ENVIRONMENTAL PRODUCT DECLARATION

Kestopuu, impregnated timber

Program operator, publisher:	
Owner of the declaration:	**Kestopuuteollisuus ry**
Name of the product:	**Kestopuu**
Declaration number:	
Registration number:	
ECO Platform reference number:	
Issue date:	
Valid to:	
Scope of the declaration	**This environmental product declaration covers the environmental impacts of Kestopuu, impregnated timber. The declaration has been prepared in accordance with EN 15804:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 26.8.2020). This declaration covers the life cycle stages from cradle-to-gate, end of life stage and benefits and loads beyond the system boundary.**
Logot (RTS, ECO Platform yms)	

1. GENERAL INFORMATION, THE SCOPE AND VERIFICATION OF THE DECLARATION

Owner of the declaration, manufacturer

Kestopuuteollisuus ry
Siltasaarenkatu 12 A, 00530 Helsinki
info@kestopuu.fi

Product name and number

Kestopuu, Impregnated timber

Place of production

Finland, Laitila, Joensuu and Kronoby

Additional information

Additional Information from info@kestopuu.fi

Product Category Rules and the scope of the declaration

The declaration has been prepared in accordance with SFS-EN 15804:2012 + A2:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 26.8.2020)

Author of the life-cycle assessment and declaration

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Verification

The declaration has been prepared in accordance with EN 15804:2012 + A2:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 26.8.2020).
The declaration was verified according to abovementioned standards and PCR rules by:
Sirje Vares, SYKE
Third party verification on 8.2.2022.
Verification is valid 8.2.2022-8.2.2027.

Declaration issue date and validity

Declaration issue date 8.2.2022. The declaration is valid 5 years, 8.2.2027.

2. PRODUCT INFORMATION

Product description

The declaration is made for Kestopuu, Finnish impregnated timber produced in accordance with NTR wood quality system. The products include sawn and planed timber and fence posts, made of domestic sustainably grown (PEFC or FCS) pine wood. The impregnation is made in under pressure in a closed process where all excess impregnation chemicals are collected and used in the next batch (Figure 1).

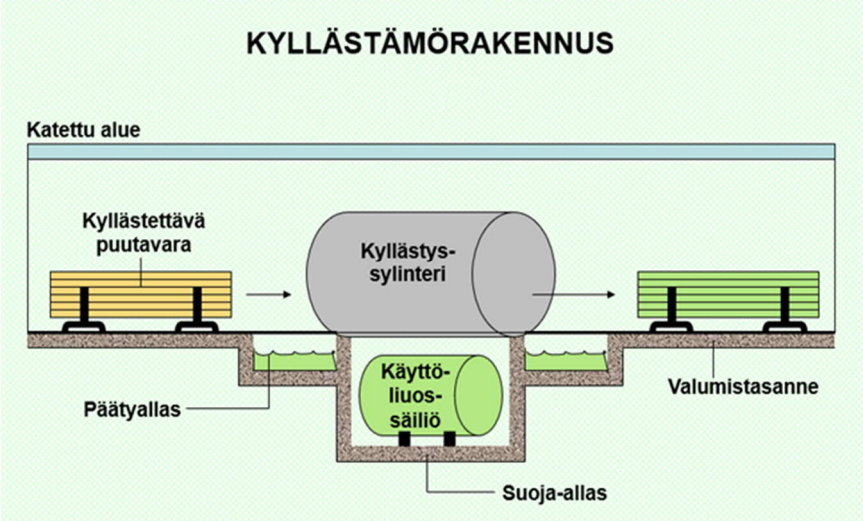

Figure 1. Impregnation process of Kestopuu

In outdoor applications wood is exposed to rain and moisture. Effective chemical preservation prolongs the service life and significantly improves the sustainability profile of wood, particularly of Nordic-grown wood species. Impregnated timber is used mainly in domestic outdoor premises: in private and industrial construction and infrastructure, such as terraces, fences, piers, bridges etc. In Finland, the larger dimensions are in principle impregnated to class NTR A, including dimensions with thickness ≥48mm and dimensions with thickness <48mm are impregnated to class NTR AB. (Figure 2) NTR A class tolerates more challenging conditions, contact to earth, water and concrete, like the load bearing structures, whereas NTR AB are for purposes above ground, used often for example in decking. The both classes are reported in the same EPD as an average of all produced impregnated timber. Of all the produced Kestopuu included in this EPD 44% was impregnated to class NTR A and 56% to class NTR AB.

