

Environmental Product Declaration



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

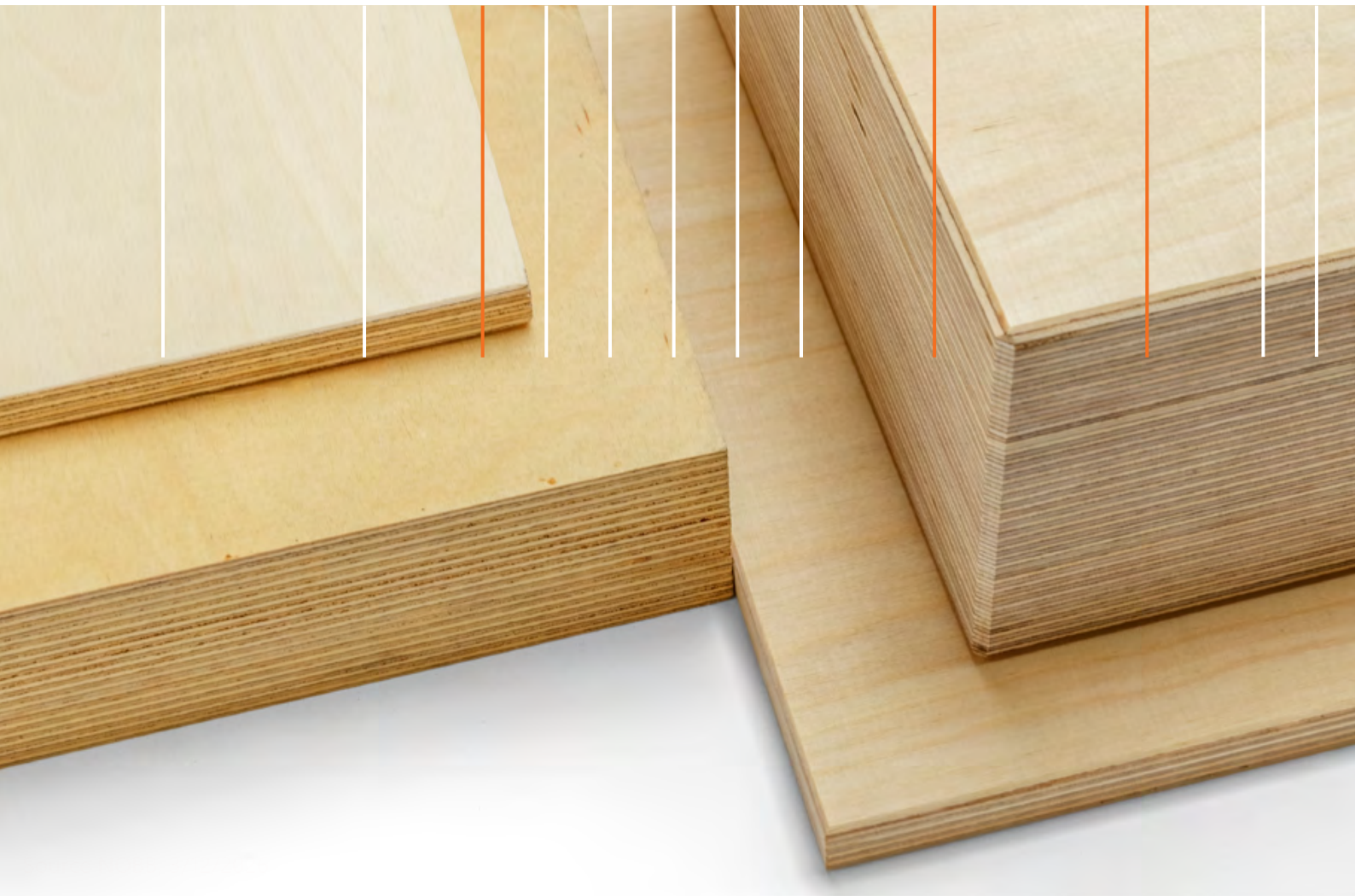
Raw birch plywood

from

AS Latvijas Finieris

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-13275
Publication date:	2024-04-15
Valid until:	2029-04-15

Multiple products EPD based on average results.
An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at www.environdec.com



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:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): *Construction Products, PCR 2019:14 Version 1.3.3 and c-PCR-006 “Wood and wood-based products for use in construction (EN 16485)”*

PCR review was conducted by: *The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.*
c-PCR-006 “Wood and wood-based products for use in construction (EN 16485):
This PCR was developed within CEN standardisation, and adopted as a c-PCR by the International EPD® System. There was thus no additional open consultation period and no additional review in addition to those within standardisation.

