Environmental Product Declaration

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

Uncoated Medium/High Density Fiberboard (Guarafiber MDF/HDF Standard)

EPD of multiple products, based on the average results of the product group (2.5 to 45 mm) from

Guararapes Painéis S.A.

Programme:	The International EPD® System registered through the fully aligned regional programme: Hub EPD Brasil. More information at www.environdec.com
Programme operator:	EPD International AB, Regional hub: EPD Brasil.
EPD registration number:	S-P-13599
Publication date:	2024-05-13
Valid until:	2029-05-06

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): PCR 2019:2014 Construction products (version 1.3.3); c-PCR-021 Furniture (c-PCR to PCR 2019:14) (Adopted from EPD Norway)*, UN CPC Code: group 314.*
PCR review was conducted by: *Review chair: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: No chair appointed. The review panel may be contacted via the Secretariat www.environdec.com/contact.*
Life Cycle Assessment (LCA)
LCA accountability: *Roni Severis, EnCiclo Soluções Sustentáveis*
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: *Claudia Peña, Director of PINDA LCT SpA. Email: pinda.lct@gmail.com* Approved by: The International EPD® System
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.

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. The use of the results of modules A1-A3 without considering the results of module C is discouraged.

Company information

Owner of the EPD:

Guararapes Painéis S.A.

Contact:

Líria Rodrigues, Head of Environment, Social, and Governance [liria.rodrigues@guararapes.com.br].

Address:

Rod. Avelino Mandeli, s/n - KM 01 - Caçador - SC, 89500-000. Santa Catarina – Brazil.

Description of the organization:

With more than three decades manufacturing wood panels, Guararapes is one of the largest MDF exporters in Latin America, supplying products to more than 50 countries. The company currently operates three factories in Brazil, located at Caçador/SC (MDF/HDF), Palmas/PR (Plywood) and Santa Cecília/SC (Plywood), with quality assurance that complies with the most demanding markets and certifications, featuring its commitment to responsible development and a healthy environment.

Product-related or management system-related certifications:

Guararapes is awarded with several certifications, following EPA TSCA Title VI regulation, “Formaldehyde Emission Standards for Composite Wood Products,” 40 CFR Part 770. This certification ensures compliance with the California Air Resources Board (CARB) Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products, 17 CCR 93120 (ATCM 93120), and the Canadian SOR/2021-148 “Formaldehyde Emissions Standard from Composite Wood Products Regulations”. Guararapes has certification for the STD E2 MDF product, which addresses the national market, and the STD E1 product, which addresses the European market. Both are controlled by NBR ABNT 15316-2:2019/EN ISO 12460-5. For melamine-coated MDF (also a product by Guararapes), regulation is under NBR ABNT 15761:2009. In addition, Guararapes complies with FSC® – Forest Stewardship Council® seal of Chain of Custody (Certificate Code: SCS-COC-002946; Trademark License Code: FSC-C041303 - FSC Standards: FSC-STD-40-003, FSC-STD-40-004, FSC-STD-40-005, FSC-STD-50-001) and ISO 14001:2015 (No. EMS 713103).

Name and location of production sites:

Rod. Avelino Mandeli, s/n - KM 01 - Caçador - SC, 89500-000. Santa Catarina – Brazil.

Product information

Product name: Medium/High Density Fiberboard (MDF/HDF), uncoated.

Product identification: Guarafiber MDF/HDF Standard are softwood MDF/HDF panels (uncoated) in a range of thicknesses from 2.5 to 45 mm. The assessed scope includes uncoated Standard panels of 03 mm, 06 mm, 15 mm and 25 mm and uncoated CARB panels of 3.5 mm, 18 mm, and 25 mm.

Product description:

Medium and High density fiberboards are made from wood chips, that are further defibered, mixed with adhesives and pressed into a uniform sheet. MDF/HDF have a lower cost comparing to many types of hardwood lumber and is often used for cabinet doors, furniture assembly, and other decorative elements. Guararapes's panels are distinguished between the Standard panels and CARB-certified products (certification on the maximum values for formaldehyde emissions in wood-based products). The table below presents further details of the product group:

Characteristics	Description and values
Applications	Used to become part of a wood-based piece of furniture
Finishing	Uncoated
Dimensions (mm x mm)	2 750 x 1 850
Thickness range (mm)	2.5 to 45 mm
Specific weight (kg/m³)	738.6 (weight average uncoated MDF/HDF) 670.0 to 870.0 (full range)

UN CPC code: group 314 (boards and panels).