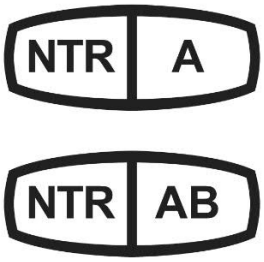

Figure 2. The two impregnation classes used for impregnated timber are NTR A and NTR AB.

Kestopuu is produced in multiple locations and this EPD is made based on the data from three factories in Laitila, Joensuu and Kronoby. The production reported in this EPD covers approximately 60% of all kestopuu production.

Key information of environmental information reported per kilogram

The density of impregnated timber varies through its lifecycle depending on the ambient conditions. For this table 480 kg/m^3 density is used, based on NTR documents. This density is for wood with moisture content ~15%.

Indicators	Unit	A1	A2	A3	**A1-A3**	B2	C1	C2	C3	C4	D
Climate change - total	kg CO_2 eq.	-1.02E+00	8.52E-03	2.94E-04	-1.01E+00	2.94E-05	7.58E-05	1.88E-02	0.00E+00	1.56E+00	-1.40E+00
Abiotic depletion, minerals & metals	kg Sb eq.	1.43E-07	1.28E-17	9.19E-14	1.43E-07	1.77E-09	3.10E-15	3.25E-17	0.00E+00	1.28E-11	-6.10E-11
Abiotic depletion of fossil resources	MJ, net calorific value	1.69E+00	6.63E-05	1.30E-06	1.69E+00	4.85E-04	6.79E-07	1.69E-04	0.00E+00	3.13E-04	-4.27E-02
Water use	m^3 world eq. Deprived	4.73E-02	5.67E-06	1.64E-06	4.73E-02	3.63E-05	2.94E-03	1.44E-05	0.00E+00	-3.88E-04	-2.08E-02
Biogenic carbon content in product	kg C/kg	0.00E+00	0.00E+00	4.17E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary material	kg/kg	1.05E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Technical information

The moisture content of impregnated timber is about 60% when leaving the factory. The water keeps evaporating depending on the ambient conditions until the wood reaches equilibrium. Finally the density of impregnated timber will be about 2% higher than that of non treated timber and depend on the ambient temperature and relative humidity. 60% moisture content is used for transport calculations in modules A1-A5 and in the module C and D the moisture content is expected to be 20%.

Initial moisture content	60%
Density	693 kg/m^3- 500 kg/m^3
Technical service life	30 years
Assessment document	EN 351, EN 599
Impregnation classes	NTR A, NTR AB

Product raw materials

Producer	Material	Amount %	Origin of the material
Producer (A)	Wood	98%	Finland
	Copper based impregnation A	~2%	Germany
	Other inorganic chemicals	~0,1%	Germany
Producer (B)	Wood	99%	Finland
	Copper based impregnation B	~1%	Germany
	Other inorganic chemicals	~0,1%	Germany
Producer (C)	Wood	99%	Finland
	Copper based impregnation C	~1%	Great Britain
	Other inorganic chemicals	~0,2%	Great Britain

Substances under European Chemicals Agency's REACH, SVHC restrictions

The amount of Boric acid in the product is 0,1% or less.

Name	EC number	CAS Number
Boric acid	233-139-2	10043-35-3

3. SCOPE OF LIFE CYCLE ASSESSMENT

This EPD covers cradle to gate, A1-A5 with options, modules B2, C1-C4 and D, as shown in the Figure 1.

