and substances. Inherent biogenic carbon and stored energy in packaging material are balanced out directly.

## Calculation of biogenic carbon content:

Sequestration (module A1) and emissions of biogenic carbon are calculated according to EN16485:2014/EN15804+A2, where the net biogenic carbon cycle A to C is zero (i.e. carbon dioxide neutral). In this EPD, the amount of biogenic carbon stored in the product (module A3) is reported additionally (according to EN 15804 A2) as biogenic carbon stored in the product (see table 'Resource use'). For biogenic carbon in all other modules after A3, the carbon in the products is assigned to the module where the emission occurs in order to support the modularity principle in EN15804, so the net result is zero. Biogenic carbon and energy stored in packaging materials (less than 5 weight-%) are directly balanced out and therefore not visible in the environmental indicator result.

# LCA: Scenarios and additional technical information

The following information below describe the scenarios in the different modules of the EPD.

## Transport from production place to user (A4)

Type	Load factor, % (90+0%)	Type of vehicle	Distance km	Fuel	Value
Semi-trailer	45%	TT/AT 28-34 + 34-40t	300	0.027 l/tkm	8.2

A4: The transportation is reported as 100 km and shall be used as factor to estimate the actual distance to the specific object.

## Assembly (A5)

	Unit	Value
Material loss	%	5
Crane, electricity consumption	kWh	2.8E-02
Front loader, diesel	kWh	2.7E-01

A5: At the construction site, 4 minutes of work with front loader is assumed (Erlandsson 2015) and an average lift with a crane (Lundström 2016). 5% material loss is assumed at construction site.

## Use (B1)

	Unit	Value
MND		

## Maintenance (B2)/Repair (B3)

	Unit	Value
MND		

The declared product is not assumed to be exposed for weather and for that reason no maintenance is needed during the service life.

## Replacement (B4)/Refurbishment (B5)

	Unit	Value
MND		

## Operational energy (B6) and water consumption (B7)

	Unit	Value
MND		

No operational energy used during service life.

## End of Life (C1, C3, C4) - base scenario\*

	Unit	Value
C1: Demolition machine (diesel)	kWh	0.51
C3: To material reuse	kg	0
C3: To material recycling	kg	0
C3: To energy recovery	kg	463
C3: Wood chipping (diesel)	kWh	2.8
C4: To landfill	kg	0

Energy need for demolition (C1) and chipping (C3) of the wooden discarded products is found in according to Erlandsson et al (2015). The scenario accounts for 100%\* energy recovery and end of waste is reached in C3. No statistics exist in Sweden on recycling of demolition wood but will likely be at least 90%. See also complementary scenario below.

## Transport to waste processing (C2)\*

Type	Load factor, % (90+0%)	Type of vehicle	Distance km	Fuel	Value
Large lorry/truck	45%	TT/AT 14-20+20-28t	35	0.037	1.3

\*C2: Assumed transport from demolition site to local waste treatment site, from where it is then sold.

The transport assume empty return.

## Benefits and loads beyond the system boundaries (D)

### - base scenario\*

	Unit	Value
Chipped discard product that substitutes fuel in a district heating plant	kg DM	413
Chipped discarded product that substitute average used fuel in a district heating plant	MJ	-7947

D: The chipped product is assumed to be used as fuel in a district heating and then replaces the average energy mix.

\* If less recycling rate than 100% is asked for shall the result from module C and D be multiplied by such factor that takes the actual number into account. 100% is used here to support the modular approach of using these figures on the buildings level.

## Additional technical information

No additional information given.



# LCA: Results

The LCA results are presented for the declared unit defined on page 2 of the EPD document. EN 15804 exists in two versions and version 2 is the latest.

System boundaries: **X**=included, **MND**= module not declared, **MNR**=module not relevant.

Product stage			Construction process stage		Use stage							End of life stage				Beyond the system boundary
Raw materials	Transport	Manufacturing	Transport	Construction, installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x
SE	SE	SE	SE	SE	—	—	—	—	—	—	—	SE	SE	SE	SE	SE

