

# Environmental Product Declaration



THE INTERNATIONAL EPD® SYSTEM



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

## Plywood, uncoated (Guaraply Plywood)

EPD of multiple products, based on the average results of the product group (7 to 30 mm) from

### Indústria de Compensados Guararapes LTDA



Programme:

Programme operator:

EPD registration number:

Publication date:

Valid until:

The International EPD® System registered through the fully aligned regional programme: Hub EPD Brasil. More information at [www.environdec.com](http://www.environdec.com)

EPD International AB, Regional hub: EPD Brasil.

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*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](http://www.environdec.com)*



## General information

### Programme information

<b>Programme:</b>	The International EPD <sup>®</sup> System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
<b>E-mail:</b>	<a href="mailto:info@environdec.com">info@environdec.com</a>

<b>Accountabilities for PCR, LCA and independent, third-party verification</b>
<b>Product Category Rules (PCR)</b>
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): <i>PCR 2019:2014 Construction products (version 1.3.3); c-PCR-006 (c-PCR to PCR 2019:2014) – Wood and wood-based products for use in construction (EN 16485:2014) (version 2019-12-20), UN CPC Code: group 314.</i>
PCR review was conducted by: <i>The Technical Committee of the International EPD System. See <a href="http://www.environdec.com">www.environdec.com</a> for a list of members. Review chair: No chair appointed. The review panel may be contacted via the Secretariat <a href="http://www.environdec.com/contact">www.environdec.com/contact</a>.</i>
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: <i>Roni Severis, EnCiclo Soluções Sustentáveis.</i>
<b>Third-party verification</b>
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by individual verifier  Third-party verifier: <i>Claudia Peña, Director of PINDA LCT SpA. Email: <a href="mailto:pinda.lct@gmail.com">pinda.lct@gmail.com</a></i>  Approved by: The International EPD <sup>®</sup> System  Procedure for follow-up of data during EPD validity involves third party verifier:  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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 characterization 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:

Indústria de Compensados Guararapes LTDA.

### Contact:

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

### Address:

R. Alcina Santos Araújo, 411 - São Francisco, Palmas – PR, CEP 85.555-000. Paraná – Brazil.

### Description of the organization:

With more than three decades manufacturing wood panels, Guararapes is one of the largest plywood exporters in Latin America, supplying products to more than 50 countries. The company currently operates three factories in Brazil, located at Caçador/SC (MDF), 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, such as the European Standards CE 2+ (No. CR 3110012981/2/2022) and CE 4 (No. UK 0836-CPR-22/F6205), British Standard 5268-2 (No. 16/5292), PS1-19 (US and Canada) (No. PS 1-19/0721811), AS/NZS 2269.0 (BV) (Australia and New Zealand) (No. 2780) and UKCA (Great Britain) (No. UK 0836-CPR-22/F6205). In addition, Guararapes complies with FSC<sup>®</sup> – Forest Stewardship Council<sup>®</sup> 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:

BR-116, S/N – Distrito Industrial, Santa Cecília – SC, CEP 89.540-000. Santa Catarina – Brazil.

R. Alcina Santos Araújo, 411 - São Francisco, Palmas – PR, CEP 85.555-000. Paraná – Brazil.



*Data from each site was weight-averaged according to the production volumes of the included products during the baseline year.*



## Product information

### Product name:

Plywood, uncoated.

### Product identification:

Guaraply Plywood is a softwood plywood in a range of thicknesses from 7 to 30 mm. The assessed scope includes uncoated plywood with thickness of 09 mm, 12 mm, 15 mm, 18 mm, 20 mm, 21 mm, and 24 mm.

