Environmental Product Declaration

In accordance with ISO 14025:2006 and
EN 15804:2012+A2:2019/AC:2021 for:

ThermoWood ®

by

Stora Enso

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0028489:003
Version date:	2026-02-16
Revision date:	2026-03-23
Validity date:	2031-02-12

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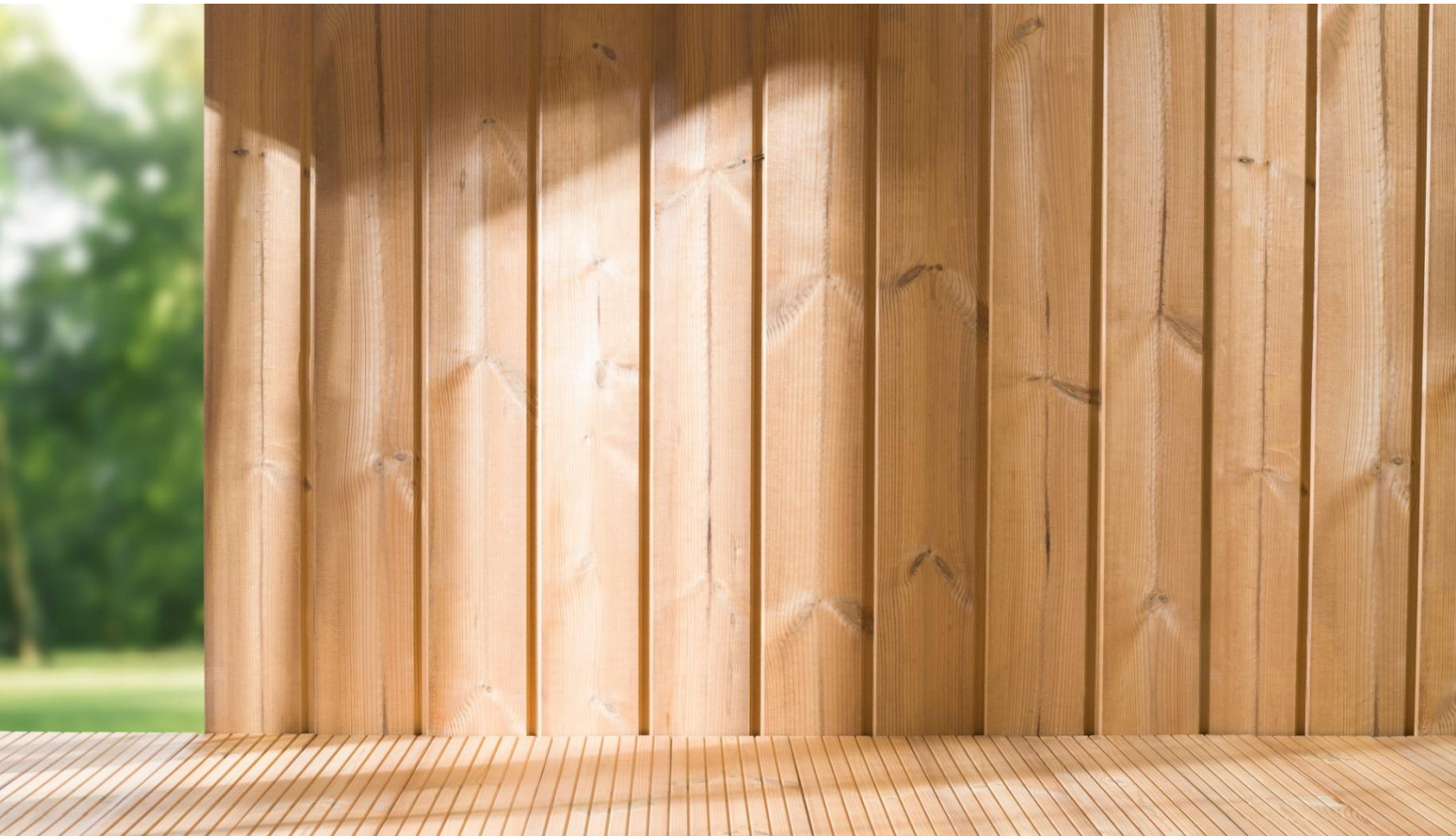


General information

Programme information	
Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	support@environdec.com

Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14, v2.0.1 Construction products (EN 15804:A2). Sub-PCR-006, Wood and wood-based products for use in construction (EN 16485). UN CPC 316 Builders' joinery and carpentry of wood*
PCR review was conducted by: *The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Rob Rouwette (chair), Noa Meron (co-chair). The review panel may be contacted via the Secretariat www.environdec.com/contact.*

Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006 via: ☒ EPD process certification* without a pre-verified LCA/EPD tool* Third-party verification: *SGS ICS Italia srl* is an approved certification body accountable for third-party verification Third-party verifier is accredited by: *ACCREDIA, Accreditation Number n° 02242* *EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Please note: *EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.*

Information about EPD owner

Owner of the EPD: Stora Enso Oyj
Address: Katajanokanlaituri 4, P.O. Box 309, FI-00101 Helsinki, Finland
Contact: Tuovi Valtonen – *tuovi.valtonen@storaenso.com*)
Description of the organisation: Stora Enso is the leading provider of renewable products in packaging, biomaterials, and wooden construction, and one of the largest private forest owners in the world. We create better choices for society by accelerating the transition to a circular bioeconomy.

Stora Enso is the largest sawn timber producer in Europe and a leading provider of sustainable wood-based solutions for the global building sector. The building sector is provided with renewable and low-carbon wood-based solutions that help decarbonise the built environment. Additionally, the wood product range includes window and door components, and co-products such as pellets made from wood residuals.

