

Environmental Product Declaration



THE INTERNATIONAL EPD® SYSTEM

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

Lavrasul Pine Plywood

EPD of multiple products, based on the average results of the product group (9 to 30 mm) from

Compensados e Laminados Lavrasul S/A



Programme:

Programme operator:

EPD registration number:

Version date:

Valid until:

The International EPD® System, registered through the fully aligned regional programme: Hub EPD Brasil. www.environdec.com

EPD International AB, Regional Hub: EPD Brasil.

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General information

Programme information

| | |
|-------------------|---|
| Programme: | The International EPD® System |
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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 2019:14 Construction products (version 1.3.4); c-PCR-006 (c-PCR to PCR 2019:14) – Wood and wood-based products for use in construction (EN 16485:2014) (version 2024-04-30), UN CPC Code group 314.*

PCR review was conducted by: *The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Last chair: Claudia A. Peña, Pinda LCT SpA, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.*

Life Cycle Assessment (LCA)



ACV Brasil Sustentabilidade Prest. Serv., Consult. e Asses. Ltda

<https://acvbrasil.com.br/>

LCA accountability: *Ana Rosa Fernandes and Laís Peixoto Rosado*

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: Edivan Cherubini, EnCiclo Soluções Sustentáveis. Email: edivan@enciclo.com.br

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.

Company information

Owner of the EPD

Compensados e Laminados Lavrasul S/A

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Description of the organization

Compensados e Laminados Lavrasul S/A, part of the Zugman Group, was founded on January 25, 1950. Renowned for the tradition, reliability and quality of its plywood and wood-based products, it stands out as one of the largest Brazilian companies in the wood export industry. Its product line currently includes plywood, doors, moldings, and other wood products. The company participates in major national and international wood quality programs and is a pioneer in Brazil in establishing an accredited-on site testing laboratory for the European Community and the United States, to ensure that its products comply with the required standards. Lavrasul mill is equipped with state-of-the-art machinery, to deliver productivity, quality, and safety to our employees. At Lavrasul, technology and product evolution go hand in hand. As such, modern production processes and continuous quality control and research are always developed.

Product-related or management system-related certifications

- FSC-C001989 SCS-COC-000617-A (FSC Chain of Custody)
- CARB/EPA/CANFER 23018 (CARB Phase 2 & TSCA Title VI & CANFER compliant)
- UKCA 8520-CPR-021 (BS EN 13986:2004+A1:2015 under system 2+)
- UKCA System 4 (BS EN 13986:2004+A1:2015)
- CE2+ 2358-CPR-0369 (EN 13986:2004+A1:2015 under system 2+)
- CE AVCP System 4 (EN 13986:2004+A1:2015)
- PNQM nº 058/2024 - National Program for Wood Quality
- PNQM nº 001/2024 - National Program for Wood Quality (Laboratory)

Name and location of production site

Compensados e Laminados Lavrasul S/A

Timbó Grande, Santa Catarina (SC) | Brazil



Industrial unit of plywood production

Product information

Product name

Lavrasul Pine Plywood.

Product identification

Lavrasul Pine Plywood is a softwood plywood in a range of thicknesses from 9 to 30 mm. The assessed scope includes uncoated plywood with thickness of 9 mm, 12 mm, 15 mm, 18 mm, 21 mm, 24 mm, and 30 mm.

Product description

The Lavrasul Pine Plywood line offers high-quality plywood panels available in thicknesses from 9 mm to 30 mm. These panels are primarily composed of softwood (pinewood) and resin. With excellent mechanical resistance and dimensional stability, they are suitable for both dry and humid environments. Lavrasul Pine Plywood panels are widely used in structural wooden constructions, packaging manufacturing, siding, concrete formwork, truck bodies, among other applications.



UN CPC code

Group 314 – Boards and panels.

Class 3141 – Plywood consisting solely of sheets of wood, except of bamboo.

Geographical scope

Raw materials production (A1), transport (A2) and the manufacturing process (A3) take place in Brazil. Product distribution (A4) and installation (A5) are modeled to reflect key consumer markets, including 62% North America, 32% Europe, 4% Central and South America, 2% Asia and Africa. The end-of-life stages (C1-C4) follow the same geographic distribution.

LCA information

Declared unit

1 m³ of Lavrasul Pine Plywood.

Reference flow

The reference flow is 1 m³ of plywood with 525 kg.

Conversion factor to mass

The product's apparent density and conversion factor to mass is 525 kg/m³ (<12% moisture content).

Declared indicator results

The results were calculated based on the total plywood production for the base year (2023). As a result, these values reflect the average environmental impacts for thicknesses ranging from 9 mm to 30 mm.