Life Cycle Assessment (LCA)

LCA accountability: *Bureau Veritas Latvia SIA, riga@bureauveritas.com*

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third-party verifier: *Elisabet Amat Guasch, GREENIZE*

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☒ No

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

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same 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 equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:

AS Latvijas Finieris

Contact:

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Lead Environmental and Sustainability Expert
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Description of the organisation

Latvijas Finieris AS is an international joint-stock company with headquarters in Riga, Latvia. Together with numerous subsidiary companies, it forms the multi-sector Latvijas Finieris Group. Latvijas Finieris AS core business is the production, research, development and sale of customised birch plywood products under the Riga Wood brand. Our birch veneer and plywood production facilities are strategically located in Latvia, Lithuania, Estonia, and Finland. The Group's other main activities are forestry and logging, production of chemicals, as well as mechanical engineering and metalworking. The Group's commitment to personalized service extends through a network of 12 Riga Wood product development and sales offices across Europe and beyond, empowering customers to craft tailored solutions.

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
- Program for the Endorsement of Forest Certification (PEFC/12-44-007)
- European Union Timber Regulation No. 995/2010
- European Union Standard EN 13986+A1:2015
- REACH Formaldehyde Restriction Regulation EU 2023/1464
- European Union REACH Regulation No. 1907/2006
- European Union RoHS Directive 2011/65/EC
- European Union Construction Products Regulation No. 305/2011 CE2+; CE4
- US Environmental Protection Agency Toxic Substances Control Act (TSCA) Title VI
- California Air Resource Board (CARB) Phase 2
- Standard EN 314-2 Plywood – Bonding quality
- Standard EN 315 Plywood – Tolerances for dimensions
- Standard EN 326-1, EN 326-2, EN 326-3
- Finnish Emission Classification of Building Materials (M1)
- French VOC Emissions Labelling Class A+

Name and location of production sites

Plywood mills:

Lignums in Riga, Latvia
Furniers in Riga, Latvia
Verems in Rezekne County, Latvia
Kohila Vineer in Kohila, Estonia

Further processing units:

Hapaks in Riga, Latvia
Troja in Riga, Latvia

Product information

Product name

Raw birch plywood

Product identification

Riga Ply

Riga Shipply



Product description

Raw birch plywood is a high-quality birch throughout plywood with both faces sanded and is designed for a wide range of applications that demand superior strength properties. Made of cross bonded birch veneers, face veneers are available in long and cross grain. For customer specific requirements, specially designed oriented veneer constructions can be used to improve the bending strength and stiffness properties. The quality grade of plywood is designed by the type and quantity of visible defects. Riga Wood raw birch plywood is available in four grades according to EN 635: S (II), BB (III), WGE and WG (IV).

Technical parameters of the product are:

- Standard thickness: 4, 6.5, 9, 12, 15, 18, 21, 24, 27, 30, 35, 40, 45, 50, 92, 102 mm. Other thicknesses are possible.
- Panel sizes: length up to 4000 mm, width up to 2290 mm.
- Gluing classes: glued with weather and boil-proof phenol formaldehyde or lignin phenol formaldehyde resin adhesive according to EN 314/Class 3 Exterior. Bonding with moisture resistant melamine-urea-formaldehyde resin according to EN 314 / Class 1 and BS 1203 / H1 possible.
- Tolerance: size, squareness and thickness tolerances fulfil the requirements of EN 315.
- Bulk density: 715 kg/m³
- Number of layers: please refer to Plywood handbook published in Latvijas Finieris website
- Moisture content: While storage at an ambient temperature of 20 °C and relative humidity of 65%, the plywood moisture content is 9 ± 3%

All Riga Wood Raw plywood variations considered in this EPD have the same composition and manufacturing processes, only design is different.

This EPD represents the average composition and production of multiple plywood products manufactured at different production sites. The results presented in this EPD for 1 m³ of average Raw birch plywood are weighted according to the production volumes at each production site.

UN CPC code

314 - Boards and panels

Geographical scope

This EPD has a European Scope.

LCA information

Declared unit

1 m³ of Raw birch plywood

Conversion factor for declared unit – 715 kg/DU.