### Product description:

Plywood is a structural material manufactured from thin layers of wood, glued with adjacent layers to assemble a composite material. In terms of application, plywood is widely used as flooring, subflooring, wall and roof sheathing, wall partitions, sidewalls, decking, and paneling applications. Plywood panels are manufactured by Guararapes in different thicknesses (range from 7 to 30 mm, production lines 1 and 2) and visual characteristics of the surfaces. These products are primarily composed of softwood (pinewood) and resin. The packaging is composed of plastic, polyester, and processed wood. The table below presents further details of the product group:



Characteristics	Description and values
<b>Finishing</b>	Sanded and not sanded
<b>Dimensions (mm x mm)</b>	2 400 x 1 200   2 440 x 1 220   2 500 x 1 250
<b>Thickness range (mm)</b>	7 to 30 mm
<b>Specific weight (kg/m<sup>3</sup>)</b>	526.50 (average)

### 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 m<sup>3</sup> of uncoated plywood.

### **Reference flow:**

The reference flow is 1 m<sup>3</sup> of uncoated plywood with 526.50 kg.

### **Conversion factor to mass:**

1 m<sup>3</sup> of uncoated plywood equals to 526.50 kg.

### **Declared indicator results:**

The results were calculated based on the volumetry of plywood production over the baseline year, according to each thickness variation from two manufacturing sites (Santa Cecilia unit and Palmas unit). For each indicator, 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.

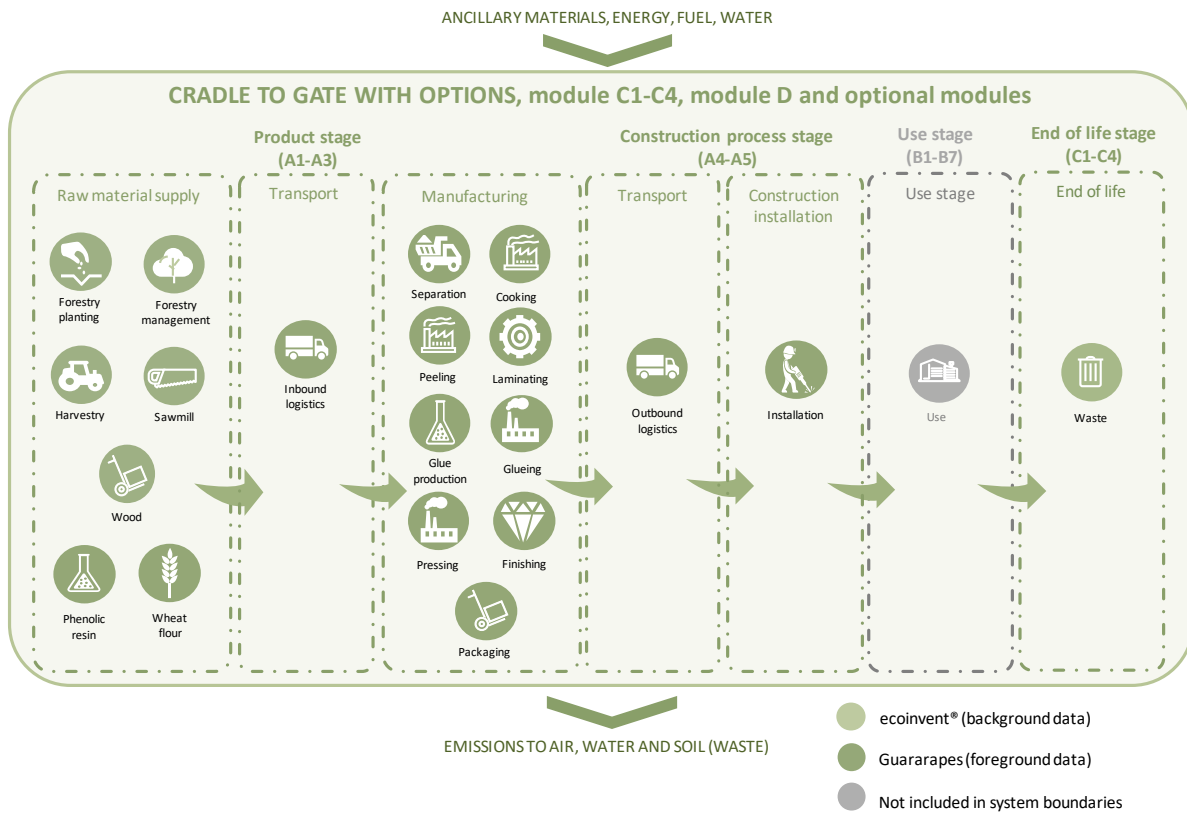
### **Database(s) and LCA software used:**

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 was based on EF 3.1.