Reference service life (RSL)

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

Time representativeness

January 2023 to December 2023.

Database and LCA software used

SimaPro software v.9.6.0.1 developed by PRé Sustainability was used to create the product system model and ecoinvent v.3.10 database provided the life cycle background data for product system modeling. EN 15804 was based on JCR characterization factors (EF 3.1 package).

Description of system boundaries

The system boundary of this EPD follows option b) Cradle to gate with options, modules C1–C4, module D and with optional modules A4-A5 (A1–A3 + C + D and A4-A5 as additional modules). The module B is not part of this EPD. The System diagram (Figure 1) and further description present the stages considered in each module.

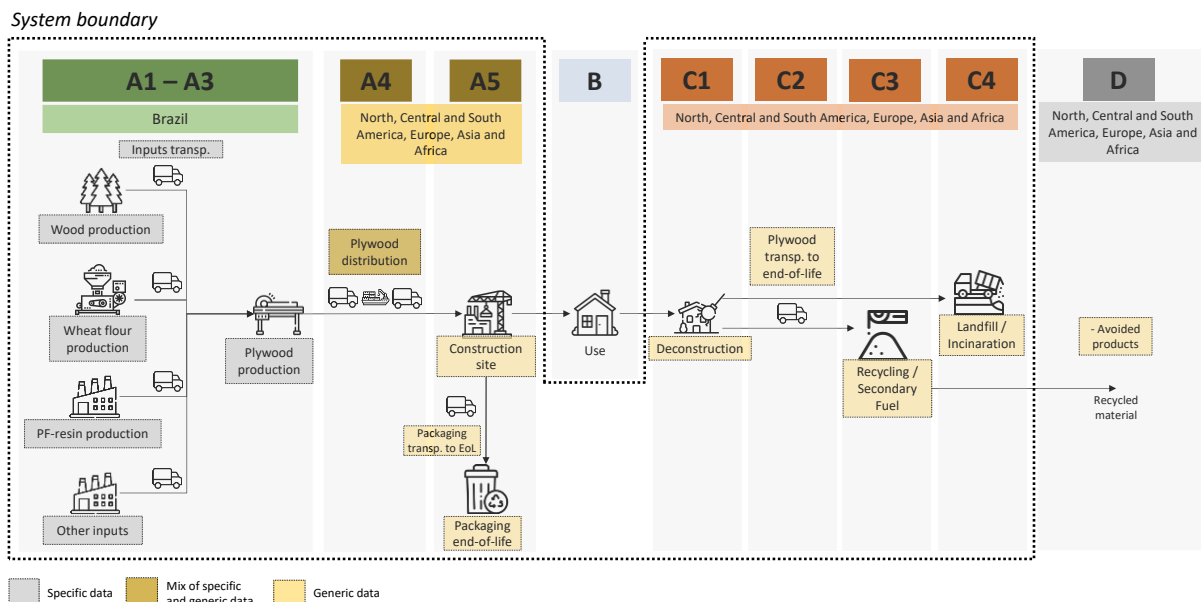


Figure 1. System diagram.

Module A1 covers the production of raw materials used in Lavrasul Pine Plywood production. Pine wood is cultivated in the state of Santa Catarina (Brazil), the same region where the industrial plant are located. Phenol-Formol resin is used as glue, in which wheat flour and water are added as a thickener.

Module A2 includes the transportation of raw materials and other inputs from the suppliers to Lavrasul industrial plant by road.

Module A3 considers the plywood panel manufacturing (Figure 2). The production process begins with receiving pine logs at the industrial plant. The heat source used throughout the process is the steam obtained by burning residual woodchips from wood processing and the electricity is from the regional grid. The logs are sent to the cooking stage, followed by the cutting for laminating the wood and then drying the veneers. The dried veneers go through machinery to classify their quality. Next, the veneers are positioned in alternating orientations and with applications of phenol-formaldehyde resin and thickener between them, followed by pressing in a steam press. The number of veneers determines the thickness of the plywood, varying between 9 and 30 mm. Finally, the plywood boards go to the sawing and sanding stages for finishing. Wood pallet, recycled plastic corners and steel wires are used as

packaging. This module also considers waste water treatment and waste sent to landfill, recycling and energy recovery.

The electricity consumed in the manufacturing stage comes from the regional electricity mix (*Electricity, medium voltage, BR-Southern grid*), whose GWP-GHG indicator is 0.188 kg CO₂ eq./kWh.