## Core environmental impact, version A2 and EF 3.0 — mandatory indicators

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> e	-6.95E+02	1.16E+01	3.44E+00	1.53E-01	1.85E+00	7.53E+02	0.00E+00	-1.82E+02
GWP-fossil	kg CO <sub>2</sub> e	5.49E+01	1.14E+01	3.39E+00	1.50E-01	1.81E+00	2.45E+00	0.00E+00	-1.92E+02
GWP-biogenic	kg CO <sub>2</sub> e	-7.51E+02	1.43E-01	8.17E-03	1.89E-03	2.28E-02	7.51E+02	0.00E+00	1.02E+01
GWP-LULUC	kg CO <sub>2</sub> e	3.69E-01	9.40E-02	2.38E-02	1.24E-03	1.50E-02	1.86E-02	0.00E+00	-3.41E-03
GWP-IOBC/GHG <sup>1)</sup>	kg CO <sub>2</sub> e	5.57E+01	1.16E+01	3.45E+00	1.53E-01	1.85E+00	2.49E+00	0.00E+00	-1.72E+02
ODP	kg CFC11 eq.	6.58E-08	1.47E-15	3.29E-09	1.94E-17	2.34E-16	1.44E-08	0.00E+00	-1.24E-06
AP	mol H <sup>+</sup> eq.	3.90E-01	6.61E-02	2.33E-02	8.74E-04	1.05E-02	1.77E-02	0.00E+00	-4.13E-01
EP-freshwater	kg P eq.	1.58E-03	3.41E-05	8.09E-05	4.51E-07	5.44E-06	3.85E-05	0.00E+00	-3.80E-04
EP-marine	kg N eq.	1.63E-01	3.24E-02	1.00E-02	4.28E-04	5.16E-03	9.04E-03	0.00E+00	-6.36E-03
EP-terrestrial	mol N eq.	1.62E+00	3.58E-01	1.01E-01	4.74E-03	5.72E-02	9.40E-02	0.00E+00	7.72E-02
POCP	kg NMVOC eq.	3.96E-01	6.23E-02	2.34E-02	8.24E-04	9.94E-03	1.50E-02	0.00E+00	-4.17E-02
ADP-m&m <sup>2)</sup>	kg Sb eq.	2.01E-05	8.74E-07	1.06E-06	1.16E-08	1.39E-07	4.84E-07	0.00E+00	-1.25E-05
ADP-fossil <sup>2)</sup>	MJ	9.12E+02	1.53E+02	5.45E+01	2.02E+00	2.44E+01	3.41E+01	0.00E+00	-1.82E+03
WDP	m <sup>3</sup>	2.37E+01	9.97E-02	1.19E+00	1.32E-03	1.59E-02	1.15E+01	0.00E+00	-3.61E+03

**GWP-total:** Global Warming Potential; **GWP-fossil:** Global Warming Potential fossil fuels; **GWP-biogenic:** Global Warming Potential biogenic; **GWP-LULUC:** Global Warming Potential land use and land use change; **ODP:** Depletion potential of the stratospheric ozone layer; **AP:** Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-m&m:** Abiotic depletion potential for non-fossil resources (**minerals and metals**); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

**Note 1** – This additional indicator **GWP-GHG/IOBC** is also referred to as **GWP-GHG** in the context of Swedish and Finish legislation.

**Disclaimer 2** – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## Additional environmental impact, version A2 & EF 3.0 — addition of non-mandatory indicators with poor reliability

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
PM <sup>2)</sup>	Disease incidence	2.16E-06	2.30E-07	1.21E-07	3.05E-09	3.68E-08	7.54E-08	0.00E+00	1.65E-02
IRP <sup>1)</sup>	kBq U235 eq	8.37E-01	2.65E-02	4.83E-02	3.50E-04	4.23E-03	2.62E-02	0.00E+00	-2.90E+01
ETP-fw <sup>2)</sup>	CTUe	5.62E+02	1.10E+02	3.45E+01	1.46E+00	1.76E+01	3.47E+01	0.00E+00	-6.39E+02
HTP-c <sup>2)</sup>	CTUh	3.81E-08	2.23E-09	2.03E-09	2.95E-11	3.56E-10	6.96E-10	0.00E+00	-1.27E-08
HTP-nc <sup>2)</sup>	CTUh	1.87E-06	1.24E-07	1.00E-07	1.64E-09	1.98E-08	4.06E-08	0.00E+00	-2.31E-06
SQP <sup>2)</sup>	Dimensionless	6.54E+04	5.25E+01	3.27E+03	6.94E-01	8.37E+00	2.08E+01	0.00E+00	-3.69E+02