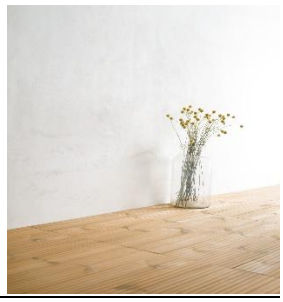
All our mills run an integrated management system, which is certified in accordance with quality management (ISO 9001), environmental management (ISO 14001), health and safety (ISO 45001) and energy management (ISO 50001) requirements. We use various tools and methods to know the origin of the wood we use, including forest certification and third-party traceability systems such as the Forest Stewardship Council®'s (FSC® licence nr. FSC-C125195) Chain of Custody/ Controlled Wood scheme and the Chain of Custody/Due Diligence System of the Programme for the Endorsement of Forest Certification (PEFC/02-32-32).

Product-related or management system-related certifications:
ISO 9001:2015 Quality Management System
ISO 14001:2015 Environmental Management System
ISO 45001:2018 Occupational Health and Safety Management System
ISO 50001:2018 Energy Management System
FSC® and PEFC Chain of Custody multi-site certificates
Due Diligence System standard (FSC® Certified Wood, PEFC, Sustainable Biomass Program)

Product information

Product name: ThermoWood® by Stora Enso.

Product identification: ThermoWood® by Stora Enso is available in two standard thermal treatment classes, Thermo-S and Thermo-D. ThermoWood® is manufactured under the International ThermoWood Association (ITWA) licence and is KOMO quality certified.



UN CPC code: 316 Builders' joinery and carpentry of wood

Product description: ThermoWood® is a dimensionally stable and environmentally sound alternative to pressure-impregnated wood. Its natural high-temperature treatment makes this wood resistant to varying weather conditions, fungi and rot. Since no harmful chemicals are added during the treatment

process, ThermoWood® contains only renewable substances. Typical uses include saunas, exterior cladding and facades, decking, fences, garden furniture and sunshades for buildings.

Properties	ThermoWood®
Heat treatment classes	Two standard thermal modification classes – Thermo-D and Thermo-S
Standard dimensions	Rough: 25x125 / x150; 32x125 / x150; 50x125 / x150 Planed: typically 19, 26, 42 mm thick and 117 and 140 mm wide Other sizes available on request
Wood species	Spruce (*Picea abies*), pine (*Pinus sylvestris*)
Moisture content	6% ± 2% when dispatched from the mill
Density	430 kg/m³
Use class	Thermo-D treated products are suitable for use class 3 (EN 335)
Durability/resistance to rot	Thermo-D products reach durability class 2 (EN 350). Resistance to termites would require additional treatment.
Dimensional stability	Due to the thermal treatment wood's tendency to warp, swell or shrink in varying humidity conditions is reduced.
Thermal conductivity	0,09 W/(mK) (EN ISO 13787 + EN 12667)

The average density 430 kg/m³ of ThermoWood® by Stora Enso is based on the dry-fresh densities of the wood species spruce and pine (391 kg/m³ and 403 kg/m³ respectively), the moisture content average (6%) of the product and on the changed composition due to the thermal treatment. 35% of the wood raw material in 2023 is spruce and 65% is pine.

Name and location of production site(s):
AS Stora Enso Latvija / Launkalne Sawmill
Krogzemji Valka, LV-4718 Launkalne, Smiltene County, Latvija.

Additional information about the products, their application, technical details etc. can be accessed via ThermoWood® - Wood products | Stora Enso

Content declaration

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/m³
Wood (*Picea abies* and *Pinus sylvestris*)	430	-	100% / 203
TOTAL	**430**	**-**	**100% / 203**

The product does not contain any substances or products that are listed in the "Candidate List of Substances of Very High Concern for Authorisation".

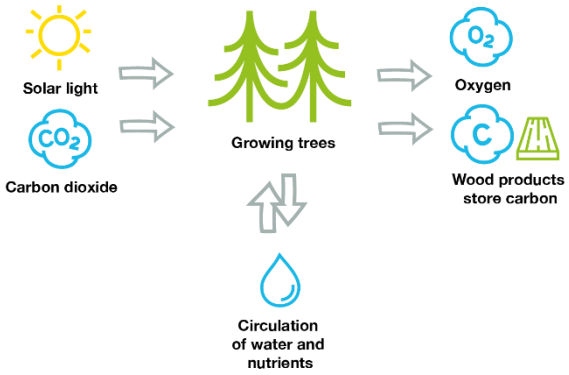
Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/product or declared unit
Plastic wrap	0,14	<0,1	0
Plastic straps	0,02	<0,1	0
TOTAL	**0,16**	**<0,1**	**0**

Biogenic carbon content at the factory gate

Biogenic carbon content	Unit (expressed per declared unit)
Biogenic carbon content in product	744 kg CO_2 eq. / m³ = 203 kg C / m³
Biogenic carbon content in accompanying packaging	0 kg CO_2 eq. / m³ = < 0,1 kg C / m³
Please note: *1 kg biogenic carbon is equivalent to 44/12 kg of CO_2*	

Carbon sequestration and storage:

The sequestration of carbon dioxide (CO_2) is unique to renewable materials. Biogenic carbon content of a renewable material is an outcome of the CO_2 that has effectively been removed from the atmosphere by photosynthesis of growing trees and other plants and turned into sugars (carbon) and oxygen. The quantity of atmospheric CO_2 has thus been reduced. The longer the CO_2 is not in the atmosphere but stays stored in a material, the greater the environmental benefit.



Biogenic carbon of wood is calculated according to the EN 16485 and 16449 standards. Half of the dry mass of wood is carbon. Each stored kg of biogenic carbon is equal to ~3,67 kg of CO_2, which is effectively removed from the atmosphere. In the case of ThermoWood® by Stora Enso the biogenic carbon content is -744 kg CO_2 eq./m³. Biogenic carbon enters the product system in forest (module A1) and for calculation purposes it is assumed to leave latest from the product system in the end-of-life stage (module C). This assumption can be made when wood is sourced from sustainably managed forest.

