



ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Frøslev Embla ThermoWood® FRX

Frøslev Træ A/S



EPD HUB, HUB-5328

Published on 11.02.2026, last updated on 11.02.2026, valid until 10.02.2031

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Frøslev Træ A/S
Address	Jens P. L. Petersens Vej 1 DK-6330 Padborg, Denmark
Contact details	info@froeslev.dk
Website	www.frøslev.dk

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with modules C1-C4, D
EPD author	Martin Oddershede
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
EPD verifier	Yazan Badour, as authorized verifier acting for EPD HUB Limited

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Frøslev Embla ThermoWood® FRX
Place of production	Padborg, Denmark
Period for data	Calendar year 2024
Averaging in EPD	No grouping
A1-A3 Specific data (%)	99,6

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m ³ of Frøslev Embla ThermoWood® FRX with non-hygroscopic fire-retardant impregnation.
Declared unit mass	478 kg
Mass of packaging	5,58 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	329
GWP-total, A1-A3 (kgCO ₂ e)	-364
Secondary material, inputs (%)	0
Secondary material, outputs (%)	100
Total energy use, A1-A3 (kWh)	2130
Net freshwater use, A1-A3 (m ³)	7,14

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

In Frøslev, we know wood. But not out of the blue. Since 1931, we have produced and delivered quality wood for everything from large constructions to private homes.

With Denmark's largest range of innovative, high-quality wood products and generations of knowledge, Frøslev offers the complete package – ensuring that any construction involving wood gets off to the right start and lasts for many years.

PRODUCT DESCRIPTION

Frøslev Embla ThermoWood® FRX is an exterior cladding board made of thermally modified softwood, primarily pine with minor content of spruce, treated with a non-hygroscopic fire-retardant impregnation.

The product is intended for above-ground façade applications and complies with EN 16755, durability class EXT.

Depending on configuration and installation, it achieves reaction to fire class B-s1, d0 or B-s2, d0.

Further information can be found at www.frøslev.dk.

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	188,55
Biogenic carbon content in packaging, kg C	0,73

FUNCTIONAL UNIT AND SERVICE LIFE

Declared / functional unit	1 m ³ of Frøslev Embla ThermoWood® FRX with non-hygroscopic fire-retardant impregnation.
Mass per declared unit	478 kg
Reference service life	An RSL of 60 years is defined based on a normal use of the products.

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage		Assembly stage		Use stage							End of life stage				Beyond the system boundaries			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
×	×	×	ND	ND	ND	ND	ND	ND	ND	ND	ND	×	×	×	×	D		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = ND. Modules not relevant = MNR

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A market-based approach is applied to model the electricity mix used at the factory.

The environmental impacts assessed for the product stage of Frøslev Embla ThermoWood® FRX with non-hygroscopic fire-retardant impregnation include the production of all raw materials and purchased goods consumed, including waste, spill, and material losses arising from the manufacturing processes, as well as packaging and other ancillary materials. This stage further includes the supply and use of energy and fuels, transport of raw materials and consumed goods to the production site, and the operation of all core production processes at the manufacturing facility.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Transport and installation (A4-A5) are not included in the specific EPD.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase.

Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life stage, it is assumed that 100% of the waste generated during demolition is collected as separate construction waste. The demolition phase (module C1) involves energy consumption from diesel fuel used by construction equipment (Bozdağ & Seçer, 2007).

Following dismantling, the wood material is transported 150 km to a nearby construction waste treatment facility (module C2), where it is managed

according to standard Scandinavian practices. End-of-life treatment of the products is assumed to be incineration with energy recovery. This is a common practice in Denmark. However, the products may also be recycled, and recycling is likewise a common treatment route for wood waste. Allocation is performed using energy efficiencies of 16% for electricity and 22% for heat.