### **Description of system boundaries:**

This is a type “b” - Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and additional modules). The selected additional modules on this EPD were A4-A5, while use stage (module B) was not declared. Module D is beyond system boundary.

**System diagram:**



**More information:**

**Description of system stages:**

**Forestry:**

Plywood is manufactured at Guararapes 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, the main raw materials (A1) consumed at plywood manufacturing units are phenolic resin and wheat flour, which are ingredients of the glue applied to attach wood veneers into each other. Phenolic resin is the product of the polycondensation of phenols and aldehydes. Wheat flour is produced from harvested and milled wheat grain. At Guararapes product system, polyethylene corners, polyester

bands and processed wood skids are used as primary packaging to assure the physical integrity of plywood during outbound logistics.

#### **Inbound logistics:**

The wood logs are stored and sent by truck to the manufacturing unit of Palmas (GRP), in Paraná State and Santa Cecília (GRS) 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 materials are received at the factory after also being transported by trucks.

#### **Manufacturing:**

Once the wood logs arrive at the factory (A3), the material goes through sorting and separation, according to the demanded type of plywood to be manufactured. The wood logs go through the processes of steaming, peeling, and lamination. Peeling and lamination processes are mechanized, with electricity-powered machinery. Wood chips generated before the assembly and glueing stage are sent to Guararapes' MDF manufacturing unit. After the primary chopping, the veneers are dried and proceed to the assembly and glueing stage. The glue is produced in a mixer, and it is made mainly from a phenolic resin. The dry wood veneers are glued perpendicularly to each other before being sent to a pneumatic press. Residual wood from this process is sent to a secondary chipper. The panel with glued veneers is the result of the pressing stage, which consumes electricity and steam. At the finishing phase, acrylic putty is applied on the panels aiming to repair any flaws on the product. Then, a squaring machine attributes fine alignment to the contours of the panels. Wood waste generated after assembly and glueing is consumed at the steam boiler. The panels repaired with acrylic putty are sanded in order to achieve desired properties and may vary in thickness according to the product. Lastly, the panels are packed and shipped to the consumer market.

#### **Outbound logistics:**

Plywood panels are transported (A4) by truck to 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 plywood and the transportation and treatment of discarded packaging and panel installation breakages (around 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 plywood 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 assessed plywood panels is for construction purposes, in order to become a permanent component of a building. 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 plywood panel (C1) from a construction 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 plywood 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 plywood 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:

Regarding plywood manufacturing, sandpapers and saws were dismissed due to low mass and environmental relevance, as well as the production volume and long lifespan. Both materials are consumed at the “Panel sanding” stage. At the modules A5 (installation) and C1 (deinstallation), a few environmental aspects were cut-off due to low environmental relevance (e.g., nails, screws, tapes and accessories). Module C3 remained with no pre-processing activities, therefore with no inventory data and loads due to plywood 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<sup>®</sup> database it was assumed the default allocation based on the economic value for the multi-output processes. Regarding waste, ecoinvent<sup>®</sup> 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<sup>®</sup> database can be found on Weidema et al. (2013). The allocation based on the economic value was used for the foreground LCA model since by-products (wood chips, wood slats, sides for doors, wood logs, and biomass) present high difference in revenue per mass. Thus, an economic allocation based on the selling price of each flow was applied at the multifunctional process.

### Emission factor for the electricity production:

GWP-GHG indicator: 0.1621 kg CO<sub>2</sub> 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:

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**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
<b>Modules declared</b>	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
<b>Geography</b>	BR	BR	BR	Global	Global	ND	ND	ND	ND	ND	ND	ND	Global	Global	Global	Europe	Europe
<b>Specific data used</b>	>90%		>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Variation on GWP-GHG results* – products</b>	+26/-10%		<10%	<10%	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Variation on GWP-GHG results* – sites</b>	+10/-8%		<10%	<10%	-	-	-	-	-	-	-	-	-	-	-	-	-

X = declared module

ND = module not declared

\* Variation range in comparison to the declared result, considering different thicknesses/finishings (products) and production sites (Palmas and Santa Cecilia).