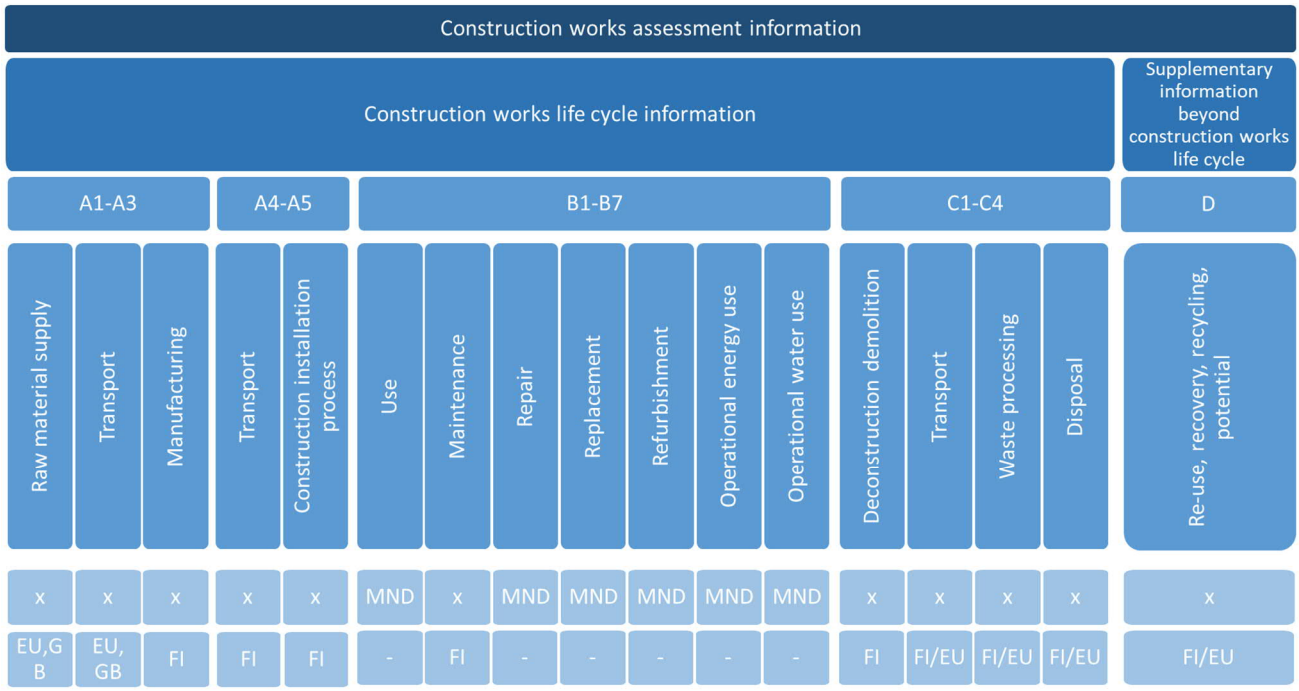

Figure 1. Modules in life cycle assessment of construction works. Modules included on this EPD are marked with x and MND = Module not included.

Declared unit

Indicators are reported per 1 m^3 impregnated timber.

Cut-off criteria

Data for A1-A5, B2 and C1-C4 and additional information on scenarios in Module D have been collected. Modules A1 to A3 include all the raw materials used, energy production (electricity, heat and fuels), including primary production and processing of raw materials and fuels and transports. Impregnated timber surfaces do not need to be painted but this is often done to maintain desired appearance. Module B2 is therefore calculated as one time painting of a 1 m^2 of a terrace. This is to make it possible to use this module in different end use cases. Demolite Oy is a company, which collects all used impregnated timber and takes care of the processing and transporting it to waste incineration plants authorized to use impregnated wood for energy production. In modules C1-C4 the collection of Kestopuu by Demolite, processing, transportation to Germany (50%) and to Vantaa (50%) and final incineration of products is covered.

The production of production equipment and means of transport, as well as the machinery, equipment and premises (production goods) needed for production and in production are excluded from the scope of the assessment, as are the commuting of workers.

The calculation of Module D is based on an assumption that all impregnated timber is incinerated to produce district heat energy. The district heating energy is calculated based on the average emissions of district heat at the time of calculation in Finland and Germany.