Geographical scope:

Product stage: Brazil.
Construction process stage: Global.
End of life stage: Global (C1 to C3) and Europe (C4).

LCA information

Declared unit:

1 piece of MDF/HDF furniture (uncoated / Standard or CARB).

Reference flow:

The reference flow is 1 m³ of uncoated MDF/HDF furniture, with 738.6 kg.

Conversion factor to mass:

1 piece (also 1 m³) of uncoated panel equals to (on weight-average content) 738.6 kg. Also, the product group lies within a range from 670 to 870 kg/m³, being HDF denser in comparison to MDF panels.

Declared indicator results:

The results were calculated based on the volumetry of panel production over the baseline year, according to each thickness and type variation from Caçador/SC manufacturing unit. For each indicator result, the average was weighted according to the production volumes of the included products.

Reference service life:

No declaration by the RSL according to the standard is given. Use stage not declared.

Time representativeness: January 2022 to December 2022.

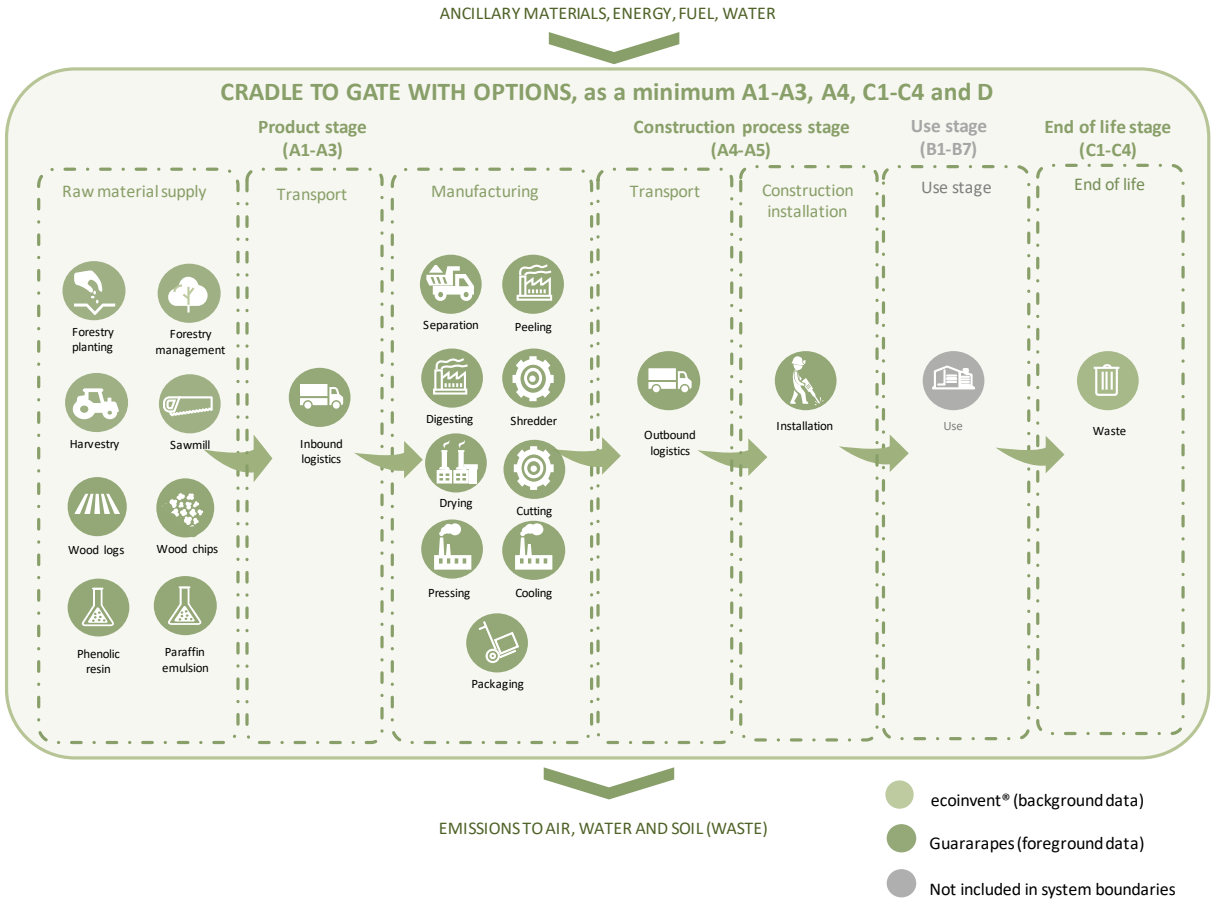
Database(s) and LCA software used:

SimaPro® (9.5.0.1) software developed by PRé Sustainability was used to create product system model and ecoinvent® (3.9.1) database provided the life cycle background data for product system modeling. EN 15804 reference package based on EF 3.1.