## 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	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/product
Wood, pine	501 (473 to 509)	0	100	250 (236 to 254)
Phenolic resin	9 (8 to 9)	0	0	0 (0 to 0)
Wheat flour	14 (13 to 14)	0	100	7 (7 to 7)
Others	3 (3 to 3)	0	20	<1 (<1 to <1)
<b>TOTAL</b>	<b>527 (498 to 535)</b>	<b>0</b>	<b>98</b>	<b>257 (243 to 261)</b>
Packaging materials	Weight, kg	Weight-% (versus the product)		Biogenic material, kg C/product
Wood	3	<1		2
Polyethylene	<1	<1		0
Polyester	<1	<1		0
<b>TOTAL</b>	<b>3</b>	<b>&lt;1</b>		<b>2</b>

### 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 m <sup>3</sup> of uncoated plywood									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
<b>GWP-fossil</b>	kg CO <sub>2</sub> eq.	2.6*10 <sup>2</sup>	6.7*10 <sup>1</sup>	1.7*10 <sup>1</sup>	0.0*10 <sup>0</sup>	8.0*10 <sup>0</sup>	0.0*10 <sup>0</sup>	2.7*10 <sup>0</sup>	-1.4*10 <sup>1</sup>
<b>GWP-biogenic</b>	kg CO <sub>2</sub> eq.	-8.7*10 <sup>2</sup>	5.2*10 <sup>-3</sup>	9.1*10 <sup>0</sup>	0.0*10 <sup>0</sup>	5.2*10 <sup>-4</sup>	0.0*10 <sup>0</sup>	9.5*10 <sup>2</sup>	-4.8*10 <sup>-1</sup>
<b>GWP-luluc</b>	kg CO <sub>2</sub> eq.	-9.3*10 <sup>1</sup>	3.7*10 <sup>-3</sup>	-4.7*10 <sup>0</sup>	0.0*10 <sup>0</sup>	1.6*10 <sup>-4</sup>	0.0*10 <sup>0</sup>	5.5*10 <sup>-4</sup>	-3.5*10 <sup>-1</sup>
<b>GWP-total</b>	kg CO <sub>2</sub> eq.	-7.1*10 <sup>2</sup>	6.7*10 <sup>1</sup>	2.1*10 <sup>1</sup>	0.0*10 <sup>0</sup>	8.0*10 <sup>0</sup>	0.0*10 <sup>0</sup>	9.6*10 <sup>2</sup>	-1.4*10 <sup>1</sup>
<b>ODP</b>	kg CFC 11 eq.	3.8*10 <sup>-6</sup>	1.5*10 <sup>-6</sup>	2.8*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	1.7*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	2.0*10 <sup>-7</sup>	-2.3*10 <sup>-7</sup>
<b>AP</b>	mol H <sup>+</sup> eq.	1.4*10 <sup>0</sup>	1.1*10 <sup>0</sup>	1.4*10 <sup>-1</sup>	0.0*10 <sup>0</sup>	2.9*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	1.5*10 <sup>-1</sup>	-6.4*10 <sup>-1</sup>
<b>EP-freshwater</b>	kg P eq.	2.3*10 <sup>-2</sup>	4.4*10 <sup>-5</sup>	1.1*10 <sup>-3</sup>	0.0*10 <sup>0</sup>	6.3*10 <sup>-6</sup>	0.0*10 <sup>0</sup>	2.4*10 <sup>-5</sup>	-5.2*10 <sup>-3</sup>