**PM:** Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

**Disclaimer 1** – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

**Disclaimer 2** – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## Environmental impact, version A1

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
GWP-TOT	kg CO <sub>2</sub> e	-6.97E+02	1.12E+01	3.30E+00	1.48E-01	1.78E+00	7.53E+02	0.00E+00	-1.83E+02
GWP-IOBC*	kg CO <sub>2</sub> e	5.32E+01	1.12E+01	3.30E+00	1.48E-01	1.78E+00	2.41E+00	0.00E+00	-1.83E+02
ODP	kg CFC11 e	7.61E-08	1.96E-15	3.80E-09	2.59E-17	3.13E-16	1.30E-08	0.00E+00	-1.02E-06
POCP**	kg C <sub>2</sub> H <sub>4</sub> e	8.65E-03	-1.73E-02	-5.54E-04	-2.29E-04	-2.76E-03	-4.05E-03	0.00E+00	1.03E-02
AP	kg SO <sub>2</sub> e	2.84E-01	4.51E-02	1.68E-02	5.96E-04	7.19E-03	1.18E-02	0.00E+00	-3.87E-01
EP	kg PO <sub>4</sub> <sup>3-</sup> e	7.27E-02	1.13E-02	4.28E-03	1.50E-04	1.80E-03	3.60E-03	0.00E+00	9.81E-03
ADPM	kg Sb e	2.01E-05	8.75E-07	1.06E-06	1.16E-08	1.40E-07	4.85E-07	0.00E+00	-1.54E-05
ADPE	MJ	8.89E+02	1.52E+02	5.32E+01	2.02E+00	2.43E+01	3.38E+01	0.00E+00	-1.24E+03

**GWP** Global warming potential; **ODP** Depletion potential of the stratospheric ozone layer; **POCP** Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP** Eutrophication potential; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources.

\* This indicator is also referred to as **GWP-GHG** in Swedish legislation and used in the Finish and Swedish mandatory generic database for building climate declarations.

\*\*LCI origin from GaBi database separates NO<sub>x</sub> into NO and NO<sub>2</sub>, in combination with the applied characterization model with a marginal approach for POCP based on highly polluted ambient air, can result in a negative characterization factor for nitric oxide.

## Resource use, version A1+A2 and EF 3.0 — mandatory indicators

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	2.06E+03	8.53E+00	1.03E+02	1.13E-01	1.36E+00	4.71E+00	0.00E+00	6.91E+03
RPEM	MJ	7.87E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.87E+03	0.00E+00	0.00E+00
TPE	MJ	9.92E+03	8.53E+00	1.03E+02	1.13E-01	1.36E+00	-7.86E+03	0.00E+00	6.91E+03
NRPE	MJ	8.14E+02	1.53E+02	4.95E+01	2.02E+00	2.44E+01	3.42E+01	0.00E+00	-1.19E+03
NRPM	MJ	8.64E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.64E+01	0.00E+00	0.00E+00
TRPE	MJ	9.00E+02	1.53E+02	4.95E+01	2.02E+00	2.44E+01	-5.22E+01	0.00E+00	-1.19E+03
SM	kg	4.14E-10	0.00E+00	2.07E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	4.14E-10	0.00E+00	2.07E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.10E+03
NRSF	MJ	4.14E-10	0.00E+00	2.07E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.38E+03
W	m <sup>3</sup>	1.76E+00	9.76E-03	8.85E-02	1.29E-04	1.56E-03	2.69E-01	0.00E+00	0.00E+00

**RPEE** Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non renewable primary energy resources used as energy carrier; **NRPM** Non renewable primary energy resources used as materials; **TRPE** Total use of non renewable primary energy resources; **SM** Use of secondary materials; **RSF** Use of renewable secondary fuels; **NRSF** Use of non renewable secondary fuels; **W** Use of net fresh water.

Energy stored as material in the packaging materials is direct balanced out in the module it arises and stored in the product is balanced out over the life cycle, exactly the same as stored biogenic carbon is reported in GWP.

## End of life — Waste, version A1+A2 and EF 3.0 — mandatory indicators

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
HW	kg	2.73E-01	7.71E-09	1.37E-02	1.02E-10	1.23E-09	1.27E-09	0.00E+00	-3.40E-08
NHW	kg	1.70E+00	2.27E-02	8.62E-02	3.01E-04	3.63E-03	4.86E-03	0.00E+00	-6.89E-01
RW	kg	7.83E-03	1.85E-04	4.45E-04	2.45E-06	2.95E-05	4.01E-05	0.00E+00	-2.31E-01

**HW** Hazardous waste disposed; **NHW** Non hazardous waste disposed; **RW** Radioactive waste disposed

## End of life — Output flow, version A1+A2 and EF 3.0 — mandatory indicators

Parameter	Unit	A1-3	A4	A5	C1	C2	C3	C4	D
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	3.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	4.92E-01	0.00E+00	1.17E+00	0.00E+00	0.00E+00	4.63E+02	0.00E+00	0.00E+00
EEE	MJ	4.14E-10	0.00E+00	2.07E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	7.25E-02	0.00E+00	3.63E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**CR** Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery; **EEE** Exported electric energy; **ETE** Exported thermal energy

## Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Amount	Unit
Biogenic carbon content in product	205	kg C
Biogenic carbon content in the accompanying packaging*	0.00*	kg C

44/12 is the ratio between the molecular mass of CO<sub>2</sub> and C molecules.