Description of System boundaries:

This is a type “2” EPD, which accounts for the cradle to gate with options, as a minimum A1-A3, A4, C1-C4 and D. We included in the assessment the optional information module A5. This scope is related to the product stage (life-cycle stages A1-A3), construction/installation stage (life-cycle stages A4-A5), end-of-life stage (life-cycle stages C1-C4), and benefits and loads beyond the system boundary (life-cycle stage D).

System diagram:



More information:

Description of system stages:

Forestry:

Guararape's wood panels (MDF/HDF) are manufactured mainly from pine (*Elliot sp.*) roundwood. The life cycle of pinewood (A1) begins with planting the seedlings after soil preparation. The soil is prepared with application of micro and macronutrients, including potassium, nitrogen, and phosphorus-based fertilizers, which increase yields and ensures production. Trees might undergo stages of plant control during the growth period: pruning and thinning, which are selective procedures of trees and vegetable mass removal aiming to improve the growth rate and quality of the remaining trees. After 25 years the trees are harvested through a mechanized process that generally consists of removing (uniformly) the trees in the selected area at the same time. Cutting should be done when the growth rate of the population slows down, which depends on the spacing, species, edaphoclimatic conditions and the genetic quality of the cultivated trees. After the harvesting, a process of land regeneration is carried out involving the rearrangement of forest residues and land treatment. The resulting land area becomes suitable for another forest cycle.

Raw Materials supply:

Besides wood logs, main raw materials (A1) that are consumed at panel manufacturing unit are urea formaldehyde resin and paraffin emulsion. Urea formaldehyde resin is a thermosetting polymer made by the combination of an aldehyde with a compound containing an amino group. At Guararapes product

system, polyethylene corners, polyester bands, cardboard protectors, and processed wood are used as primary packaging to assure the physical integrity of panels during outbound logistics.

Inbound logistics:
The wood logs are stored and sent by truck to the manufacturing unit in Caçador (GRC) in Santa Catarina State (A2). Diesel is consumed in trucks for the transportation of logs. Logs arrive from Guararapes's economic group forestry areas, as well as from external suppliers. Ancillary products are received at the factory after also being transported by trucks.

Manufacturing:
Once the wood arrives at the factory (A3) they go through sorting and separation, according to the demanded type of the panel. Wood logs are peeled off when arriving, aiming to separate the peels from the proper wood. The wood logs are then sent to a chipper to ensure uniform particle sizes. Then, the chips are digested to weaken internal bonds which eases further processing. Once digestion is complete, the material follows to a shredder in order to form the pulp. The lignin present in intercellular layers is softened, losing its ability to retain fibers, which results in a more resistant pulp and more flexible fibers. The wood fibers are dried, mixed with additives and hot-pressed, which attributes a panel-like shape to the whole mass and to meet their attributed thickness. The panels are cut and weathered at room temperature to avoid variation in dimensions after heating. The panels are sanded, finished, and packaged for shipment.

Outbound logistics:
Wood panels are transported (A4) by truck to inland ports and seaports, consuming diesel in the process. At the seaports, the panels are shipped to multiple destinations such as the United States, the European Union, Mexico and the United Kingdom (thus, representative of Global geography), until reaching the site of construction installation. The distribution scenario is representative of Guararapes' export operation. The assumptions pertaining to the scenarios of the declared modules are in accordance with the project report.

Installation:
The product is installed (A5) according to the instructions provided by the manufacturer. This stage comprises the installation of the panel, the transportation of wastes and final treatment of discarded packaging and panel installation breakages (5%). No energy or material inputs were considered in construction installation due to minor significance of those flows over the panel life cycle. According to professional's best judgement, installation of panels is a task that relies on human handling of the product, and it generates low wastages. The assumptions pertaining to the scenarios of the declared modules are in accordance with the project report.