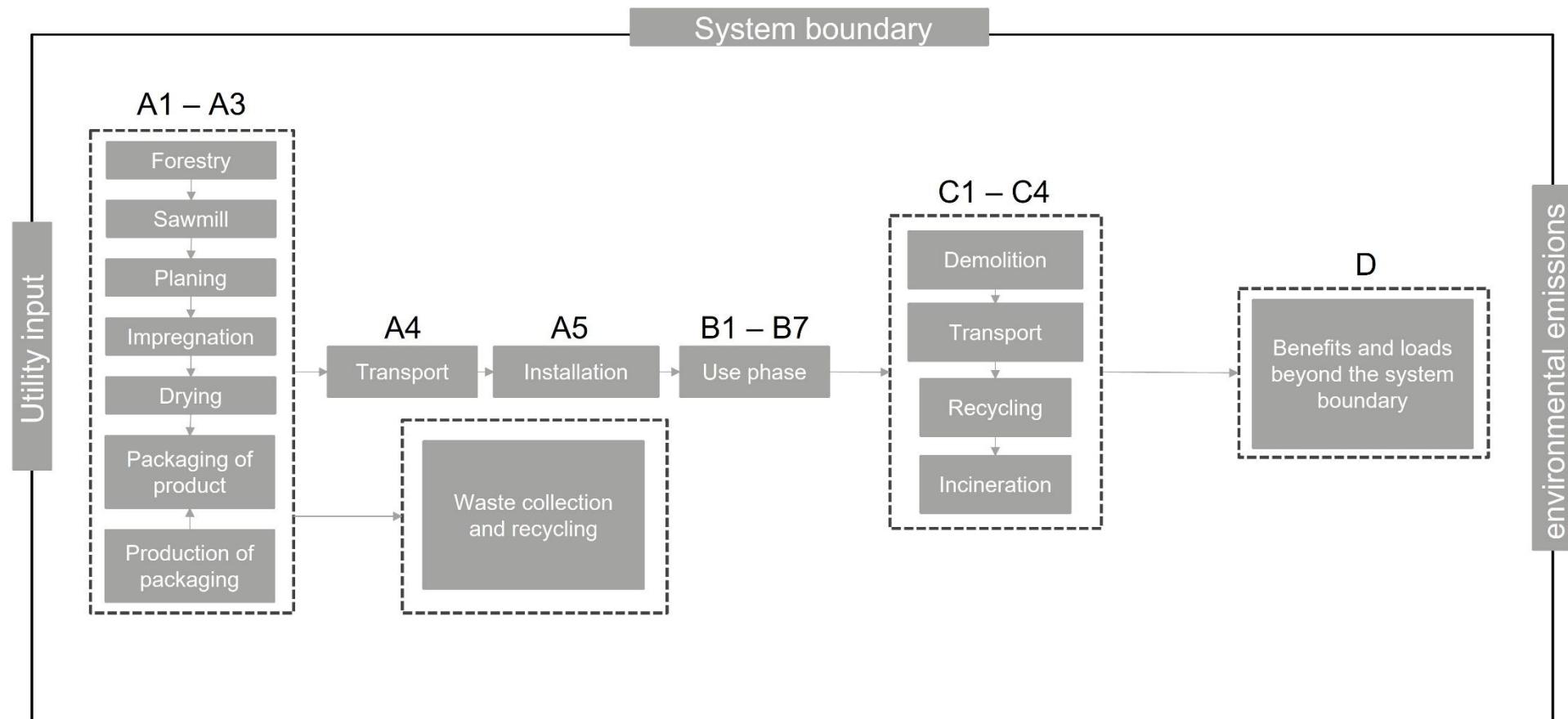
Regarding packaging materials, the following end-of-life treatments are assumed:

Wood packaging: 26% recycled, 50% energy recovery, 24% landfilled.

Plastic packaging: 23 % recycled, 50 % incineration, 27 % landfilled.

Module D includes the net impacts and benefits associated with avoided Danish average electricity production and recovered thermal energy.

SYSTEM DIAGRAM



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process that is more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are made according to the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	Allocated by mass or volume
Packaging material	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

This EPD is product and factory specific.