Reference service life

As an integral element of buildings or infrastructure, birch plywood finds primary application in dry indoor or moderately humid conditions, including use in roofing, flooring, and wall sheeting. Birch plywood stands out as one of the most durable and environmentally friendly materials with excellent strength-to-weight ratio, stability, durability, high impact, warping and bowing resistance. The numerical service life is estimated to about 100 years.

Time representativeness

Data represents the manufacturing of the products in year 2022. The database used for proxy data is Ecoinvent v3.9.1. This database data is compiled in January 2023, i.e., no data is older than ten years.

Database(s) and LCA software used

Ecoinvent v3.9.1. has been used to conduct the quantitative evaluation in this study. This database provided the background system's life cycle inventory data for raw and processed materials. The LCA software used to obtain results of impact assessment - SimaPro 9.5.

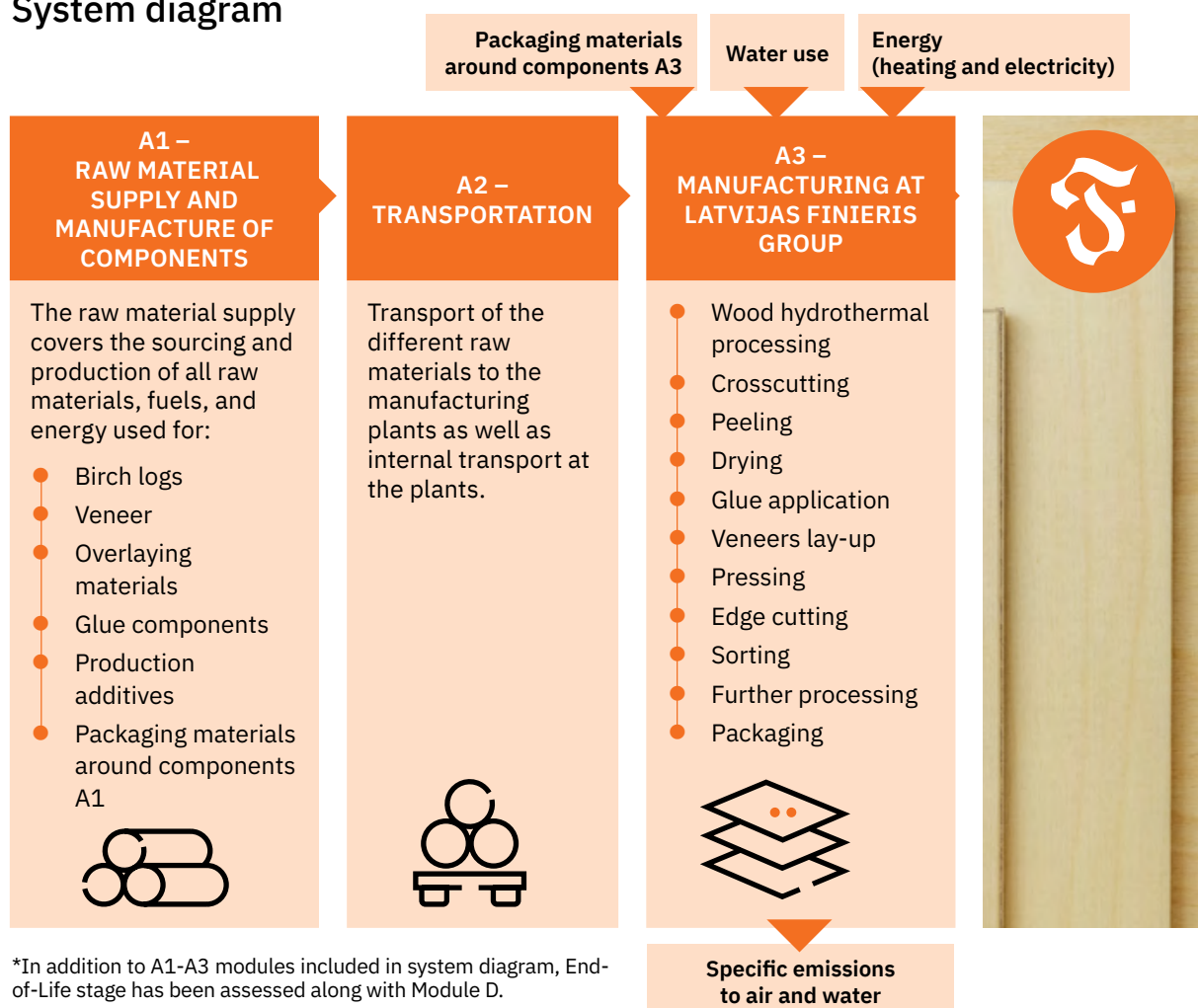
Description of system boundaries

LCA study has been performed in the “Cradle-to-gate with modules C1-C4 and module D” form. All major materials, production energy use and waste are included for phases A1-A3, C1-C4 and D. Construction stage (A4-A5) and Use stage (B1-B7) has not been considered for this study.