<b>EP-marine</b>	kg N eq.	6.3*10 <sup>-1</sup>	2.7*10 <sup>-1</sup>	5.0*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	1.3*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	7.5*10 <sup>-2</sup>	-3.1*10 <sup>-1</sup>
<b>EP-terrestrial</b>	mol N eq.	5.2*10 <sup>0</sup>	3.0*10 <sup>0</sup>	4.6*10 <sup>-1</sup>	0.0*10 <sup>0</sup>	1.4*10 <sup>-1</sup>	0.0*10 <sup>0</sup>	8.6*10 <sup>-1</sup>	-3.5*10 <sup>0</sup>
<b>POCP</b>	kg NMVOC eq.	1.5*10 <sup>0</sup>	8.4*10 <sup>-1</sup>	1.3*10 <sup>-1</sup>	0.0*10 <sup>0</sup>	4.5*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	2.2*10 <sup>-1</sup>	-9.4*10 <sup>-1</sup>
<b>ADP-minerals&amp;metals*</b>	kg Sb eq.	1.5*10 <sup>-4</sup>	1.6*10 <sup>-6</sup>	7.8*10 <sup>-6</sup>	0.0*10 <sup>0</sup>	2.8*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	4.6*10 <sup>-7</sup>	-9.0*10 <sup>-7</sup>
<b>ADP-fossil*</b>	MJ	3.7*10 <sup>3</sup>	8.5*10 <sup>2</sup>	2.3*10 <sup>2</sup>	0.0*10 <sup>0</sup>	1.1*10 <sup>2</sup>	0.0*10 <sup>0</sup>	2.6*10 <sup>1</sup>	-1.5*10 <sup>2</sup>
<b>WDP*</b>	m <sup>3</sup>	9.3*10 <sup>1</sup>	7.0*10 <sup>-1</sup>	4.8*10 <sup>0</sup>	0.0*10 <sup>0</sup>	9.8*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	1.0*10 <sup>0</sup>	-4.9*10 <sup>-1</sup>
<b>Acronyms</b>	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-fossil: *site GRS's plywood 09mm (3.1\*10<sup>2</sup> kg CO<sub>2</sub> eq.).*
- GWP-luluc: *site GRP's plywood 09mm, 24mm (-1.1\*10<sup>2</sup>, -1.1\*10<sup>2</sup> kg CO<sub>2</sub> eq., respectively); site GRS's plywood 20mm, 24mm (-8.1\*10<sup>1</sup>, -8.8\*10<sup>1</sup> kg CO<sub>2</sub> eq., respectively).*
- GWP-total: *site GRP's plywood 09mm, 15mm (2.9\*10<sup>2</sup>, 3.0\*10<sup>2</sup> kg CO<sub>2</sub> eq., respectively); site GRS's plywood 09mm (3.0\*10<sup>2</sup> kg CO<sub>2</sub> eq.).*
- ODP: *site GRS's plywood 09mm (5.2\*10<sup>-6</sup> kg CFC 11 eq.). AP, from A to C, site GRP's plywood 12mm, 24mm (3.2\*10<sup>0</sup>, 3.2\*10<sup>0</sup> mol H+ eq., respectively); site GRS's plywood 09mm, 12mm, 15mm, 18mm, 20mm, 21mm (2.3\*10<sup>0</sup>, 2.5\*10<sup>0</sup>, 2.4\*10<sup>0</sup>, 2.5\*10<sup>0</sup>, 2.4\*10<sup>0</sup>, 2.4\*10<sup>0</sup> mol H+ eq., respectively).*