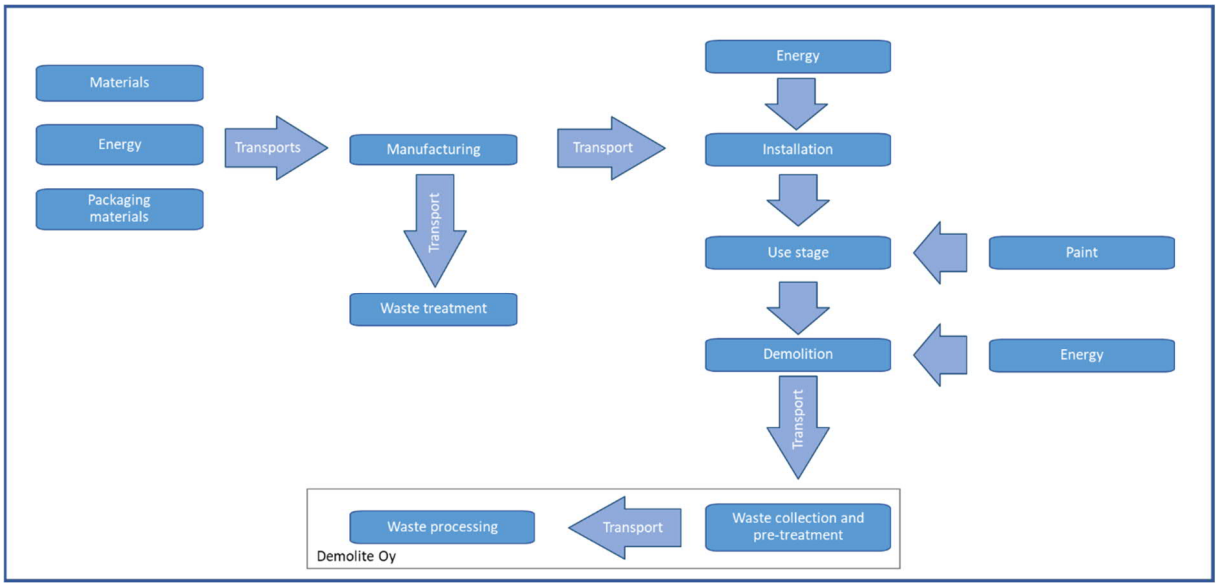

Figure 3 The system boarders for the Kestopuu EPD

Allocation

In the factories making impregnated wood, the impregnation is made separately from other processes and no allocation is needed.

4. ENVIRONMENTAL IMPACTS AND THE USE OF RESOURCES

Core environmental impacts

Indicators	Unit	A1	A2	A3	A1-A3	A4	A5
Climate change - total	kg CO_2 eq.	-4.88E+02	4.09E+00	1.41E-01	-4.84E+02	1.99E+01	3.64E-02
Climate change - fossil	kg CO_2 eq.	5.31E+01	3.62E+00	1.34E-01	5.69E+01	1.80E+01	1.95E-02
Climate change - biogenic	kg CO_2 eq.	-5.42E+02	4.72E-01	6.85E-03	-5.41E+02	1.95E+00	1.69E-02
Climate change - LULUC	kg CO_2 eq.	8.17E-01	1.25E-04	3.00E-05	8.17E-01	7.00E-04	3.95E-06
Ozone depletion	kg CFC-11 eq.	9.98E-06	8.92E-07	5.63E-09	1.09E-05	5.01E-06	6.82E-09
Acidification	mol H^+ eq.	9.37E-01	7.86E-03	2.31E-04	9.46E-01	4.17E-02	7.99E-05
Eutrophication aquatic freshwater	kg PO_4 eq.	7.93E-02	3.17E-05	1.49E-05	7.93E-02	1.78E-04	1.91E-06
Eutrophication aquatic marine	kg N eq.	3.17E-01	1.36E-03	8.98E-05	3.19E-01	6.45E-03	1.82E-05
Eutrophication terrestrial	mol N eq.	3.10E+00	1.49E-02	7.00E-04	3.11E+00	7.03E-02	1.54E-04
Photochemical ozone formation	kg NMVOC eq.	7.50E-01	5.10E-03	2.16E-04	7.55E-01	2.55E-02	4.34E-05
Depletion of abiotic resources - minerals & metals *	kg Sb eq.	6.85E-05	6.13E-15	4.41E-11	6.85E-05	3.44E-14	1.49E-12
Depletion of abiotic resources - fossil fuels *	MJ, net calorific value	8.09E+02	3.18E-02	6.26E-04	8.09E+02	1.79E-01	3.26E-04
Water use *	m^3 world eq. Deprived	2.27E+01	2.72E-03	7.89E-04	2.27E+01	1.53E-02	1.41E+00

* 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.