The processes related to infrastructure, construction, and production of equipment, as well as tools that are not directly consumed in the production process, have been excluded. Personnel-related activities, such as transportation to and from work, have been excluded.



System diagram



Data quality: The foreground data has been collected internally, considering the latest available average production amounts and measurements during 2022. Data quality level in this study is qualified as **Very good** according to the UN Environment Global Guidance criteria on LCA database development. Data is geographically representative as it comes from the area of study. It is technically representative as it comes from processes and products under study using the same state of technology defined in goal and scope. According to the provided data, it is also time representative.

Cut-off criteria: All materials have been accounted for in the LCA according to the data provided by manufacturer. There is no missing data for processes in the system boundaries. All the materials and processes, which have been accounted for by the manufacturing company for the relevant manufacturing process are included in the LCI. The cut-off in LCA is according to PCR: "General cut-off criteria are given in standard EN 15804:2012+A2, clause 6.3.6."

Allocation: General allocation principles have been applied according to ISO 14044:2006 4.3.4 and in line with the provisions of EN 15804:2012+A2. Incoming energy, water and generation of waste are allocated equally among all products through economic allocation, keeping the mass balance within aggregated module A1-A3. The material and energy consumption in manufacturer's data according to recorded production is also indicated per declared unit of each product. The effects of primary production of recycled materials have been allocated to the main product in which the material has been used.

The handling of waste for this study is accounted according to the polluter pays principle and is described by chapter in EN15804 and PCR(s). The provenience of recycled materials (pre-consumer or post-consumer) in the product according to the PCR followed the Polluter Pays principle. This principle is applied in the waste management of the product in the system and secondary material use.

Stages and Production description

Product Stage

In an aggregated **module A1-A3** extraction and processing of raw materials and generation of electricity and heat from primary energy resources, used to produce these raw materials, are included. Main raw material for production of Raw plywood is Birch log, with additional raw materials, e.g., various chemicals for own produced resins and impregnated paper etc.

Datasets used to represent consumption of electricity in LCA calculations represent residual national grid mixes of four different countries – Latvia, Lithuania, Estonia and Finland. Medium voltage mixes are based on the data presented in Ecoinvent v3.9.1 database. Over 80% of our plywood is manufactured in Latvia, utilizing certified green electricity.

Table below displays GWP-GHG of each grid mix used for the purpose of this LCA study, incl. modified dataset representing the use of Electricity with Guarantees of Origin:

Country	GWP-GHG, kgCO ₂ eq per 1 kWh
Latvia	0.027*
Estonia	0.621
Lithuania	0.416
Finland	0.211

*Guarantees of Origin have been considered only for electricity consumption in Latvian manufacturing sites.

For transportation, represented by module A2, following assumptions have been made. Only 16-32t EURO5 emission standard has been applied as a default value for all Freight lorries used for supply of raw materials and transportation of veneer/plywood within manufacturing sites.

Construction process Stage

Modules A4-A5 have not been considered for the purpose of this study.

Use Stage

Modules B1-B7 have not been considered for the purpose of this study.

End of Life Stage

According to JRC report of LCA for buildings, it has been assumed, that 0.323 MJ/kg of mechanical energy is consumed in **module C1** by construction machinery that for the purpose of this study has been represented by Diesel burned in a building machine. Specific demand of energy represents demolition/de-construction activities for Wooden frames.

For **module C2** an average transportation with 50 km distance has been assumed as distance between de-construction site and waste processing facility. EURO5 16-32 t Freight lorry has been considered for calculations in module C2.

As a waste processing activity in **module C3**, considering followed End-of-Life scenario of Energy recovery provided in EN 16485:2014, product crushing, site operation and wood combustion have been considered as attributed end-of-life processes in this module. Therefore, to account for product crushing, Wood chipping with stationary electric chipper has been considered as an input for this module.