- EP-freshwater: *site GRP's plywood 09mm, 15mm (1.9\*10<sup>-2</sup>, 2.1\*10<sup>-2</sup> kg P eq., respectively); site GRS's plywood 09mm, 15mm, 21mm (1.8\*10<sup>-2</sup>, 2.1\*10<sup>-2</sup>, 2.2\*10<sup>-2</sup> kg P eq., respectively).*
- EP-marine: *site GRP's plywood 12mm, 18mm, 24mm (1.2\*10<sup>0</sup>, 1.2\*10<sup>0</sup>, 1.2\*10<sup>0</sup> kg N eq., respectively); site GRS's plywood 09mm, 12mm, 15mm, 18mm, 20mm, 21mm, 24mm (8.0\*10<sup>-1</sup>, 9.1\*10<sup>-1</sup>, 8.5\*10<sup>-1</sup>, 9.1\*10<sup>-1</sup>, 8.6\*10<sup>-1</sup>, 8.5\*10<sup>-1</sup>, 9.1\*10<sup>-1</sup> kg N eq., respectively).*
- EP-terrestrial, from A to C, *site GRP's plywood 09mm, 12mm, 15mm, 18mm, 21mm, 24mm (1.1\*10<sup>1</sup>, 1.2\*10<sup>1</sup>, 1.1\*10<sup>1</sup>, 1.1\*10<sup>1</sup>, 1.1\*10<sup>1</sup>, 1.2\*10<sup>1</sup> mol N eq., respectively); site GRS's plywood 09mm, 12mm, 15mm, 18mm, 20mm, 21mm, 24mm (7.2\*10<sup>0</sup>, 8.0\*10<sup>0</sup>, 7.5\*10<sup>0</sup>, 8.0\*10<sup>0</sup>, 7.6\*10<sup>0</sup>, 7.6\*10<sup>0</sup>, 8.1\*10<sup>0</sup> mol N eq., respectively).*
- POCP: *site GRP's plywood 12mm, 18mm, 21mm, 24mm (3.2\*10<sup>0</sup>, 3.1\*10<sup>0</sup>, 3.0\*10<sup>0</sup>, 3.2\*10<sup>0</sup> kg NMVOC eq., respectively); site GRS's plywood 09mm, 12mm, 15mm, 18mm, 20mm, 21mm, 24mm (2.1\*10<sup>0</sup>, 2.3\*10<sup>0</sup>, 2.2\*10<sup>0</sup>, 2.3\*10<sup>0</sup>, 2.2\*10<sup>0</sup>, 2.2\*10<sup>0</sup>, 2.3\*10<sup>0</sup> kg NMVOC eq., respectively).*
- ADP-minerals&metals: *site GRP's plywood 09mm, 15mm (1.3\*10<sup>-4</sup>, 1.4\*10<sup>-4</sup> kg Sb eq., respectively); site GRS's plywood 09mm, 15mm, 21mm (1.2\*10<sup>-4</sup>, 1.4\*10<sup>-4</sup>, 1.4\*10<sup>-4</sup> kg Sb eq., respectively).*
- ADP-fossil: *site GRP's plywood 09mm (4.3\*10<sup>3</sup> MJ); site GRS's plywood 09mm, 15mm, (3.9\*10<sup>3</sup>, 4.4\*10<sup>3</sup> MJ, respectively).*
- WDP: *site GRP's plywood 09mm (8.9\*10<sup>1</sup> m<sup>3</sup> world depriv.); site GRS's plywood 09mm, 15mm, 20mm, 21mm (7.7\*10<sup>1</sup>, 8.6\*10<sup>1</sup>, 8.9\*10<sup>1</sup>, 8.7\*10<sup>1</sup> m<sup>3</sup> world depriv., respectively).*