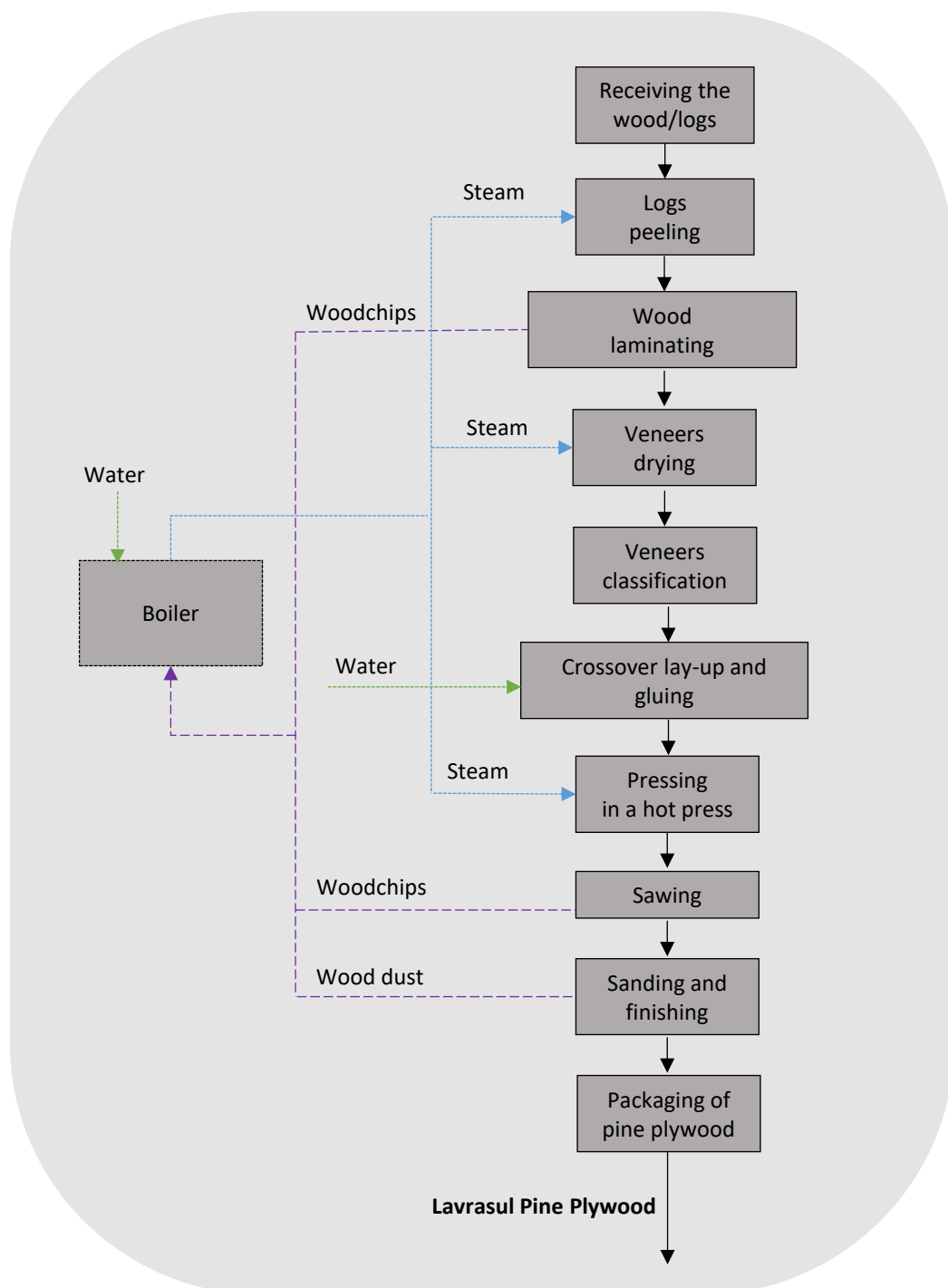


Figure 2. Plywood manufacturing diagram.

Module A4 covers the distribution of plywood to end users, considering the following consumer market distribution: 62% North America, 32% Europe, 4% Central and South America, 2% Asia and Africa. In most cases, transportation follows this sequence: road transport from Lavrasul to the Brazilian export port, maritime transport from the Brazilian port to the import ports, and road transport for final distribution within the destination countries. In Brazil, the product is transported by road from Lavrasul to distribution centers, from where it is subsequently delivered to the final consumer (see [Scenarios and additional technical information](#)).

Module A5 considers the installation of the product in construction sites, including complementary materials. However, due to low representation, by the cut-off exclusion rule, this EPD does not consider inputs in the installation phase. Packaging transport to end-of-life and end-of-life processes are also considered in this module. The end-of-life scenarios of packaging followed specific statistical data by type of material for the consumer market (including recycling, incineration and landfill disposal, see [Scenarios and additional technical information](#)).