Module C4 represents Disposal activities. Considering EN 16485:2014, in case of Energy recovery scenario that has been followed in this study, there are no end-of-life attributed processes in module C4. Therefore, there are no resulting impacts.

Benefits and loads beyond the system boundaries:

As described above, this study also considers **module D**, representing Reuse, Recovery and Recycling potential. As per EN 16485:2014, avoided impact of electricity production and thermal energy has been considered in this module. Net energy production from the product contents, considered for Incineration within the module C3, has been modelled for this purpose, representing both thermal and electric energy. As per EN 16485:2014 clause 6.4.3.3, for thermal energy recovery, substitution of heat from fossil fuels, e.g. **Natural gas** as a conservative choice, has been considered. Produced electricity has been modelled without attribution to any specific geographic location.

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	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	EU	EU	LV, EE	MND	MND	MND	MND	MND	MND	MND	MND	MND	EU	EU	EU	EU	EU
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	from -27% to +56%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Wood	646.4	0%	100% and 0.5
Resins	45.7	0%	0% and 0.0
Hardener	17.2	0%	0% and 0.0
Overlays, composite materials	0.0	0%	0% and 0.0
Other	5.7	0%	0% and 0.0
TOTAL	715.0	0%	90.4% and 0.45

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Containerboard	1.3	0.2%	0.5
Oriented strand board	15.1	2.1%	0.5
Polyester	0.8	0.1%	0.0
Wooden spacers	8.0	1.1%	0.5
TOTAL	25.2	3.5%	0.48

The plywood composition represents a calculated average of all included plywood products and not any specific product.

During the life cycle of the product any hazardous substance listed in the “Candidate List of Substances of Very High Concern (SVHC) for authorization” has not been used in a percentage higher than 0,1% of the weight of the product.



Environmental Information

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.

Potential environmental impact – mandatory indicators according to EN 15804 (EF 3.1 reference package)

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	3,1E+02	2,2E+01	5,5E+00	1,9E+02	0,0E+00	-2,8E+02
GWP-biogenic	kg CO ₂ eq.	-1,2E+03	1,4E-03	3,6E-04	1,2E+03	0,0E+00	-7,8E-01
GWP-luluc	kg CO ₂ eq.	7,7E+00	9,0E-04	1,1E-04	1,3E-02	0,0E+00	-3,3E-01
GWP-total	kg CO ₂ eq.	-8,6E+02	2,2E+01	5,5E+00	1,4E+03	0,0E+00	-2,8E+02
ODP	kg CFC 11 eq.	1,8E-05	3,4E-07	1,2E-07	5,5E-07	0,0E+00	-9,1E-06
AP	mol H ⁺ eq.	1,9E+00	2,1E-01	1,4E-02	2,7E-01	0,0E+00	-7,3E-01
EP-freshwater	kg P eq.	1,0E-01	1,8E-05	4,3E-06	5,6E-04	0,0E+00	-1,3E-02
EP-marine	kg N eq.	7,7E-01	9,7E-02	5,6E-03	1,4E-01	0,0E+00	-1,2E-01
EP-terrestrial	mol N eq.	7,7E+00	1,1E+00	5,9E-02	1,4E+00	0,0E+00	-1,4E+00
POCP	kg NMVOC eq.	2,4E+00	3,1E-01	2,3E-02	3,3E-01	0,0E+00	-5,7E-01
ADP-minerals & metals*	kg Sb eq.	1,0E-04	9,1E-07	1,9E-07	2,6E-06	0,0E+00	-9,1E-06
ADP-fossil*	MJ	5,6E+03	2,8E+02	7,3E+01	2,2E+02	0,0E+00	-5,3E+03
WDP*	m ³	2,2E+01	3,6E-01	6,6E-02	3,8E+00	0,0E+00	-3,4E+01
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 for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

* 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.

** The GWP-biogenic results have been balanced out in accordance with following approach – characterization factors for uptake and release of biogenic Carbon dioxide have been set to zero.

Biogenic carbon of wood is calculated according to the EN 16485 and 16449 standards. Half of the dry mass of wood is carbon. Each kilogram of stored biogenic carbon is equal to 44/12 kgCO₂eq, which is effectively removed from the atmosphere. In case of 1m³ of Raw plywood, biogenic carbon content is 323 kgC that results in -1185 kgCO₂eq. Biogenic carbon enters the product system in sustainably managed forest or raw material module A1 and for calculation purpose it is assumed to later leave the product system in the End-of-Life stage, i.e., module C3.