LCA information

Declared unit: 1 m³ ThermoWood® by Stora Enso of 100% with average moisture content of 6%.
The weight per 1 m³ ThermoWood® is 430 kg and the conversion factor to 1 kg is 0,00233.
Reference service life: The reference service life (RSL) is understood as the period of time until the structure is replaced, rebuild, renovated or restored. Wood products can reach over 100 years' service life in service classes 1 and 2.
Time representativeness: Data for the study was collected from the production site and represents the year 2023. This data includes raw material supply, transport distances, fuels, energy consumption, packaging, produced ThermoWood®, by-products and waste.

Geographical scope: Product is manufactured in Latvia (A1-A3) and distributed across Europe (A4-D)
Database used: ecoinvent 3.11 (March 2025)
LCA software used: SimaPro 10.2.

Description of system boundaries: Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and additional modules). All infrastructure and capital goods, like machinery used in the manufacturing of the product or its materials or components, or vehicles used in transports in the product system, are excluded for all the upstream, core and downstream processes. Only exception of this principle is applied datasets on electricity or heat used in manufacturing processes in module A3.

Target group: business to business and business to consumers

Allocation: Environmental impact from forestry operations is allocated to the roundwood only and nothing to forestry residues such as branches and tops.

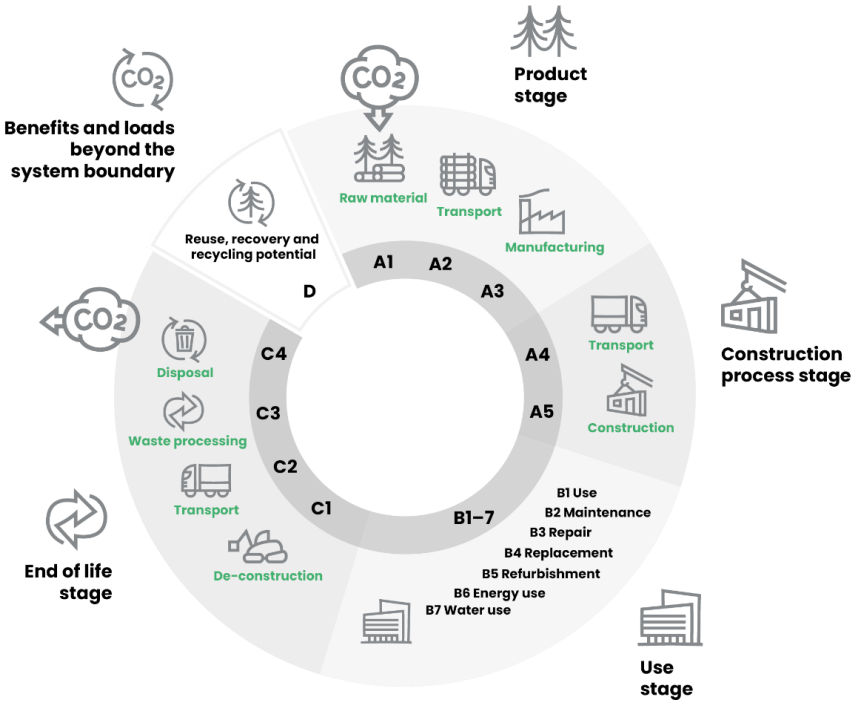
The production of ThermoWood®, and further processing where applied, results in several valuable by-products like wood chips used for example in cellulose pulp production, as well as sawdust, bark and dry wood chips that can be used as biofuels.

The environmental impact allocation from the sawmill and further processing where applied have been done between sawn timber and by-products as well as the main product and by-products based on economic revenue in accordance with EN 15804.

Cut-Off Rule: 1%. This rule is based on the assumption that the input flows do not have a major impact on the environmental impacts as a whole. In insufficient data cases for such material flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators, conservative "worst case" assumptions have been used when filling the data gaps. In accordance with the applicable PCR and the underlying standard EN 15804:2012+A2, at least 95% of total inflows (raw materials and energy) and outflows per module have been accounted for. Packaging used for product distribution has also been included. The "polluter pays" principle has been applied.

Characterisation factors: EN 15804 reference package based on EF 3.1 has been used.

System diagram:

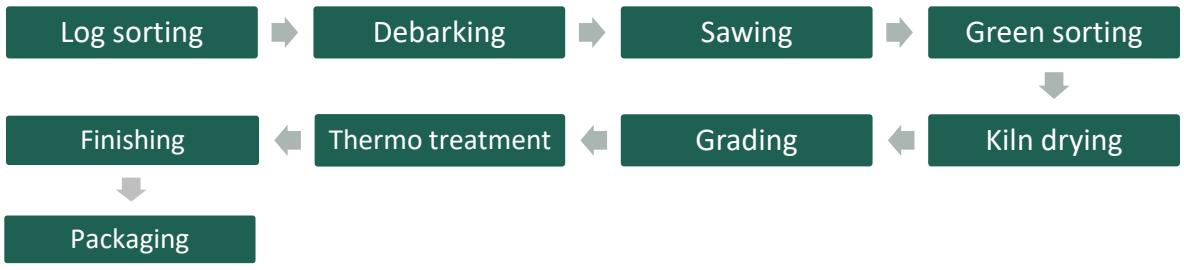


Product stage:

A1: This stage covers the extraction and processing of raw materials, such as forestry operations. All Stora Enso's wood raw material is sourced through a third-party certified wood traceability system. Stora Enso traceability system is certified according to FSC® and PEFC Chain of Custody systems.[1]

A2: This stage covers the transportation of raw materials to the mill and the fuels needed for on-site transportation. The wood supply operations include the acquisition of softwood for each unit, as well as the optional procurement of sawn timber from other Stora Enso units or external suppliers. The purchased spruce or pine logs are transported by trucks, vessels and trains.