Indicators	Unit	B2	C1	C2	C3	C4	D
Climate change - total	kg CO_2 eq.	1.41E-02	3.64E-02	9.04E+00	0.00E+00	7.48E+02	-6.73E+02
Climate change - fossil	kg CO_2 eq.	1.41E-02	1.95E-02	8.02E+00	0.00E+00	1.68E+01	-3.77E+02
Climate change - biogenic	kg CO_2 eq.	9.33E-10	1.69E-02	1.03E+00	0.00E+00	7.31E+02	-2.97E+02
Climate change - LULUC	kg CO_2 eq.	2.90E-13	3.95E-06	3.18E-04	0.00E+00	1.75E-03	-1.38E-01
Ozone depletion	kg CFC-11 eq.	2.67E-09	6.82E-09	2.27E-06	0.00E+00	2.84E-06	-1.99E-05
Acidification	mol H^+ eq.	1.81E-11	7.99E-05	1.90E-02	0.00E+00	1.57E-01	-1.59E+00
Eutrophication aquatic freshwater	kg PO_4 eq.	1.94E-05	1.91E-06	8.07E-05	0.00E+00	3.68E-03	-4.46E-02
Eutrophication aquatic marine	kg N eq.	3.10E-12	1.82E-05	2.96E-03	0.00E+00	7.35E-02	-2.91E-01
Eutrophication terrestrial	mol N eq.	3.38E-11	1.54E-04	3.23E-02	0.00E+00	7.49E-01	-3.78E+00
Photochemical ozone formation	kg NMVOC eq.	1.17E-11	4.34E-05	1.17E-02	0.00E+00	1.92E-01	-8.63E-01
Depletion of abiotic resources - minerals & metals *	kg Sb eq.	8.51E-07	1.49E-12	1.56E-14	0.00E+00	6.16E-09	-2.93E-08
Depletion of abiotic resources - fossil fuels *	MJ, net calorific value	2.33E-01	3.26E-04	8.11E-02	0.00E+00	1.50E-01	-2.05E+01
Water use *	m^3 world eq. Deprived	1.74E-02	1.41E+00	6.93E-03	0.00E+00	-1.86E-01	-9.99E+00

* 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 impacts

Impacts	Unit	A1	A2	A3	A1-A3	A4	A5	B2
Particulate Matter emissions	Desease incidence	7.58E-06	4.56E-08	4.07E-09	7.63E-06	2.33E-07	1.16E-09	1.00E-16
Ionizing radiation, human health **	kBq U235 eq.	2.92E+01	2.45E-01	3.82E-03	2.95E+01	1.37E+00	8.61E-02	5.68E-10
Eco-toxicity (freshwater) *	CTUe	6.52E+03	2.66E+01	6.77E-01	6.55E+03	1.49E+02	2.40E-01	6.17E-08
Human toxicity, cancer effects *	CTUh	9.37E-08	2.33E-10	8.11E-11	9.40E-08	1.30E-09	1.08E-12	5.40E-19
Human toxicity, non-cancer effects *	CTUh	3.20E-06	6.39E-09	9.52E-10	3.21E-06	3.55E-08	4.27E-11	1.52E-17
Land use related impacts/Soils quality *	Dimensionless	1.05E+05	3.56E-01	4.08E-01	1.05E+05	2.00E+00	1.28E+00	7.04E+02

** 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.

* 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.

Impacts	Unit	C1	C2	C3	C4	D
Particulate Matter emissions	Desease incidence	1.16E-09	1.06E-07	0.00E+00	2.38E-06	-8.09E-06
Ionizing radiation, human health **	kBq U235 eq.	8.61E-02	6.24E-01	0.00E+00	7.91E-01	-3.12E+00
Eco-toxicity (freshwater) *	CTUe	2.40E-01	6.78E+01	0.00E+00	1.97E+02	-5.72E+03
Human toxicity, cancer effects *	CTUh	1.08E-12	5.93E-10	0.00E+00	1.45E-06	-7.49E-08
Human toxicity, non-cancer effects *	CTUh	4.27E-11	1.62E-08	0.00E+00	7.34E-07	-2.62E-06
Land use related impacts/Soils quality *	Dimensionless	1.28E+00	9.08E-01	0.00E+00	1.10E+01	-1.34E+04

** 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.

* 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.