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	3,2E+02	2,2E+01	5,5E+00	1,9E+02	0,0E+00	-2,8E+02
EP-freshwater	kg PO ₄ ³⁻ eq.	3,0E-01	5,6E-05	1,3E-05	1,7E-03	0,0E+00	-3,9E-02

Additional voluntary indicators e.g., the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017

Use of resources

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1,7E+03	4,8E-01	1,7E-01	2,0E+01	0,0E+00	-5,1E+02
PERM	MJ	3,2E+04	7,3E-02	2,6E-02	3,7E+00	0,0E+00	-8,7E+01
PERT	MJ	3,4E+04	5,5E-01	1,9E-01	2,4E+01	0,0E+00	-5,9E+02
PENRE	MJ	5,6E+03	2,8E+02	7,3E+01	2,2E+02	0,0E+00	-5,3E+03
PENRM	MJ	6,8E+00	8,0E-04	7,9E-06	8,3E-04	0,0E+00	-7,2E-03
PENRT	MJ	5,6E+03	2,8E+02	7,3E+01	2,2E+02	0,0E+00	-5,3E+03
SM	kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
RSF	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
NRSF	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
FW	m ³	3,6E+00	1,4E-02	3,0E-03	4,6E-01	0,0E+00	-2,5E+00

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

¹ 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 CO₂ is set to zero.

Waste production and output flows

Waste production

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8,3E-01	1,9E-03	4,8E-04	2,0E-03	0,0E+00	-1,3E-02
Non-hazardous waste disposed	kg	1,4E+01	2,1E-02	3,5E-03	5,2E+00	0,0E+00	-3,7E+00
Radioactive waste disposed	kg	4,6E-03	1,4E-05	6,2E-06	8,7E-04	0,0E+00	-2,3E-02

Output flows

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
Material for recycling	kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
Materials for energy recovery	kg	3,46E+02	0,0E+00	0,0E+00	7,2E+02	0,0E+00	0,0E+00
Exported energy, electricity	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	1,4E+03
Exported energy, thermal	MJ	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	2,8E+03



Other environmental performance indicators

Additional indicators, EN 15804:2012+A2:2019/AC:2021

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PM Particulate matter emissions	Disease inc.	4,5E-05	5,8E-06	3,6E-07	1,3E-06	0,0E+00	-1,7E-06
IRP Ionising radiation, human health	kBq U-235 eq.	8,2E+00	3,3E-02	1,2E-02	1,1E+00	0,0E+00	-2,8E+01
ETP-fw Ecotoxicity, fresh-water	CTUe	2,2E+03	1,4E+02	3,2E+01	5,4E+02	0,0E+00	-3,5E+02
HTP-c Human toxicity, cancer effects	CTUh	7,5E-07	1,2E-09	3,8E-10	2,3E-08	0,0E+00	-2,6E-08
HTP-nc Human toxicity, non-cancer effects	CTUh	3,4E-06	3,0E-08	3,9E-08	1,5E-06	0,0E+00	-9,7E-07
SQP Potential Soil quality index	dimensionless	1,1E+05	5,4E-01	1,4E-01	2,0E+01	0,0E+00	-3,9E+02

Biogenic carbon content

Results per functional or declared unit	
Biogenic carbon content	Quantity
Carbon content in product, kg C	3,2E+02
Carbon content in accompanying packaging, kg C	1,2E+01

Biogenic carbon of wood is calculated according to the EN 16485 and 16449 standards. Half of the dry mass of wood is carbon. Each kilogram of stored biogenic carbon is equal to 44/12 kgCO₂eq, which is effectively removed from the atmosphere. In case of 1m³ of Raw plywood, biogenic carbon content is 323 kgC that results in -1185 kgCO₂eq. Biogenic carbon enters the product system in sustainably managed forest or raw material module A1 and for calculation purpose it is assumed to later leave the product system in the End-of-Life stage, i.e., module C3.

Additional environmental information

Not applicable.