A3: This stage covers the production of ThermoWood® and by-products. Generation of electricity or heat from primary energy resources are counted. Fossil-free electricity used at Stora Enso's production sites is purchased and verified through Guarantees of Origin, resulting in a climate impact of GWP-GHG: 0,0219 kg CO_2-eq./kWh. Also packaging materials and the treatment of waste not leaving the factory with the product are counted in module A3. Typical production steps of ThermoWood® are demonstrated below.



[1] FSC® trademark license no. C125195

Construction process stage:

A4: This stage covers product transportation to customers across Europe. The data reflects the average environmental impact of delivering 1 m³ of ThermoWood® to customers in 2023, based on production unit output. According to Stora Enso specific logistic emission reporting system, the average delivery was 1300 km by road and 970 km by sea in year 2023. Transport specific greenhouse gas emission data, provided by the transport service operator or default values according to the Clean Cargo Working Group (CCWG) & Network for Transport Measures (NTM) emission factors has been used for greenhouse gas emissions for the packed product transport, otherwise the data used is generic from respective transport modes in ecoinvent database, as shown in below table.

Transport type	Vehicle type	Fuel type	Consumption	Distance	Capacity utilisation (incl. empty returns)
Truck (road)	Transport, freight, lorry >32 metric ton, EURO6	Low sulphur diesel	0,023 litre/tkm	1300 km	50%
Ship (sea)	Transport, freight, sea, container ship	Heavy fuel oil	0,0028 litre/tkm	970 km	70%

A5: The construction process only includes packaging waste, which relates to the delivered product. There are various applications and further processing possibilities, which are up to the customer and are therefore excluded from the product systems. Therefore, no ancillary materials, water use, other resource use, energy consumption or direct emissions to ambient air, soil and water are considered in this EPD. Align with that, waste materials on the building site before waste processing, generated by the product's installation and output materials as result of waste processing at the building site will be adjusted to waste materials at wholesalers and further processing companies, which refers to the same amount of packaging as declared in the chapter Content declaration and can be described as follows:

Waste materials per m³ ThermoWood®	Mass, kg	Transport of waste, km	Waste processing type
Plastic wrap	0,14	50	According to market group for waste polyethylene for Europe without Switzerland
Plastic straps	0,02	50	According to market group for waste polyethylene for Europe without Switzerland

Use stage:

B1–B7: There are no environmental impacts expected in the use phase, and at least no harmful substances are released to air, water or ground during the use of the product.

End-of-life scenarios:

C1–C4 and Module D: Four alternative European average scenarios have been presented for the end-of-life stage as the main market is in Europe. Wood has an average content in European Construction and Demolition waste of around 2,3%. Cascading usage should be applied and therefore re-use and recycling should be preferred over incineration. If this principle can't be followed incineration in general is a treatment with the highest net savings and therefore considered as main scenario in this EPD.[2]

Disclaimer: *The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).*

Please note: *The end-of-life options are scenario based and the choice of the most appropriate one can vary from situation, country and their legislation, energy and raw material availability. The options should indicate the potential environmental impact. Specific scenarios are available on request.*

[2] Damgaard, Anders, et al. "Background data collection and life cycle assessment for construction and demolition waste (CDW) management." (2022).

<table>
<tr><th>Scenario</th><th>100% Incineration with energy recovery</th><th>100% Recycling to wood chips</th><th>100% Re-Use in coherent form</th><th>100% Landfill with energy recovery</th></tr>
<tr><td>Module C1</td><td colspan="4">Deconstruction / Demolition of the building.
430 kg which equals the declared unit is collected separately per scenario.
Required energy demand is considered in line with PCR 2019:14 version 2.0.1 with a diesel consumption of 1,1 kWh/tonne. The actual energy demand can vary significantly depending on how the products are installed within the building context.</td></tr>
<tr><td rowspan="3">Module C2</td><td>Transport to the incineration site</td><td>Transport to the sorting platform</td><td>Transport to the sorting platform</td><td>Transport to landfill</td></tr>
<tr><td>130 km distance</td><td>80 km distance</td><td>80 km distance</td><td>80 km distance</td></tr>
<tr><td colspan="4">Distances as above and truck type applied is 16-32 tonne lorry (EURO 5) with 50% load factor in line with PCR 2019:14 version 2.0.1</td></tr>
<tr><td rowspan="2">Module C3</td><td>Chipping, site operation and wood combustion. Biogenic carbon flows and energy stored as material are balanced out according to EN 16485.</td><td>Sorting and chipping at the platform. Biogenic carbon flows and energy stored as material are balanced out according to EN 16485.</td><td>Sorting and preparing at the platform. Biogenic carbon flows and energy stored as material are balanced out according to EN 16485.</td><td rowspan="2">-</td></tr>
<tr><td colspan="3">Energy demand is considered in line with PCR 2019:14 version 2.0.1 with a
• diesel consumption of 1,8 kWh/tonne for loading and unloading at sorting facility
• electricity consumption (European average) of 2,2 kWh/tonne for mechanical sorting
• diesel consumption of 6 kWh/tonne for crushing of wood</td></tr>
<tr><td rowspan="2">Module C4</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">-</td><td>Landfilling (waste operation, leachate treatment and landfill gas combustion). Biogenic carbon flows and energy stored as material are balanced out according to EN 16485 as if released immediately without taking into account delayed emissions.</td></tr>
<tr><td>Energy demand is considered in line with PCR 2019:14 version 2.0.1 with a diesel consumption of 1,6 kWh/tonne for inert construction waste for landfills (including backfilling)</td></tr>
<tr><td>Module D</td><td>Avoided impact of electricity production and thermal energy recovery.</td><td>Avoided impact of forestry, harvesting, wood chips preparation and drying.</td><td>Avoided impact of producing ThermoWood® from virgin wood.</td><td>Avoided impact of electricity production and thermal energy recovery from landfill gas.</td></tr>
<tr><td>Additional information on Module D scenario</td><td>For the thermal energy recovery, it is assumed that average heat produced from natural gas in Europe is replaced. The replaced electricity is referring to the European average grid mix.</td><td>Wood chips produced from virgin wood are replaced, considering additional transport and energy to produce wood chips in the same quality from the recycled product.</td><td>ThermoWood® produced from virgin wood and representing Stora Enso's ThermoWood® production unit, as declared in this EPD, are replaced, considering additional energy for cutting, drilling or sanding of the re-used product.</td><td>For the thermal energy recovery, it is assumed that average heat produced from natural gas in Europe is replaced. The replaced electricity is referring to the European average grid mix.</td></tr>
</table>