Use/Maintenance:
The main application of the MDF/HDF panel is for furniture purposes, that is, to become a component of a piece of furniture. Due to uncertainty on the use and maintenance condition this module (B) was not declared in this EPD. The assumptions pertaining to the scenarios of the declared modules are in accordance with the project report.

End-of-life (EoL):
The removal of the panel (C1) from a site often involves human handling. Therefore, one of the most common scenarios is the manual operation. Since this do not imply in machinery use (or other processes), C1 burdens would reflect only small material fractions (e.g., nails and screws), which were not considered due to cut-off rule of environmental relevance. Once removed, the MDF/HDF is assumed

to be transported (C2) by trucks over 100 km to a waste processing facility and treatment site. The end-of-life (EoL) treatment accounted for incineration with energy recovery as the baseline scenario, which was modeled as a disposal process (C4) due to the efficiency of thermal treatment and PCR requirements. This EoL condition is representative of Europe, although it may vary and other management practices may apply, such as landfilling, recycling, reuse, and composting. Module C3 remains with no activities once the panel waste reaches the EoL in module C4 and involves some waste handling. The assumptions pertaining to the scenarios of the declared modules are in accordance with the project report.

Cut-off criteria:

At the manufacturing processes (i.e., module A3), sandpapers were dismissed due to its low mass and environmental relevance in comparison to the production volume over the manufacturing line. At the modules A5 (installation) and C1 (deinstallation), a few environmental aspects were cut-off due to low environmental relevance (e.g., nails, screws). Module C3 remained with no pre-processing activities, therefore with no inventory data and loads due to wood panel reaching the end of life in module C4. An internal sensitivity considering chipping or grinding at C3 demonstrated low influence on the impacts of GWP-GHG results in the most conservative scenario. Following recommendations of PCR 2019:14 (v. 1.3.3), section 4.3.2, the production and end-of-life processes of infrastructure or capital goods used in the product system were excluded because there was no evidence that they were relevant in terms of their environmental impact.

Allocation:

ISO 14044 provides a stepwise procedure (section 4.3.4.2) to recommend the choice of an allocation approach for the foreground processes. For the background datasets (unit process) from ecoinvent® database it was assumed the default allocation based on the economic value for the multi-output processes. Regarding waste, ecoinvent® database follows the cut-off approach which is equivalent to the polluter-pays principle adopted by the PCR 2019:14. More information on the allocation procedures by ecoinvent® database can be found on Weidema et al. (2013). For the foreground LCA model, economic allocation is applied to wood chips that enters the process as raw materials for the panel production. Those flows are by-products from Guararapes's Plywood units. At Caçador unit, mass allocation was applied for some minimal residual wood that is reprocessed into wooden skids and other wood frames aimed for packaging.

Emission factor for the electricity production:

GWP-GHG indicator: 0.1621 kg CO_2 eq./kWh on the manufacturing process (Southern Brazil's energy grid: 75% hydro, 11% other renewables, 12% non-renewables).

Name and contact information of LCA practitioner:

EnCiclo Soluções Sustentáveis	**EnCiclo Soluções Sustentáveis Ltda. Florianópolis, Brazil**	LCA practitioner:	Roni Severis
		Tel.:	Florianópolis: +55 48 99144-9245 São Paulo: +55 11 95694-7217
		E-mail:	roni@enciclo.com.br guilherme@enciclo.com.br
		Website:	www.enciclo.com.br

Uncoated panel	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	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	BR	BR	BR	Global	Global	ND	ND	ND	ND	ND	ND	ND	Global	Global	Global	Europe	Europe
Specific data used	>90%			>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation on GWP-GHG results* – products	+10/−13%			<10%	<10%	-	-	-	-	-	-	-	-	-	-	-	-
Variation on GWP-GHG results* – sites	0%			0%	0%	-	-	-	-	-	-	-	-	-	-	-	-

X = declared module

ND = module not declared

* Variation range in comparison to the declared result, considering different thicknesses/finishings (products).