\*GRS stands for manufacturing unit of Santa Cecilia/SC | GRP stands for manufacturing unit of Palmas/PR

## Additional mandatory and voluntary impact category indicators

Results per declared unit - 1 m <sup>3</sup> of uncoated plywood									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
<b>GWP-GHG<sup>1</sup></b>	kg CO <sub>2</sub> eq.	2.5*10 <sup>2</sup>	6.7*10 <sup>1</sup>	1.6*10 <sup>1</sup>	0.0*10 <sup>0</sup>	8.0*10 <sup>0</sup>	0.0*10 <sup>0</sup>	2.8*10 <sup>0</sup>	-1.4*10 <sup>1</sup>
<b>PM</b>	disease inc.	1.1*10 <sup>-5</sup>	3.2*10 <sup>-6</sup>	7.9*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	5.6*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	1.1*10 <sup>-6</sup>	-5.7*10 <sup>-5</sup>
<b>IRP**</b>	kBq U235 eq	9.6*10 <sup>-1</sup>	9.4*10 <sup>-2</sup>	5.5*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	1.7*10 <sup>-2</sup>	0.0*10 <sup>0</sup>	2.6*10 <sup>-2</sup>	-1.4*10 <sup>-1</sup>
<b>ETP-fw*</b>	CTUe	1.6*10 <sup>4</sup>	3.4*10 <sup>2</sup>	8.4*10 <sup>2</sup>	0.0*10 <sup>0</sup>	4.7*10 <sup>1</sup>	0.0*10 <sup>0</sup>	5.6*10 <sup>1</sup>	-2.3*10 <sup>2</sup>
<b>HTP-c*</b>	CTUh	7.7*10 <sup>-7</sup>	7.5*10 <sup>-9</sup>	4.7*10 <sup>-8</sup>	0.0*10 <sup>0</sup>	5.6*10 <sup>-10</sup>	0.0*10 <sup>0</sup>	1.5*10 <sup>-7</sup>	-5.5*10 <sup>-8</sup>
<b>HTP-nc*</b>	CTUh	2.9*10 <sup>-6</sup>	3.3*10 <sup>-7</sup>	1.8*10 <sup>-7</sup>	0.0*10 <sup>0</sup>	5.7*10 <sup>-8</sup>	0.0*10 <sup>0</sup>	2.8*10 <sup>-7</sup>	-2.0*10 <sup>-6</sup>
<b>SQP*</b>	Pt	7.3*10 <sup>4</sup>	1.3*10 <sup>0</sup>	3.7*10 <sup>3</sup>	0.0*10 <sup>0</sup>	2.0*10 <sup>-1</sup>	0.0*10 <sup>0</sup>	1.5*10 <sup>0</sup>	-8.8*10 <sup>3</sup>
<b>Acronyms</b>	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, A1-A3, site GRP's plywood 09mm, 15mm, 21mm (1.9\*10<sup>2</sup>, 2.1\*10<sup>2</sup>, 2.2\*10<sup>2</sup> kg CO<sub>2</sub> eq., respectively); site GRS's plywood 09mm (2.1\*10<sup>2</sup> kg CO<sub>2</sub> eq.).

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

- GWP-GHG: site GRP's plywood 09mm, 15mm (2.9\*10<sup>2</sup>, 3.0\*10<sup>2</sup> kg CO<sub>2</sub> eq., respectively); site GRS's plywood 09mm (3.0\*10<sup>2</sup> kg CO<sub>2</sub> eq.).
- PM: site GRS's plywood 09mm, 15mm, 21mm (1.4\*10<sup>-5</sup>, 1.5\*10<sup>-5</sup>, 1.5\*10<sup>-5</sup> disease inc., respectively).
- IRP: site GRS's plywood 09mm (9.8\*10<sup>-1</sup> kBq U235 eq.).
- ETP-fw: site GRP's plywood 09mm (1.5\*10<sup>4</sup> CTUe); site GRS's plywood 09mm, 15mm, 21mm (1.3\*10<sup>4</sup>, 1.5\*10<sup>4</sup>, 1.5\*10<sup>4</sup> CTUe, respectively).

<sup>1</sup> 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<sub>2</sub> is set to zero.



- HTP-c: site GRP's plywood 09mm, 15mm ( $8.0 \times 10^{-7}$ ,  $8.6 \times 10^{-7}$  CTUh); site GRS's plywood 09mm, 15mm, 21mm ( $7.3 \times 10^{-7}$ ,  $8.5 \times 10^{-7}$ ,  $8.8 \times 10^{-7}$  CTUh, respectively).
- HTP-nc: site GRP's plywood 09mm ( $3.3 \times 10^{-6}$  CTUh); site GRS's plywood 09mm, 15mm, 21mm ( $3.0 \times 10^{-6}$ ,  $3.3 \times 10^{-6}$ ,  $3.4 \times 10^{-6}$  CTUh, respectively).
- SQP: site GRP's plywood 09mm, 15mm, 18mm, 21mm ( $6.8 \times 10^4$ ,  $6.8 \times 10^4$ ,  $6.9 \times 10^4$ ,  $6.8 \times 10^4$  Pt, respectively).