LCA SOFTWARE AND BIBLIOGRAPHY

The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	-5,10E+02	1,38E+02	7,49E+00	-3,64E+02	ND	1,72E+00	2,66E+00	7,07E+02	1,35E+00	-1,91E+00								
GWP – fossil	kg CO ₂ e	1,80E+02	1,38E+02	1,02E+01	3,29E+02	ND	1,72E+00	2,66E+00	1,24E+01	1,23E-01	-1,96E+00								
GWP – biogenic	kg CO ₂ e	-6,91E+02	1,62E-05	-2,70E+00	-6,94E+02	ND	1,76E-04	1,94E-05	6,95E+02	1,23E+00	5,21E-02								
GWP – LULUC	kg CO ₂ e	1,00E+00	5,19E-02	3,72E-03	1,06E+00	ND	1,77E-04	1,19E-03	2,16E-03	1,02E-05	-6,62E-04								
Ozone depletion pot.	kg CFC-11e	2,35E-05	2,78E-06	2,32E-08	2,63E-05	ND	2,64E-08	3,92E-08	8,46E-08	4,05E-10	-1,06E-07								
Acidification potential	mol H ⁺ e	1,66E+00	4,46E-01	2,41E-02	2,13E+00	ND	1,56E-02	9,06E-03	7,80E-02	1,11E-04	-5,15E-03								
EP-freshwater ²⁾	kg Pe	5,43E-02	9,32E-03	1,04E-03	6,46E-02	ND	4,97E-05	2,07E-04	3,24E-03	4,72E-06	-3,12E-04								
EP-marine	kg Ne	3,36E-01	1,52E-01	1,34E-02	5,01E-01	ND	7,21E-03	2,98E-03	4,14E-02	4,13E-04	-9,98E-04								
EP-terrestrial	mol Ne	3,80E+00	1,65E+00	1,02E-01	5,55E+00	ND	7,90E-02	3,24E-02	3,97E-01	4,55E-04	-1,08E-02								
POCP ("smog") ³⁾	kg NMVOCe	1,03E+00	7,27E-01	2,88E-02	1,78E+00	ND	2,36E-02	1,34E-02	1,00E-01	1,94E-04	-1,16E-02								
ADP-minerals & metals ⁴⁾	kg Sbe	2,52E-03	3,82E-04	7,22E-06	2,91E-03	ND	6,18E-07	7,42E-06	1,59E-05	3,52E-08	-1,88E-05								
ADP-fossil resources	MJ	3,59E+03	2,00E+03	2,44E+06	2,44E+06	ND	2,25E+01	3,86E+01	6,68E+01	3,48E-01	-7,15E+01								
Water use ⁵⁾	m ³ e depr.	4,65E+02	1,03E+01	3,29E+00	4,79E+02	ND	5,63E-02	1,91E-01	1,58E+01	1,69E-03	-4,64E-01								

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential;

5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	1,78E-06	1,37E-05	1,06E-07	1,56E-05	ND	4,42E-07	2,66E-07	8,71E-07	2,52E-09	-1,92E-08								
Ionizing radiation ⁶⁾	kBq I1235e	1,02E+01	2,41E+00	5,59E-01	1,32E+01	ND	9,99E-03	3,36E-02	8,11E-02	3,44E-04	-1,92E-01								
Ecotoxicity (freshwater)	CTUe	5,33E+02	2,36E+02	2,20E+01	7,91E+02	ND	1,24E+00	5,46E+00	5,19E+01	4,15E-01	-3,53E+00								
Human toxicity, cancer	CTUh	2,15E-08	2,27E-08	9,20E-10	4,52E-08	ND	1,77E-10	4,39E-10	1,41E-08	7,19E-12	-2,51E-10								
Human tox. non-cancer	CTUh	1,52E-06	1,30E-06	1,38E-07	2,96E-06	ND	2,81E-09	2,50E-08	9,41E-07	1,25E-09	-1,53E-08								
SQP ⁷⁾	-	5,84E+04	2,02E+03	2,47E+02	6,07E+04	ND	1,58E+00	3,88E+01	1,94E+01	8,11E-01	-6,95E+00								

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	1,88E+03	3,26E+01	1,12E+01	1,92E+03	ND	1,43E-01	5,29E-01	-8,11E+03	-6,94E+00	-2,51E+00								
Renew. PER as material	MJ	1,28E+04	0,00E+00	2,83E+01	1,28E+04	ND	0,00E+00	0,00E+00	-1,28E+04	-6,78E+00	0,00E+00								
Total use of renew. PER	MJ	1,46E+04	3,26E+01	3,94E+01	1,47E+04	ND	1,43E-01	5,29E-01	-2,09E+04	-1,37E+01	-2,51E+00								
Non-re. PER as energy	MJ	3,77E+03	2,00E+03	-3,44E+01	5,74E+03	ND	2,25E+01	3,86E+01	-4,06E+01	-3,84E+01	-8,11E+01								
Non-re. PER as material	MJ	0,00E+00	0,00E+00	6,12E+01	6,12E+01	ND	0,00E+00	0,00E+00	-6,12E+01	0,00E+00	4,20E+01								
Total use of non-re. PER	MJ	3,77E+03	2,00E+03	2,67E+01	5,80E+03	ND	2,25E+01	3,86E+01	-1,02E+02	-3,84E+01	-3,90E+01								
Secondary materials	kg	0,00E+00	8,66E-01	2,83E+00	3,70E+00	ND	9,36E-03	1,64E-02	1,58E-01	1,26E-04	1,04E+00								
Renew. secondary fuels	MJ	0,00E+00	1,09E-02	7,80E-02	8,89E-02	ND	2,45E-05	2,09E-04	3,91E-04	2,36E-06	-8,61E-05								
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00								
Use of net fresh water	m ³	6,75E+00	2,96E-01	8,94E-02	7,14E+00	ND	1,49E-03	5,70E-03	9,74E-02	-5,18E-03	-1,26E-02								