Content information

Content declaration of the weight-averaged product group. In parentheses, the range of weight and biogenic material to the product group

Product components of 1 piece of uncoated panel	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/product
Wood, pine	681 (595 to 819)	0	100	333 (291 to 401)
Urea formaldehyde resin	55 (44 to 73)	0	0	0
Paraffin emulsion	3 (1 to 9)	0	0	0
TOTAL	**739 (670 to 870)**	**0**	**92**	**333 (291 to 401)**
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**		**Biogenic material, kg C/product**
Wood	32	4		14
Cardboard	<1	<1		<1
Polyethylene	<1	<1		0
Polyester	<1	<1		0
TOTAL	**33**	**5**		**14**

Substances of very high concern (SVHC)

These products contain no substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency or their amount is negligible.

Results of the environmental performance indicators

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 according to EN 15804

Results per declared unit – 1 piece of uncoated panel									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	$1.7*10^{2}$	$9.2*10^{1}$	$1.5*10^{1}$	$0.0*10^{0}$	$1.1*10^{1}$	$0.0*10^{0}$	$3.7*10^{0}$	$-1.9*10^{1}$
GWP-biogenic	kg CO_2 eq.	$-1.1*10^{3}$	$7.9*10^{-3}$	$5.4*10^{1}$	$0.0*10^{0}$	$7.1*10^{-4}$	$0.0*10^{0}$	$1.1*10^{3}$	$-6.6*10^{-1}$
GWP-luluc	kg CO_2 eq.	$-4.0*10^{1}$	$5.8*10^{-3}$	$-2.0*10^{0}$	$0.0*10^{0}$	$2.1*10^{-4}$	$0.0*10^{0}$	$7.5*10^{-4}$	$-4.8*10^{-1}$
GWP-total	kg CO_2 eq.	$-9.7*10^{2}$	$9.2*10^{1}$	$6.7*10^{1}$	$0.0*10^{0}$	$1.1*10^{1}$	$0.0*10^{0}$	$1.1*10^{3}$	$-2.0*10^{1}$
ODP	kg CFC 11 eq.	$5.1*10^{-6}$	$2.3*10^{-6}$	$4.1*10^{-7}$	$0.0*10^{0}$	$2.4*10^{-7}$	$0.0*10^{0}$	$2.8*10^{-7}$	$-3.1*10^{-7}$
AP	mol H^+ eq.	$8.1*10^{-1}$	$1.4*10^{0}$	$1.3*10^{-1}$	$0.0*10^{0}$	$4.0*10^{-2}$	$0.0*10^{0}$	$2.1*10^{-1}$	$-8.7*10^{-1}$
EP-freshwater	kg P eq.	$3.8*10^{-3}$	$5.8*10^{-5}$	$2.0*10^{-4}$	$0.0*10^{0}$	$8.6*10^{-6}$	$0.0*10^{0}$	$3.3*10^{-5}$	$-7.0*10^{-3}$
EP-marine	kg N eq.	$2.2*10^{-1}$	$3.4*10^{-1}$	$3.9*10^{-2}$	$0.0*10^{0}$	$1.7*10^{-2}$	$0.0*10^{0}$	$1.0*10^{-1}$	$-4.2*10^{-1}$
EP-terrestrial	mol N eq.	$2.1*10^{0}$	$3.8*10^{0}$	$4.2*10^{-1}$	$0.0*10^{0}$	$1.8*10^{-1}$	$0.0*10^{0}$	$1.2*10^{0}$	$-4.8*10^{0}$
POCP	kg NMVOC eq.	$7.4*10^{-1}$	$1.1*10^{0}$	$1.2*10^{-1}$	$0.0*10^{0}$	$6.1*10^{-2}$	$0.0*10^{0}$	$3.0*10^{-1}$	$-1.3*10^{0}$
ADP-minerals&metals*	kg Sb eq.	$5.7*10^{-5}$	$2.5*10^{-6}$	$3.0*10^{-6}$	$0.0*10^{0}$	$3.8*10^{-7}$	$0.0*10^{0}$	$6.2*10^{-7}$	$-1.2*10^{-6}$
ADP-fossil*	MJ	$2.9*10^{3}$	$1.2*10^{3}$	$2.1*10^{2}$	$0.0*10^{0}$	$1.5*10^{2}$	$0.0*10^{0}$	$3.5*10^{1}$	$-2.0*10^{2}$
WDP*	m^3	$7.4*10^{1}$	$9.6*10^{-1}$	$3.9*10^{0}$	$0.0*10^{0}$	$1.3*10^{-1}$	$0.0*10^{0}$	$1.4*10^{0}$	$-6.6*10^{-1}$
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 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.*