Please note: *Module D declares potential benefits and loads of secondary material, secondary fuel or recovered energy leaving the product system. The information given in Module D lies beyond the system boundary.*

Data quality assessment:

The data quality assessment follows the scheme outlined in EN 15804:2012+A2:2019, Annex E, Table E.2 and in accordance with EN 15941:2024, which supports the overall reliability and representativeness of the EPD.

Data collection for this EPD was conducted in 2023 and is based on a consistent and systematic approach across Stora Enso's sawmills. Supplier-specific data were requested regularly to ensure accuracy and completeness. For each unit process within the system boundaries, measured, calculated input and output data were gathered. This includes data on raw materials, ancillary materials, fuels, energy, water, packaging, waste, and associated transport processes.

The data quality assessment was carried out considering several dimensions: Data were measured, calculated, or estimated, with a preference for measured values where available. All relevant flows and processes were included, and no significant emissions or inputs were omitted. A consistent methodology was applied across all life cycle stages. Regarding representativeness, the primary data reflect the production year 2023, ensuring temporal relevance. The data are specific to the production site in Launkalne/Latvia and were adjusted where necessary to reflect conditions across European distribution. Technologically, the data correspond to the actual processes and equipment used in the production of ThermoWood®. Where primary data were not available, secondary datasets from the ecoinvent 3.11 database (March 2025) were used. The use of proxy data is documented in the project report and considered to have minimal influence on the results.

The total share of primary data contributing to GWP-GHG results in modules A1–A3 is 77%. All datasets contributing to at least 80% of the results for each core environmental impact indicator have been individually assessed.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of product	Collected+ database	ecoinvent 3.11	2023	primary data	69 %
Transport of roundwood	Collected+ database	EPD owner	2023	primary data	4,0 %
Internally sourced timber	Supplier	EPD owner	2023	primary data, secondary data	2,5 %
Electricity for manufacturing of product	Collected+ database	EPD owner+ ecoinvent 3.11	2023	primary data	1,9 %
Packaging	Database	ecoinvent 3.11	2023	secondary data	0 %
Other processes	Collected, EPDs, database	EPD owner+ sector EPDs+ ecoinvent 3.11	2023	secondary data	0 %
Total share of primary data, of GWP-GHG results for A1-A3					**77%**

Please note: *The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.*

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage	End-of-life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use, maintenance, repair, replacement, refurbishment, operational energy use and water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Landfill-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1–B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	X	X	X	X	X
Geography	EU	EU	LV	EU	EU	-	EU	EU	EU	EU	EU

GWP-GHG (A1–A3): specific data used: 77%.
variation – products: NA, variation – sites: NA

Environmental performance

LCA results of the product(s) - main environmental performance results

Below tables are describing the environmental indicator results of 1m³ ThermoWood® by Stora Enso along its life cycle. Incineration as the most representative end-of-life scenario in Europe is applied. The incineration scenario describes the dismantling and chipping of ThermoWood® before incineration and is replacing average European heat produced with natural gas and average European market high voltage electricity. Other end-of-life scenarios have been made available in tables “alternative end-of-life scenarios”. The environmental impact results in this EPD are calculated using the EF 3.1 characterization factors published by the European Commission's Joint Research Centre (JRC). As required by EN 15804:2012+A2:2019/AC:2021 and the applicable Product Category Rules, all declared impacts are based on this standardized method to ensure consistency and comparability. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Mandatory impact category indicators, EN 15804										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	**1,14E+2**	3,56E+1	2,91E-1	ND	4,76E-2	2,19E+0	7,52E+0	0,00E+0	-2,38E+2
GWP-biogenic	kg CO_2 eq.	**-7,43E+2**	1,31E-2	3,47E-6	ND	4,79E-6	4,71E-4	7,44E+2	0,00E+0	-2,00E-1
GWP luluc	kg CO_2 eq.	**2,58E-1**	2,35E-2	1,68E-6	ND	4,87E-6	8,14E-4	1,93E-3	0,00E+0	-2,79E-1
GWP total	kg CO_2 eq.	**-6,29E+2**	3,56E+1	2,91E-1	ND	4,76E-2	2,19E+0	7,51E+2	0,00E+0	-2,39E+2
ODP	kg CFC 11 eq.	**2,83E-7**	3,14E-8	6,67E-12	ND	1,50E-11	1,13E-9	8,16E-9	0,00E+0	-1,54E-7
AP	mol H^+ eq.	**4,53E-1**	2,44E-1	5,07E-5	ND	4,26E-4	5,32E-3	7,78E-2	0,00E+0	-5,66E-1
EP-freshwater	kg P eq.	**1,73E-3**	4,71E-4	5,12E-8	ND	1,67E-7	1,72E-5	9,78E-5	0,00E+0	-9,14E-3
EP-marine	kg N eq.	**1,27E-1**	6,20E-2	2,30E-5	ND	1,98E-4	1,37E-3	3,71E-2	0,00E+0	-1,03E-1
EP-terrestrial	mol N eq.	**1,51E+0**	6,87E-1	2,48E-4	ND	2,17E-3	1,51E-2	3,97E-1	0,00E+0	-1,14E+0
POCP	kg NMVOC eq.	**6,62E-1**	3,14E-1	7,89E-5	ND	6,49E-4	8,90E-3	1,02E-1	0,00E+0	-4,66E-1
ADP minerals&metals[3]	kg Sb eq.	**2,86E-4**	1,73E-4	1,23E-8	ND	1,70E-8	6,37E-6	1,19E-5	0,00E+0	-1,33E-4
ADP-fossil[3]	MJ	**2,53E+3**	9,25E+2	6,44E-2	ND	6,20E-1	3,32E+1	7,14E+1	0,00E+0	-4,54E+3
WDP[3]	m^3	**1,95E+1**	4,10E+0	-5,64E-3	ND	1,32E-3	1,51E-1	2,80E+0	0,00E+0	-2,21E+1
Acronyms	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 marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