Module C1 covers the dismantling and deconstruction process. However, due to low representation, by the cut-off exclusion rule, this EPD does not consider inputs in the deconstruction phase.

Module C2 includes the transportation of post-consumer plywood to end-of-life, by road.

Module C3 considers the plywood recovery processes for recycling or use as secondary fuel. The end-of-life scenarios were defined based on regional statistical data for the consumer market (see [Scenarios and additional technical information](#)).

Module C4 covers the plywood's destination for incineration or landfill. The end-of-life scenarios were defined based on regional statistical data for the consumer market (see [Scenarios and additional technical information](#)).

Module D includes the potential benefits generated by material recovery by avoiding future use of primary resources. The plywood that goes for recycling or use as secondary fuel reaches the "end of waste" point in the form of woodchips. Therefore, the product chosen to be avoided by recovery is virgin woodchips.

More information

Data quality

Specific data were used for the plywood manufacturing process; the production of pine wood and PF-resin; the regional electricity grid; the distances for transporting inputs to Lavrasul; and the distribution of plywood to the main import ports. These data were collected from the manufacturing plant, according to 2023-year production. Generic data were used for transport distances for internal distribution in the consumer market and background processes. The ecoinvent v.3.10 database was the main source of generic data, adapting the electrical grid to the reference country whenever possible and relevant.

Cut-off rules

Flows excluded from the analysis do not exceed 5% of the system's material or energetic inputs. The excluded flows are listed below:

- Infrastructure, equipment and employee consumption (all modules);
- Acrylic putty used to correct aesthetic imperfections in the wood (A3);

- Water-based paint used to identify the final products (A3);
- Only GHG emissions resulting from the use of LPG were considered, while other atmospheric emissions, such as nitrogen oxides (NO_x), volatile organic compounds (VOCs), and sulfur dioxide (SO₂), were excluded from the analysis (A3);
- Material losses in the installation stage (A5);
- Nails and or screws, energy and equipment consumption in installation (A5);
- Separation of material or demolition for deconstruction (C1).

Allocation

The plywood production process also generates veneers, surplus woodchips, bark, rollers, refills, and shavings, which are sold to third parties. All these items are classified as co-products. Given the significant revenue difference between the main product and its co-products, allocation should be based on economic criteria. However, according to PCR 2019:14, products that contribute minimally to the total revenue of the process may be excluded from allocation. In this EPD, all co-products contribute less than 2% of total revenue and, as a conservative approach, do not carry any environmental burden from the plywood manufacturing process. Consequently, 100% of the environmental impacts are allocated to plywood, while co-products receive 0%. The same principle applies to waste generated during manufacturing that is sent for recycling—100% of the impacts are attributed to plywood, with none assigned to scrap.

Scenarios and additional technical information

Module A4

The plywood distribution scenarios were defined based on Lavrasul's consumer markets: 62% North America, 32% Europe, 4% Central and South America, 2% Asia and Africa. Transportation begins with road transit from the manufacturing facility to the Ports of Itapoá and Navegantes (Santa Catarina, SC), followed by maritime shipping to the respective import ports. Final distribution within each country occurs by road, with an estimated transport distance of 1,200 km for all regions, in accordance with PEF – Category Rules Guidance recommendations. The only exception is Brazil, where the estimated distances are 647 km from Lavrasul to distribution centers and an additional 250 km from distribution centers to final consumers. The transport distances considered and the corresponding ecoinvent v.3.10 datasets used for their representation are detailed in the following table.

| Parameter | Value |
|---|---|
| Average distance from Lavrasul to the Ports of Itapoá and Navegantes | 328 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {BR}</i> |
| Average distance from Brazilian ports to consumer market port | 7,906 km, by sea <i>Transport, freight, sea, container ship {GLO}</i> |
| Estimated distance from ports to internal distribution in Europe | 1,200 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {RER}</i> |
| Estimated distance from ports to internal distribution in other countries | 1,200 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {RoW}</i> |
| Estimated distance from Lavrasul to distribution centers in Brazil | 647 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {BR}</i> |
| Estimated distance from distribution centers to internal distribution in Brazil | 250 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {BR}</i> |
| Bulk density of transported productions | 527 kg/m ³ |

Module A5

No installation materials and energy consumption were considered due to the cut-off rule applied. Packaging end-of-life scenarios followed specific statistical data by type of material, as presented in the following table. Transports to the packaging end-of-life (EoL) stage were estimated at 50 km.