Products which the variation of each declared impact indicator result was above 10% (from A to C) compared to the declared results:

- GWP-luluc: *uncoated panel Std. 03mm, 25mm, CARB 3.5mm (*$-5.1*10^{1}$*,* $-3.6*10^{1}$*,* $-4.8*10^{1}$ *kg* CO_2 *eq., respectively).*
- ODP: *uncoated panel CARB 25mm (*$9.6*10^{-6}$ *kg CFC 11 eq.).*
- ADP-minerals&metals: *uncoated panel Std. 03mm, 06mm, 25mm, CARB 3.5mm, 18mm, 25mm (*$5.7*10^{-5}$*,* $5.4*10^{-5}$*,* $7.3*10^{-5}$*,* $5.3*10^{-5}$*,* $7.2*10^{-5}$*,* $8.0*10^{-5}$ *kg Sb eq., respectively).*
- ADP-fossil: *uncoated panel CARB 25mm (*$5.2*10^{3}$ *MJ).*

Additional mandatory and voluntary impact category indicators

Results per declared unit – 1 piece of uncoated panel									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	$2.0*10^{2}$	$9.2*10^{1}$	$1.6*10^{1}$	$0.0*10^{0}$	$1.1*10^{1}$	$0.0*10^{0}$	$3.8*10^{0}$	$-2.0*10^{1}$
PM	disease inc.	$8.3*10^{-6}$	$4.9*10^{-6}$	$8.5*10^{-7}$	$0.0*10^{0}$	$7.5*10^{-7}$	$0.0*10^{0}$	$1.5*10^{-6}$	$-7.7*10^{-5}$
IRP**	kBq U-235 eq	$1.4*10^{0}$	$1.3*10^{-1}$	$8.0*10^{-2}$	$0.0*10^{0}$	$2.3*10^{-2}$	$0.0*10^{0}$	$3.6*10^{-2}$	$-1.9*10^{-1}$
ETP-fw*	CTUe	$8.6*10^{2}$	$4.4*10^{2}$	$7.7*10^{1}$	$0.0*10^{0}$	$6.4*10^{1}$	$0.0*10^{0}$	$7.6*10^{1}$	$-3.1*10^{2}$
HTP-c*	CTUh	$1.5*10^{-6}$	$9.8*10^{-9}$	$9.7*10^{-8}$	$0.0*10^{0}$	$7.5*10^{-10}$	$0.0*10^{0}$	$2.0*10^{-7}$	$-7.4*10^{-8}$
HTP-nc*	CTUh	$1.3*10^{-6}$	$5.0*10^{-7}$	$1.3*10^{-7}$	$0.0*10^{0}$	$7.7*10^{-8}$	$0.0*10^{0}$	$3.8*10^{-7}$	$-2.8*10^{-6}$
SQP*	Pt	$2.9*10^{4}$	$1.8*10^{0}$	$1.5*10^{3}$	$0.0*10^{0}$	$2.8*10^{-1}$	$0.0*10^{0}$	$2.1*10^{0}$	$-1.2*10^{4}$
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index								

** 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. ** 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.*

Products which the declared GWP-GHG result (A1-A3) differed by more than 10% compared to the declared GWP-GHG results:

- GWP-GHG: *uncoated panel CARB 25mm ($2.3*10^{2}$ kg CO_2 eq.).*

Products which the variation of each declared impact indicator result was above 10% (from A to C) compared to the declared results:

- HTP-c: *uncoated panel Std. 03mm, 06mm, 25mm, CARB 3.5mm, 18mm, 25mm ($1.6*10^{-6}$, $1.6*10^{-6}$, $2.2*10^{-6}$, $1.5*10^{-6}$, $2.1*10^{-6}$, $2.4*10^{-6}$ CTUh, respectively).*
- SQP: *uncoated panel Std. 03mm, 25mm ($3.6*10^{4}$, $2.7*10^{4}$ Pt, respectively).*

[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 CO_2 is set to zero.