[3] Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Additional climate indicator, EPD International										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[4]	kg CO_2 eq.	**1,14E+2**	3,56E+1	2,91E-1	ND	4,76E-2	2,19E+0	7,53E+0	0,00E+0	-2,39E+2

Resource use indicators										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	**6,75E+2**	1,35E+1	1,17E-3	ND	3,80E-3	4,97E-1	1,56E+0	0,00E+0	-4,81E+2
PERM	MJ	**7,58E+3**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	-7,58E+3	0,00E+0	0,00E+0
PERT	MJ	**8,26E+3**	1,35E+1	1,17E-3	ND	3,80E-3	4,97E-1	-7,58E+3	0,00E+0	-4,81E+2
PENRE	MJ	**2,53E+3**	9,25E+2	6,44E-2	ND	6,20E-1	3,32E+1	7,14E+1	0,00E+0	-4,54E+3
PENRM	MJ	**7,52E+0**	0,00E+0	-7,52E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
PENRT	MJ	**2,54E+3**	9,25E+2	-7,45E+0	ND	6,20E-1	3,32E+1	7,14E+1	0,00E+0	-4,54E+3
SM	kg	**1,23E-3**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
RSF	MJ	**0,00E+0**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
NRSF	MJ	**0,00E+0**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
FW	m^3	**8,71E-1**	1,26E-1	-1,16E-4	ND	4,37E-5	4,62E-3	8,76E-2	0,00E+0	-1,39E+0
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

Waste indicators										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	**3,24E-1**	2,56E-2	1,94E-3	ND	5,80E-6	9,47E-4	3,53E+0	0,00E+0	-7,75E-2
Non-hazardous waste disposed	kg	**2,06E+1**	7,61E+1	2,12E-1	ND	4,18E-4	2,86E+0	4,07E+0	0,00E+0	-5,77E+0
Radioactive waste disposed	kg	**6,48E-3**	2,47E-4	1,75E-8	ND	6,49E-8	9,13E-6	1,82E-5	0,00E+0	-1,56E-2

[4] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Output flow indicators										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	**0,00E+0**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Material for recycling	kg	**7,31E-3**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Materials for energy recovery	kg	**1,15E-3**	0,00E+0	0,00E+0	ND	0,00E+0	0,00E+0	4,30E+2	0,00E+0	0,00E+0
Exported energy, electricity	MJ	**2,88E+0**	0,00E+0	9,05E-1	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Exported energy, thermal	MJ	**4,51E+0**	0,00E+0	1,74E+0	ND	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0

Additional impact category indicators										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Particulate matter emissions	Disease incidence	**7,95E-6**	5,85E-6	4,43E-10	ND	1,21E-8	2,16E-7	1,02E-6	0,00E+0	-1,91E-6
Ionising radiation, human health[5]	kBq U235 eq.	**1,65E+1**	3,71E-1	2,61E-5	ND	1,03E-4	1,37E-2	2,76E-2	0,00E+0	-1,92E+1
Ecotoxicity (freshwater)[3]	CTUe	**1,93E+2**	1,06E+2	1,25E-1	ND	3,36E-2	3,89E+0	4,69E+1	0,00E+0	-2,62E+2
Human toxicity, cancer effects[3]	CTUh	**6,19E-8**	1,03E-8	1,24E-11	ND	4,84E-12	3,61E-10	1,25E-8	0,00E+0	-3,13E-8
Human toxicity, non-cancer effects[3]	CTUh	**9,10E-7**	5,75E-7	5,39E-10	ND	7,61E-11	2,13E-8	8,38E-7	0,00E+0	-6,96E-7
Land use related impacts / soil quality[3]	dimensionless	**5,75E+4**	8,90E+2	7,01E-2	ND	4,11E-2	3,34E+1	1,75E+1	0,00E+0	-3,31E+2

[5] Disclaimer: 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.