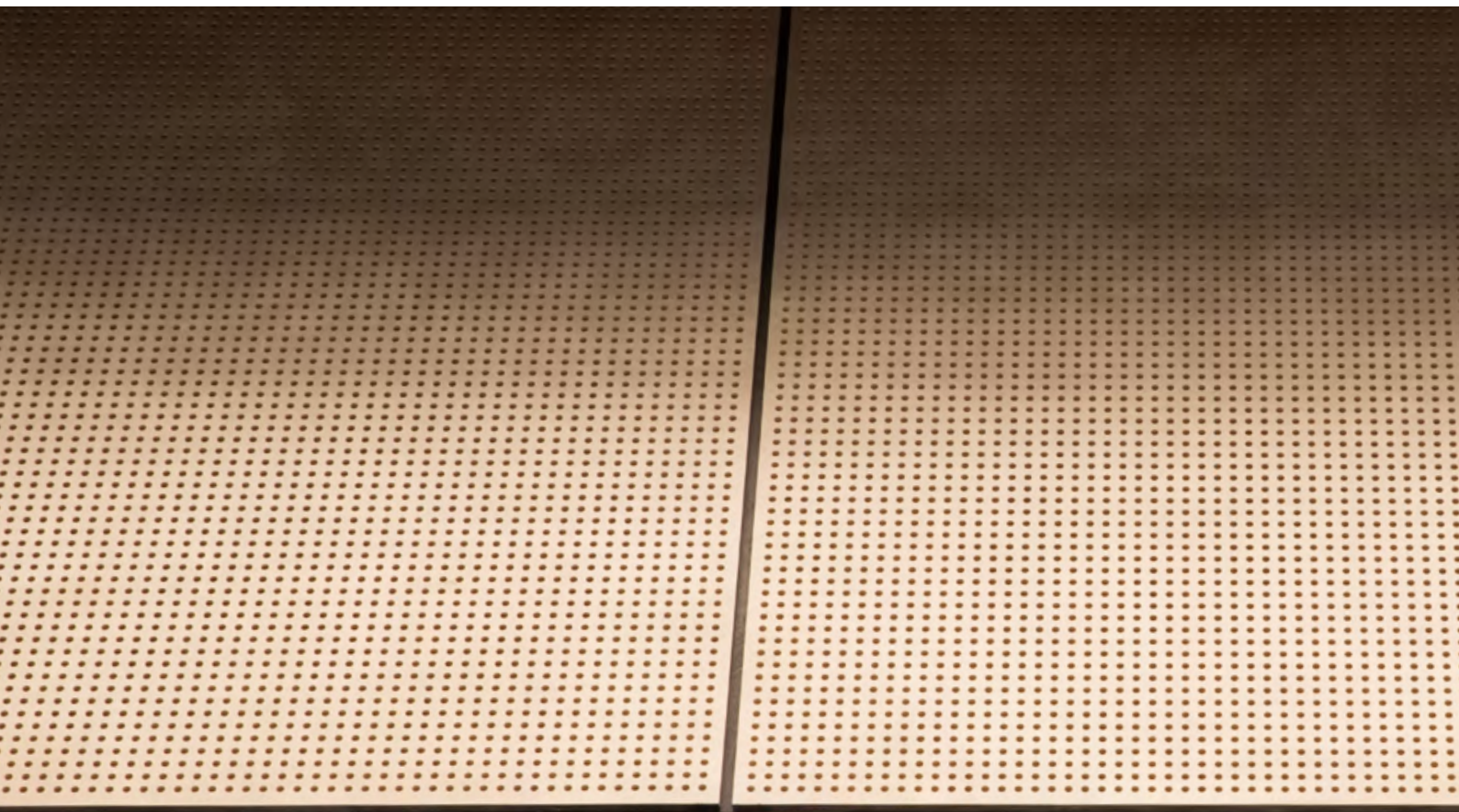
Information related to Sector EPD

This is an individual EPD.

Differences versus previous versions

This EPD is prepared according to EN 15804:2012+A2 standard, the previous EPD which was prepared according to EN 15804+A1 standard.

This EPD related LCA has been performed with much greater company specialist and expert involvement with the goal to model correct and process representative logistics in supply chain, material flows, chose material specific and representative data sets for life cycle assessment calculations.



References

- General Programme Instructions of the International EPD® System. Version 4.0.
- PCR 2019:14 Construction products v1.3.3
- c-PCR-006 Wood and wood-based products for use in Construction (version 2019-12-20)
- 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
- LCA software SimaPro 9.5.0.2, Ecoinvent v3.9.1
- ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework
- ISO 14044:2006. Environmental management – Life cycle assessment – Requirements and guidelines
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