Resource use

Use of natural resources	Unit	A1	A2	A3	A1-A3	A4	A5	B2
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	9.09E+00	1.07E-01	9.11E-06	9.20E+00	6.02E-01	3.37E-01	0.00E+00
Renewable primary energy resources used as raw materials	MJ	8.30E+03	0.00E+00	0.00E+00	8.30E+03	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	8.31E+03	1.07E-01	9.11E-06	8.31E+03	6.02E-01	3.37E-01	0.00E+00
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ	6.57E+01	5.82E+01	4.94E-03	1.24E+02	3.27E+02	1.29E+00	1.35E-07
Nonrenewable primary energy resources used as raw materials	MJ	2.20E+00	0.00E+00	0.00E+00	2.20E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non renewable primary energy resources	MJ	6.79E+01	5.82E+01	4.94E-03	1.26E+02	3.27E+02	1.29E+00	1.35E-07
Use of secondary material	kg	5.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	0.00E+00	0.00E+00	3.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Use of natural resources	Unit	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	3.37E-01	3.79E-01	0.00E+00	0.00E+00	-4.32E+ 03
Renewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	-9.50E+03	0.00E+ 00
Total use of renewable primary energy resources	MJ	3.37E-01	3.79E-01	0.00E+00	0.00E+00	-4.32E+ 03
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ	0.00E+00	2.06E+02	0.00E+00	0.00E+00	-5.18E+ 03
Nonrenewable primary energy resources used as raw materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+ 00
Total use of non renewable primary energy resources	MJ	0.00E+00	2.06E+02	0.00E+00	0.00E+00	-5.18E+ 03
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+ 00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+ 00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+ 00
Net use of fresh water	m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+ 00

5. OTHER INDICATORS

Biogenic carbon content

Biogenic carbon content	Unit	A3
Biogenic carbon content in product	kg C	200
Biogenic carbon content in packaging	kg	0

Wastes

Waste categories	Unit	A1-A3	A4	A5	B2	C1-C4	D
Hazardous waste disposed	kg	1.96E-02	0.00E+00	5.00E-02	0.00E+00	1.00E+00	0.00E+00
Non hazardous waste disposed	kg	7.25E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other environmental indicators

Other environmental indicators	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for reuse	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
Materials for recycling	kg	2.06E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	3.62E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5,00E+02	0.00E+00	0.00E+00
Exported energy (heat)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.50E+03	0.00E+00	15.84E+00

6. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Energy in manufacturing phase

Parameter	Finland
Electricity data source and quality	Ecoinvent database 3.7, Electricity, high voltage, production mix, FI, reference year 2014-2020
GWP per 1kWh electricity	0.2097 kg CO2-Eq
District heating	Energiateollisuus, 2020
GWP per 1kWh heating energy	0.2016 kg CO2-Eq

Additional technical information, transport to the building site, A4

Scenario information	Quantity	Data quality
Semi trailer/Delivery lorry, diesel	37 l/100km / 9,9 l/100km	Lipasto/Ecoinvent
Average distance	350km/10km	
Capacity utilisation % (including empty returns)	80%	
Bulk density of transported products kg/m^3	693 kg/m^3	
Volume capacity utilisation factor	100%	
GWP	17,95 kg CO2-Eq/m^3	

End-of-life process description, module C

Process flow	Value	Data quality
Collection process -	Collected separately	1 m^3 (500kg)
	Collected with mixed waste	-
Recovery system -	for re-use	-
	for recycling	-
	for energy recovery	1 m^3 (500kg)
Disposal specified by type	for final deposition	-
Assumptions for scenario development, e.g. transportation	units as appropriate	End of life product (0,5 m^3) transported to Germany 1253km (tanker + trailer 80%). End of life product (0,5 m^3) transported to Vantaa 122km (trailer 80%).

Additional information

Emissions to indoor air
The information is not available

Emissions to soil
The information is not available

Emissions to water
The information is not available

7. REFERENCES

EN15804:2019 Sustainability of construction works. Environmental Product Declarations. Core rules for the product category of construction products

ISO 14025:2011-10 Environmental labels and declarations. Type III environmental declarations. Principles and procedures

https://cer.rts.fi/wp-content/uploads/rts-pcr_english_a2_2019_260820_valid-1.pdf

NTR-documents, NWPC Document No 3:2017 https://www.nwpc.eu/index.php/nwpc-home/downloads/ntr-documents/?lang=fi

https://energia.fi/uutishuone/materiaalipankki/energiavuosi_2020_-_kaukolampo.html#material-view

https://ag-energiebilanzen.de/10-0-Auswertungstabellen.html

Ecoinvent 3.5 database, 2018. http://www.ecoinvent.org/

Lipasto - a calculation system for traffic exhaust emissions and energy use in Finland. VTT Technical Research Centre of Finland Ltd. http://lipasto.vtt.fi/en/index.htm

Nors, M., 2009. Painotuotteen hiilijalanjälki tapaustarkastelujen pohjalta. VTT. http://www.vkl.fi/files/776/Painotuotteen_hiilijalanjalki_VTT.pdf

EN 16485:2014 Round and sawn timber. Environmental Product Declarations. Product category rules for wood and wood-based products for use in construction