Additional LCA results

Below tables are describing the environmental indicator results of 1m³ ThermoWood® by Stora Enso **alternative end-of-life scenarios** Re-use, Recycling & Landfill. The environmental impact results in this EPD are calculated using the EF 3.1 characterization factors published by the European Commission's Joint Research Centre (JRC). As required by EN 15804:2012+A2:2019/AC:2021 and the applicable Product Category Rules, all declared impacts are based on this standardized method to ensure consistency and comparability. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Mandatory impact category indicators, EN 15804 – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
Indicator	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	4,76E-2	2,19E+0	5,95E-1	0,00E+0	-9,41E+1	4,76E-2	2,19E+0	2,80E-1	0,00E+0	-1,20E+1	4,76E-2	2,19E+0	0,00E+0	4,26E+0	-4,21E-2
GWP-biogenic	kg CO_2 eq.	4,79E-6	4,71E-4	7,44E+2	0,00E+0	-2,03E-1	4,79E-6	4,71E-4	7,44E+2	0,00E+0	-5,75E-2	4,79E-6	4,71E-4	0,00E+0	9,15E+2	-4,20E-5
GWP luluc	kg CO_2 eq.	4,87E-6	8,14E-4	9,68E-4	0,00E+0	-1,51E-1	4,87E-6	8,14E-4	2,87E-5	0,00E+0	-1,54E-1	4,87E-6	8,14E-4	0,00E+0	9,61E-4	-5,90E-5
GWP total	kg CO_2 eq.	4,76E-2	2,19E+0	7,44E+2	0,00E+0	-9,44E+1	4,76E-2	2,19E+0	7,44E+2	0,00E+0	-1,22E+1	4,76E-2	2,19E+0	0,00E+0	9,19E+2	-4,22E-2
ODP	kg CFC 11 eq.	1,50E-11	1,13E-9	3,64E-10	0,00E+0	-4,70E-8	1,50E-11	1,13E-9	8,85E-11	0,00E+0	-2,52E-8	1,50E-11	1,13E-9	0,00E+0	3,93E-9	-2,83E-11
AP	mol H^+ eq.	4,26E-4	5,32E-3	4,07E-3	0,00E+0	-2,97E-1	4,26E-4	5,32E-3	2,51E-3	0,00E+0	-1,04E-1	4,26E-4	5,32E-3	0,00E+0	2,80E-2	-1,13E-4
EP-freshwater	kg P eq.	1,67E-7	1,72E-5	3,19E-5	0,00E+0	-5,32E-4	1,67E-7	1,72E-5	9,81E-7	0,00E+0	-9,63E-4	1,67E-7	1,72E-5	0,00E+0	4,02E-5	-1,94E-6
EP-marine	kg N eq.	1,98E-4	1,37E-3	1,37E-3	0,00E+0	-6,43E-2	1,98E-4	1,37E-3	1,17E-3	0,00E+0	-2,95E-2	1,98E-4	1,37E-3	0,00E+0	1,94E-2	-1,95E-5
EP-terrestrial	mol N eq.	2,17E-3	1,51E-2	1,51E-2	0,00E+0	-7,95E-1	2,17E-3	1,51E-2	1,28E-2	0,00E+0	-3,38E-1	2,17E-3	1,51E-2	0,00E+0	1,28E-1	-2,15E-4
POCP	kg NMVOC eq.	6,49E-4	8,90E-3	4,58E-3	0,00E+0	-4,33E-1	6,49E-4	8,90E-3	3,82E-3	0,00E+0	-1,22E-1	6,49E-4	8,90E-3	0,00E+0	1,17E-1	-8,47E-5
ADP minerals&metals[3]	kg Sb eq.	1,70E-8	6,37E-6	7,68E-7	0,00E+0	-2,43E-4	1,70E-8	6,37E-6	1,00E-7	0,00E+0	-8,36E-5	1,70E-8	6,37E-6	0,00E+0	8,45E-6	-2,56E-8
ADP-fossil[3]	MJ	6,20E-1	3,32E+1	1,10E+1	0,00E+0	-1,87E+3	6,20E-1	3,32E+1	3,65E+0	0,00E+0	-2,71E+2	6,20E-1	3,32E+1	0,00E+0	9,97E+1	-8,26E-1
WDP[3]	m^3	1,32E-3	1,51E-1	7,69E-2	0,00E+0	-7,50E+0	1,32E-3	1,51E-1	7,80E-3	0,00E+0	-1,58E+1	1,32E-3	1,51E-1	0,00E+0	-2,27E+0	-4,59E-3
Acronyms	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 marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential, deprivation-weighted water consumption															

Additional climate indicator, EPD International – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
GWP-GHG[4]	kg CO_2 eq.	4,76E-2	2,19E+0	5,96E-1	0,00E+0	-9,43E+1	4,76E-2	2,19E+0	2,80E-1	0,00E+0	-1,20E+1	4,76E-2	2,19E+0	0,00E+0	1,92E+2	-4,21E-2

Resource use indicators – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
Indicator	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	3,80E-3	4,97E-1	1,61E+0	0,00E+0	-5,59E+2	3,80E-3	4,97E-1	2,24E-2	0,00E+0	-2,26E+3	3,80E-3	4,97E-1	0,00E+0	2,59E+0	-1,02E-1
PERM	MJ	0,00E+0	0,00E+0	-7,58E+3	0,00E+0	-7,20E+3	0,00E+0	0,00E+0	-7,58E+3	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	-7,58E+3	0,00E+0
PERT	MJ	3,80E-3	4,97E-1	-7,58E+3	0,00E+0	-7,76E+3	3,80E-3	4,97E-1	-7,58E+3	0,00E+0	-2,26E+3	3,80E-3	4,97E-1	0,00E+0	-7,58E+3	-1,02E-1
PENRE	MJ	6,20E-1	3,32E+1	1,10E+1	0,00E+0	-1,87E+3	6,20E-1	3,32E+1	3,65E+0	0,00E+0	-2,71E+2	6,20E-1	3,32E+1	0,00E+0	9,97E+1	-8,26E-1
PENRM	MJ	0,00E+0	0,00E+0	0,00E+0	0,00E+0	-7,14E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
PENRT	MJ	6,20E-1	3,32E+1	1,10E+1	0,00E+0	-1,87E+3	6,20E-1	3,32E+1	3,65E+0	0,00E+0	-2,71E+2	6,20E-1	3,32E+1	0,00E+0	9,97E+1	-8,26E-1
SM	kg	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
RSF	MJ	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
NRSF	MJ	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
FW	m^3	4,37E-5	4,62E-3	4,66E-3	0,00E+0	-4,66E-1	4,37E-5	4,62E-3	2,58E-4	0,00E+0	-4,51E-1	4,37E-5	4,62E-3	0,00E+0	-1,94E+0	-2,91E-4
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water															