\* The biogenic carbon and its energy content stored in packaging materials is less than 5% and therefore according to EN 15804 direct balanced out in the environmental indicator result (i.e. set to zero for GWP and energy used as materials).

# LCA: Complementary scenario results

This section includes an alternative end of life scenario and create an information model that in combination med the main scenario reported above can be used by the end-user to define a specific scenario based on local conditions.

## Alternative 100% scenario for the scenario: Deconstruction losses

It should be noticed that landfilling of organic waste as wood is not allowed by EC legislation and the worst scenario alternative will then be the fact that the deconstruction/demolition process generate a wood fraction that will not be recycled at all. Such waste flow can be generated in the deconstruction process and where the wood is then wasted on the surface or alternative in the topsoil in the ground at the construction site or elsewhere. The modelled scenario presented below is based on the wood that remains on the site of the building being broken down aerobic, that is, with access to oxygen and completely decomposed within the 100-year time-related cut off that is applied. In such aerobic decomposition is the inherent carbon transformed to carbon dioxide (compared to an anaerobic process that partly also create methene). The demolition process C1 is the same as in the main scenario reported above. There will not be any transport C2 since the waste is lost at the site.

End of life stage				Beyond the system boundary
De-construction demolition	Transport	Waste processing	Disposal	
C1	C2	C3	C4	D
x	x	x	x	x
SE	SE	SE	SE	SE

## Core environmental impact, version A2 and EF 3.0 – mandatory indicators

Parameter	Unit				C1	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> e				1.53E-01	0.00E+00	0.000E+00	7.51E+02	0.00E+00
GWP-fossil	kg CO <sub>2</sub> e				1.50E-01	0.00E+00	0.000E+00	0.00E+00	0.00E+00
GWP-biogenic	kg CO <sub>2</sub> e				1.89E-03	0.00E+00	0.000E+00	7.51E+02	0.00E+00
GWP-LULUC	kg CO <sub>2</sub> e				1.24E-03	0.00E+00	0.000E+00	0.00E+00	0.00E+00
GWP-IOBC/GHG <sup>1)</sup>	kg CO <sub>2</sub> e				1.53E-01	0.00E+00	0.000E+00	0.00E+00	0.00E+00
ODP	kg CFC11 eq.				1.94E-17	0.00E+00	0.000E+00	0.00E+00	0.00E+00
AP	mol H <sup>+</sup> eq.				8.74E-04	0.00E+00	0.000E+00	0.00E+00	0.00E+00
EP-freshwater	kg P eq.				4.51E-07	0.00E+00	0.000E+00	0.00E+00	0.00E+00
EP-marine	kg N eq.				4.28E-04	0.00E+00	0.000E+00	0.00E+00	0.00E+00
EP-terrestrial	mol N eq.				4.74E-03	0.00E+00	0.000E+00	0.00E+00	0.00E+00
POCP	kg NMVOC eq.				8.24E-04	0.00E+00	0.000E+00	0.00E+00	0.00E+00
ADP-m&m <sup>2)</sup>	kg Sb eq.				1.16E-08	0.00E+00	0.000E+00	0.00E+00	0.00E+00
ADP-fossil <sup>2)</sup>	MJ				2.02E+00	0.00E+00	0.000E+00	0.00E+00	0.00E+00
WDP	m <sup>3</sup>				1.32E-03	0.00E+00	0.000E+00	0.00E+00	0.00E+00

**GWP-total:** Global Warming Potential; **GWP-fossil:** Global Warming Potential fossil fuels; **GWP-biogenic:** Global Warming Potential biogenic; **GWP-LULUC:** Global Warming Potential land use and land use change; **ODP:** Depletion potential of the stratospheric ozone layer; **AP:** Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-m&m:** Abiotic depletion potential for non-fossil resources (**minerals and metals**); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

**Note 1** – This additional indicator **GWP-GHG/IOBC** is also referred to as **GWP-GHG** in the context of Swedish and Finish legislation.