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	5,84E-05	2,90E+00	7,90E-02	2,98E+00	ND	2,51E-02	6,54E-02	3,15E+00	6,09E-04	-4,96E-02								
Non-hazardous waste	kg	8,99E-01	5,80E+01	2,27E+02	2,86E+02	ND	3,42E-01	1,21E+00	4,94E+02	6,95E+00	-1,85E+01								
Radioactive waste	kg	8,37E-02	5,97E-04	4,60E-04	8,48E-02	ND	2,45E-06	8,22E-06	2,02E-05	8,42E-08	-4,88E-05								

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00								
Materials for recycling	kg	9,41E-01	0,00E+00	3,67E-03	9,45E-01	ND	0,00E+00	0,00E+00	1,29E+00	0,00E+00	0,00E+00								
Materials for energy rec	kg	8,15E-02	0,00E+00	3,18E-04	8,18E-02	ND	0,00E+00	0,00E+00	4,78E+02	0,00E+00	0,00E+00								
Exported energy	MJ	3,35E-03	0,00E+00	1,31E-05	3,36E-03	ND	0,00E+00	0,00E+00	2,68E+01	0,00E+00	0,00E+00								
Exported energy – Electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	0,00E+00	0,00E+00	1,13E+01	0,00E+00	0,00E+00								
Exported energy – Heat	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	0,00E+00	0,00E+00	1,55E+01	0,00E+00	0,00E+00								

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e	1,81E+02	1,38E+02	1,02E+01	3,30E+02	ND	1,72E+00	2,66E+00	1,24E+01	1,23E-01	-1,96E+00								

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO₂ is set to zero.

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation

1. Natural Gas-DK, Gas-mix-DK-2020, Denmark, ProBas, 0.0038 kgCO2e/MJ
2. Electricity, Wind-KW-Park-mittel-DK-2000, Denmark, ProBas, 0.0052 kgCO2e/MJ

EOL scenario documentation - C1-C4 (Data source)

1. Diesel, burned in building machine, Ecoinvent, 4.78 kWh
2. Wood chipping, industrial residual wood, stationary electric chipper, Ecoinvent, Materials for recycling, 0.0 kg
3. Wood chipping, industrial residual wood, stationary electric chipper, Ecoinvent, Materials for recycling, 0.44 kg
4. Treatment of waste wood, municipal incineration, Ecoinvent, 0.0 kg
5. Treatment of waste wood, municipal incineration, Ecoinvent, 0.85 kg
6. Treatment of waste wood, municipal incineration, Ecoinvent, Materials for energy recovery, 478.0 kg
7. Exported Energy: Electricity, Ecoinvent, 0.0 MJ
8. Exported Energy: Electricity, Ecoinvent, 1.68 MJ
9. Exported Energy: Electricity, Ecoinvent, 9.6 MJ
10. Exported Energy: Electricity, Ecoinvent, 947.816 MJ
11. Exported Energy: Thermal, Ecoinvent, 0.0 MJ
12. Exported Energy: Thermal, Ecoinvent, 2.312 MJ
13. Exported Energy: Thermal, Ecoinvent, 13.21 MJ
14. Exported Energy: Thermal, Ecoinvent, 1303.25 MJ
15. Treatment of waste wood, sanitary landfill, Ecoinvent, 0.0 kg
16. Treatment of waste wood, sanitary landfill, Ecoinvent, 0.41 kg
17. Treatment of waste polyethylene, for recycling, unsorted, sorting,

Ecoinvent, Materials for recycling, 0.85 kg

18. Treatment of waste polypropylene, municipal incineration, Ecoinvent, 1.84 kg
19. Treatment of waste polyethylene, sanitary landfill, Ecoinvent, 0.99 kg

Scenario information	Value
Scenario assumptions e.g. transportation	Between 50 km and 250 km by truck to treatment facilities, according to EU standards.

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance is filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez

Tool verification validity: 27 March 2025 - 26 March 2028

Yazan Badour, as authorized verifier acting for EPD HUB Limited

11.02.2026