Resource use indicators

Results per declared unit – 1 piece of uncoated panel									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	$2.3*10^{3}$	$2.3*10^{0}$	$1.1*10^{2}$	$0.0*10^{0}$	$3.8*10^{-1}$	$0.0*10^{0}$	$1.2*10^{0}$	$-6.3*10^{3}$
PERM	MJ	$9.4*10^{3}$	$0.0*10^{0}$	$4.7*10^{2}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
PERT	MJ	$1.2*10^{4}$	$2.3*10^{0}$	$5.8*10^{2}$	$0.0*10^{0}$	$3.8*10^{-1}$	$0.0*10^{0}$	$1.2*10^{0}$	$-6.3*10^{3}$
PENRE	MJ	$1.7*10^{3}$	$1.2*10^{3}$	$1.5*10^{2}$	$0.0*10^{0}$	$1.5*10^{2}$	$0.0*10^{0}$	$3.5*10^{1}$	$-2.0*10^{2}$
PENRM	MJ	$1.2*10^{3}$	$0.0*10^{0}$	$6.2*10^{1}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
PENRT	MJ	$2.9*10^{3}$	$1.2*10^{3}$	$2.2*10^{2}$	$0.0*10^{0}$	$1.5*10^{2}$	$0.0*10^{0}$	$3.5*10^{1}$	$-2.0*10^{2}$
SM	kg	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
RSF	MJ	$5.6*10^{0}$	$0.0*10^{0}$	$2.8*10^{-1}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
NRSF	MJ	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
FW	m^3	$8.5*10^{0}$	$9.4*10^{-2}$	$4.6*10^{-1}$	$0.0*10^{0}$	$6.1*10^{-3}$	$0.0*10^{0}$	$3.1*10^{-1}$	$-5.9*10^{-2}$
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

Results per declared unit – 1 piece of uncoated panel									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	$4.0*10^{-1}$	$5.4*10^{-2}$	$2.2*10^{0}$	$0.0*10^{0}$	$7.3*10^{-3}$	$0.0*10^{0}$	$2.1*10^{1}$	$-1.9*10^{0}$
Non-hazardous waste disposed	kg	$2.8*10^{1}$	$4.3*10^{-1}$	$3.7*10^{0}$	$0.0*10^{0}$	$5.0*10^{-2}$	$0.0*10^{0}$	$2.2*10^{1}$	$-1.4*10^{-1}$
Radioactive waste disposed	kg	$6.7*10^{-3}$	$3.7*10^{-4}$	$3.8*10^{-4}$	$0.0*10^{0}$	$8.7*10^{-5}$	$0.0*10^{0}$	$1.6*10^{-4}$	$-1.1*10^{-4}$

Output flow indicators

Results per declared unit – 1 piece of uncoated panel									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
Material for recycling	kg	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
Materials for energy recovery	kg	$2.8*10^{-1}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$
Exported energy, electricity	MJ	$3.6*10^{-1}$	$0.0*10^{0}$	$4.6*10^{1}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$9.3*10^{2}$	$0.0*10^{0}$
Exported energy, thermal	MJ	$4.8*10^{0}$	$0.0*10^{0}$	$9.8*10^{1}$	$0.0*10^{0}$	$0.0*10^{0}$	$0.0*10^{0}$	$2.0*10^{3}$	$0.0*10^{0}$

Information on biogenic carbon content - average

Results per declared unit – 1 piece of uncoated panel		
Biogenic carbon content	**Unit**	**Quantity**
Biogenic carbon content in product	kg C	$3.3*10^{2}$
	kg CO_2 eq.	$1.2*10^{3}$
Biogenic carbon content in packaging	kg C	$1.4*10^{1}$
	kg CO_2 eq.	$5.0*10^{1}$

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

References

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

BS (2019) EN 15804+A2:2019 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EPD International (2022) Complementary Product Category Rules (c-PCR) to PCR 2019:14: Norge PCR 026 Part B for Furniture, version 2.0 (2022-021).

EPD International (2021) General Programme Instructions (GPI) for the International EPD® System, version 4.0.

EPD International (2024) Product Category Rules: construction products. PCR 2019:14, version 1.3.3.

ISO (2006a) 14025: Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

ISO (2006b) 14040: Environmental Management – Life Cycle Assessment – Principles and Framework.

ISO (2006c) 14044: Environmental Management – Life Cycle Assessment – Requirements and guidelines.

Weidema BP, Bauer C, Hischier R, Mutel C, Nemecek T, Reinhard J, Vadenbo CO, Wernet G (2013) Overview and methodology. Data quality guideline for the ecoinvent database version 3. Ecoinvent Report 1(v3). St. Gallen: The ecoinvent Centre.

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