**Disclaimer 2** – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## Additional environmental impact, version A2 & EF 3.0 – addition of non-mandatory indicators with poor reliability

Parameter	Unit				C1	C2	C3	C4	D
PM <sup>2)</sup>	Disease incidence				3.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
IRP <sup>1)</sup>	kBq U235 eq				3.50E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETP-fw <sup>2)</sup>	CTUe				1.46E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTP-c <sup>2)</sup>	CTUh				2.95E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HTP-nc <sup>2)</sup>	CTUh				1.64E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SQP <sup>2)</sup>	Dimensionless				6.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**PM:** Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

**Disclaimer 1** – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

**Disclaimer 2** – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## Environmental impact, version A1

Parameter	Unit				C1	C2	C3	C4	D
GWP-TOT	kg CO <sub>2</sub> e				1.48E-01	0.00E+00	0.00E+00	7.51E+02	0.00E+00
GWP-IOBC*	kg CO <sub>2</sub> e				1.48E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ODP	kg CFC11 e				2.59E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POCP**	kg C <sub>2</sub> H <sub>4</sub> e				-2.29E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AP	kg SO <sub>2</sub> e				5.96E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EP	kg PO <sub>4</sub> <sup>3-</sup> e				1.50E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADPM	kg Sb e				1.16E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADPE	MJ				2.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**GWP** Global warming potential; **ODP** Depletion potential of the stratospheric ozone layer; **POCP** Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP** Eutrophication potential; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources.

\* Also referred to as **GWP-GHG** in context of e.g. Swedish and Finish legislation.

\*\* Negative impact occur due to negative characterization factors. LCI origin from GaBi database separates NO<sub>x</sub> into NO and NO<sub>2</sub>, in combination with the applied characterization model with a marginal approach for POCP based on highly polluted ambient air than can result in a negative characterization factor for nitric oxide.

## Resource use, version A1+2 and EF 3.0 — mandatory indicators

Parameter	Unit				C1	C2	C3	C4	D
RPEE	MJ				1.13E-01	0.00E+00	0.00E+00	7.87E+03	0.00E+00
RPEM	MJ				0.00E+00	0.00E+00	0.00E+00	-7.87E+03	0.00E+00
TPE	MJ				1.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPE	MJ				2.02E+00	0.00E+00	0.00E+00	8.64E+01	0.00E+00
NRPM	MJ				0.00E+00	0.00E+00	0.00E+00	-8.64E+01	0.00E+00
TRPE	MJ				2.02E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	kg				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	m <sup>3</sup>				1.29E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**RPEE** Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non renewable primary energy resources used as energy carrier; **NRPM** Non renewable primary energy resources used as materials; **TRPE** Total use of non renewable primary energy resources; **SM** Use of secondary materials; **RSF** Use of renewable secondary fuels; **NRSF** Use of non renewable secondary fuels; **W** Use of net fresh water.

Energy stored as material in the packaging materials is direct balanced out in the module it arise and stored in the product is balanced out over the life cycle, exactly the same as stored biogenic carbon is reported in GWP.

## End of life — Waste, version A1+2 and EF 3.0 — mandatory indicators

Parameter	Unit				C1	C2	C3	C4	D
HW	kg				1.02E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHW	kg				3.01E-04	0.00E+00	0.00E+00	4.63E+02	0.00E+00
RW	kg				2.45E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**HW** Hazardous waste disposed; **NHW** Non hazardous waste disposed; **RW** Radioactive waste disposed

## End of life — Output flow, version A1+2 and EF 3.0 — mandatory indicators

Parameter	Unit				C1	C2	C3	C4	D
CR	kg				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ				0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**CR** Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery; **EEE** Exported electric energy; **ETE** Exported thermal energy



# Additional requirements

The GWPtotal indicator result reported below is the same result as the indicator value as for GWP-IOBC/GHG.

The reported LCA result in this EPD use this approach:

## Location based electricity mix from the use of electricity in manufacturing

National electricity grid	Data source	Foreground /core [kWh]	GWPtotal [kg CO <sub>2</sub> e/kWh]	Sum [kg CO <sub>2</sub> e]
Electricity grid Sweden	Gabi	137	0.042	5.7

The GWP result above is based on national production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity bought in the core manufacturing process in module A3 per declared unit.

Alternative figures are reported here that can be used to recalculate the result A1-3:

## Guarantees of origin from the use of electricity in the manufacturing phase

National electricity grid	Data source	Foreground /core	GWPtotal	Sum
Electricity in A3 are using GoOs	Gabi	137	0.012	1.7

The GWP result above is based on:

- Guarantee of origin (GoO) electricity used
- National residual mix electricity according to AIB

Data used in the upstream system that use source of origin are listed below:

No such data are used.

## Hazardous substances

- The product contains no substances given by the REACH Candidate list
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by
- The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as

Name	CAS no.	Amount
—	—	—

## Indoor environment





Not relevant

## Carbon footprint

Carbon footprint according to ISO 14067 has not been worked out for the product.

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