\*GRS stands for manufacturing unit of Santa Cecilia/SC | GRP stands for manufacturing unit of Palmas/PR

## Resource use indicators

Results per declared unit - 1 m <sup>3</sup> of uncoated plywood									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	$1.6 \times 10^3$	$1.6 \times 10^0$	$7.9 \times 10^1$	$0.0 \times 10^0$	$2.8 \times 10^{-1}$	$0.0 \times 10^0$	$8.8 \times 10^{-1}$	$-4.6 \times 10^3$
PERM	MJ	$6.7 \times 10^3$	$0.0 \times 10^0$	$3.4 \times 10^2$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
PERT	MJ	$8.3 \times 10^3$	$1.6 \times 10^0$	$4.1 \times 10^2$	$0.0 \times 10^0$	$2.8 \times 10^{-1}$	$0.0 \times 10^0$	$8.8 \times 10^{-1}$	$-4.6 \times 10^3$
PENRE	MJ	$3.5 \times 10^3$	$8.5 \times 10^2$	$2.2 \times 10^2$	$0.0 \times 10^0$	$1.1 \times 10^2$	$0.0 \times 10^0$	$2.6 \times 10^1$	$-1.5 \times 10^2$
PENRM	MJ	$2.9 \times 10^2$	$0.0 \times 10^0$	$1.5 \times 10^1$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
PENRT	MJ	$3.8 \times 10^3$	$8.5 \times 10^2$	$2.4 \times 10^2$	$0.0 \times 10^0$	$1.1 \times 10^2$	$0.0 \times 10^0$	$2.6 \times 10^1$	$-1.5 \times 10^2$
SM	kg	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
RSF	MJ	$7.8 \times 10^0$	$0.0 \times 10^0$	$3.9 \times 10^{-1}$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
NRSF	MJ	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
FW	m <sup>3</sup>	$6.5 \times 10^0$	$6.0 \times 10^{-2}$	$3.4 \times 10^{-1}$	$0.0 \times 10^0$	$4.5 \times 10^{-3}$	$0.0 \times 10^0$	$2.3 \times 10^{-1}$	$-4.3 \times 10^{-2}$
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 resources; 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 m <sup>3</sup> of uncoated plywood									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	$3.6 \times 10^{-2}$	$5.4 \times 10^{-3}$	$1.3 \times 10^{-1}$	$0.0 \times 10^0$	$7.7 \times 10^{-4}$	$0.0 \times 10^0$	$2.2 \times 10^0$	$-1.4 \times 10^0$
Non-hazardous waste disposed	kg	$3.4 \times 10^0$	$4.5 \times 10^{-2}$	$3.1 \times 10^{-1}$	$0.0 \times 10^0$	$5.2 \times 10^{-3}$	$0.0 \times 10^0$	$2.3 \times 10^0$	$-1.0 \times 10^{-1}$
Radioactive waste disposed	kg	$5.3 \times 10^{-3}$	$1.0 \times 10^{-4}$	$4.6 \times 10^{-4}$	$0.0 \times 10^0$	$1.6 \times 10^{-5}$	$0.0 \times 10^0$	$3.1 \times 10^{-3}$	$-7.7 \times 10^{-5}$

## Output flow indicators

Results per declared unit - 1 m <sup>3</sup> of uncoated plywood									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
Material for recycling	kg	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
Materials for energy recovery	kg	$1.8 \times 10^{-1}$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$
Exported energy, electricity	MJ	$2.3 \times 10^{-1}$	$0.0 \times 10^0$	$3.4 \times 10^1$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$6.8 \times 10^2$	$0.0 \times 10^0$
Exported energy, thermal	MJ	$3.1 \times 10^0$	$0.0 \times 10^0$	$7.2 \times 10^1$	$0.0 \times 10^0$	$0.0 \times 10^0$	$0.0 \times 10^0$	$1.4 \times 10^3$	$0.0 \times 10^0$

## Information on biogenic carbon content - average

Results per declared unit - 1 m <sup>3</sup> of uncoated plywood		
Biogenic carbon content	Unit	Quantity
Biogenic carbon content in product	kg C	$2.6 \times 10^2$
	kg CO <sub>2</sub> eq.	$9.5 \times 10^2$
Biogenic carbon content in packaging	kg C	$1.4 \times 10^0$
	kg CO <sub>2</sub> eq.	$5.0 \times 10^0$

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

## References

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