Waste indicators – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
Hazardous waste disposed	kg	5,80E-6	9,47E-4	2,68E-4	0,00E+0	-2,23E-1	5,80E-6	9,47E-4	3,42E-5	0,00E+0	-6,40E-2	5,80E-6	9,47E-4	0,00E+0	6,60E-3	-1,57E-5
Non-hazardous waste disposed	kg	4,18E-4	2,86E+0	1,82E-2	0,00E+0	-1,82E+1	4,18E-4	2,86E+0	2,46E-3	0,00E+0	-2,79E+0	4,18E-4	2,86E+0	0,00E+0	8,61E+2	-1,14E-3
Radioactive waste disposed	kg	6,49E-8	9,13E-6	5,33E-5	0,00E+0	-2,42E-4	6,49E-8	9,13E-6	3,82E-7	0,00E+0	-1,33E-3	6,49E-8	9,13E-6	0,00E+0	3,72E-5	-3,32E-6

Output flow indicators – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
Components for re-use	kg	0,00E+0	0,00E+0	4,30E+2	0,00E+0	5,00E-2	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Material for recycling	kg	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	4,30E+2	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Materials for energy recovery	kg	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0
Exported energy, electricity	MJ	0,00E+0	0,00E+0	0,00E+0	0,00E+0	-2,20E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	3,06E-1	0,00E+0
Exported energy, thermal	MJ	0,00E+0	0,00E+0	0,00E+0	0,00E+0	-4,03E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	0,00E+0	1,48E-1	0,00E+0

Additional impact category indicators – alternative end-of-life scenarios

		Re-use					Recycling					Landfill				
Indicator	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**	**C1**	**C2**	**C3**	**C4**	**D**
Particulate matter emissions	Disease inc.	1,41E-8	2,52E-7	8,84E-8	0,00E+0	-6,33E-6	1,41E-8	2,52E-7	8,60E-8	0,00E+0	-6,21E-6	1,41E-8	2,52E-7	0,00E+0	8,00E-7	-4,10E-10
Ionising radiation, human health[5]	kBq U235 eq.	1,20E-4	1,59E-2	7,56E-2	0,00E+0	-5,33E+1	1,20E-4	1,59E-2	1,48E-3	0,00E+0	-1,91E+0	1,20E-4	1,59E-2	0,00E+0	7,71E-2	-4,53E-3
Ecotoxicity (freshwater)[3]	CTUe	3,36E-2	3,89E+0	8,95E-1	0,00E+0	-1,27E+2	3,36E-2	3,89E+0	1,98E-1	0,00E+0	-7,43E+1	3,36E-2	3,89E+0	0,00E+0	1,29E+1	-5,17E-2
Human toxicity, cancer effects[3]	CTUh	4,84E-12	3,61E-10	7,44E-11	0,00E+0	-2,11E-8	4,84E-12	3,61E-10	2,85E-11	0,00E+0	-9,07E-8	4,84E-12	3,61E-10	0,00E+0	9,02E-10	-5,55E-12
Human toxicity, non-cancer effects[3]	CTUh	7,61E-11	2,13E-8	2,62E-9	0,00E+0	-6,30E-7	7,61E-11	2,13E-8	4,48E-10	0,00E+0	-2,37E-7	7,61E-11	2,13E-8	0,00E+0	3,71E-7	-1,39E-10
Land use related impacts / soil quality[3]	dimensionless	4,11E-2	3,34E+1	1,28E+0	0,00E+0	-3,50E+4	4,11E-2	3,34E+1	2,42E-1	0,00E+0	-1,40E+4	4,11E-2	3,34E+1	0,00E+0	2,44E+2	-6,88E-2

Abbreviations

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
SVHC	Substances of Very High Concern
ND	Not Declared
NA	Not Applicable
Technical units	
MJ	Megajoule
kg	Kilogram
m^3	Cubic meter
km	Kilometer
tkm	Tonne-kilometer
kg C	Kilogram of carbon – used for biogenic carbon content

References

EPD International (2025): General Programme Instructions for the International EPD® System. Version 5.0.1, published on 2025-02-27

EPD International (2025): PCR 2019:14 Construction products. Version 2.0.1, published on 2025-06-05

EPD International (2025): PCR 2019:14-c-PCR-006 Being updated - Wood and wood-based products for use in construction (EN 16485). Version 1.0.0, published 2025-04-08

EN 15804:2012 + A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

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

EN 16449:2014 Wood and wood-based products. Calculation of the biogenic carbon content of wood and conversion to carbon dioxide

EN 15942:2012 Sustainability of construction works - Environmental product declarations - Communication format business-to-business

ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures.

ISO 14044:2006 Environmental management. Life Cycle Assessment. Requirements and guidelines.

ThermoWood HANDBOOK 2025, English version

Version history

Original Version of the EPD, 2026-02-16
Version 002 2026-02-16 – publication date amended before the first publication (was published with version number 001)
Version 003 2026-03-23 **–** changed links to indicator results updated. Affected indicator results: Ecotoxicity (freshwater), Human toxicity cancer effects, Human toxicity non-cancer effects, Land use related impacts / soil quality.

Detailed product information

ThermoWood® inspiration

More on our website

EPD owner and LCA author

Stora Enso
E-mail tuovi.valtonen@storaenso.com
Tel +358 2046 131
www.storaenso.com

EPD®

www.environdec.com