| Parameter | Value | | |
|---|--|--------------|----------|
| | Recycling | Incineration | Landfill |
| Mexico¹ | Wood pallets EoL ^(*) | - | 100% |
| | Plastic corners EoL | 15% | 85% |
| | Steel wires EoL | 38% | 62% |
| Europe² | Wood pallets EoL | 30% | 32% |
| | Plastic corners EoL | 23% | 35% |
| | Steel wires EoL | 74% | 12% |
| United States³ | Wood pallets EoL | 27% | 14% |
| | Plastic corners EoL | 3% | 19% |
| | Steel wires EoL | 81% | 3% |
| Latin America⁴ | Wood pallets EoL ^(*) | - | 100% |
| | Plastic corners EoL | 10% | 90% |
| | Steel wires EoL | - | 100% |
| Canada⁵ | Wood pallets EoL | 1% | 99% |
| | Plastic corners EoL | 9% | 91% |
| | Steel wires EoL | 66% | 34% |
| Africa & Asia^(*) | Wood pallets EoL ^(*) | - | 100% |
| | Plastic corners EoL ^(*) | - | 100% |
| | Steel wires EoL ^(*) | - | 100% |
| Brazil⁶ | Wood pallets EoL ^(*) | - | 100% |
| | Plastic corners EoL | 23% | 77% |
| | Steel wires EoL | 48% | 52% |
| Estimated distance from construction site to EoL in Europe | 50 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {RER}</i> | | |
| Estimated distance from construction site to EoL in other countries | 50 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {RoW}</i> | | |
| Estimated distance from construction site to EoL in Brazil | 50 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5 {BR}</i> | | |
| Bulk density of transported packaging | 2.47 kg/m ³ | | |

Sources: ¹[Sandoval-García *et al.*, 2023] ²[EC, 2018] ³[EPA, 2018] ⁴[ONU, 2018] ⁵[Schorr *et al.*, 2023] ⁶[CEMPRE, 2024].

(*) The end-of-life scenario was defined based on a conservative assumption (100% destined for landfills), considering the absence of specific data for these countries.

Module C1

No deconstruction materials and energy consumption were considered due to the cut-off rule applied.

Module C2

Transports to the end-of-life stage were estimated at 50 km.

| Parameter | Value |
|---|--|
| Estimated distance from construction site to EoL (Europe / other countries / Brazil) | 50 km, by road <i>Transport, freight, lorry 16-32 metric ton, EURO5</i> {RER} / {RoW} / {BR} |
| Bulk density of transported productions | 525 kg/m ³ |

Modules C3 and C4

The end-of-life scenarios for plywood were determined based on regional statistical data from consumer markets. To reach the 'end-of-waste' stage, plywood is assumed to undergo a wood chipping process, as recommended by c-PCR-006. In this EPD, following a conservative approach, wood collected for energy recovery is classified as secondary fuel. The rates of recycling, secondary fuel recovery, incineration, and landfill disposal are presented in the table below.

| Parameter | | Value | | | |
|------------------------------|-------------|-----------|----------------|----------|--------------|
| | | Recycling | Secondary fuel | Landfill | Incineration |
| Latin America ¹ | Plywood EoL | - | - | 100% | - |
| Europe ² | | 46% | 49% | <1% | 4% |
| United States ³ | | 10% | 21% | 70% | - |
| Canada ⁴ | | 7% | - | 74% | 19% |
| Africa and Asia ⁵ | | - | - | 100% | - |

Sources: ¹ Including Mexico and Brazil. The end-of-life scenario was defined based on a conservative assumption (100% destined for landfills), considering the absence of specific data for Latin American countries. ²[EUROSTAT, 2023] ³[EPA, 2020] ⁴[Schorr et al., 2023]. ⁵The end-of-life scenario was defined based on a conservative assumption (100% destined for landfills), considering the absence of specific data for African and Asian countries

Name and contact information of LCA practitioner



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 LCA practitioner: Ana Rosa Fernandes and Laís Peixoto Rosado

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 | X | X | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | BR | BR | BR | ■ | ■ | ND | ND | ND | ND | ND | ND | ND | ■ | ■ | ■ | ■ | ■ |
| Specific data used ^(*) | 96% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation on GWP-GHG results – products | < 1% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation on GWP-GHG results – sites | Not applicable. | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

X = declared module. ND = module not declared. BR: Brazil. ■ The plywood distribution scenarios were defined based on Lavrasul's consumer markets: 62% North America, 32% Europe, 4% Central and South America, 2% Asia and Africa. ^(*) The share of specific data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that does not capture all relevant aspects of data quality. The indicator is not comparable across product categories.



Content information

The content declaration represents the average content of the product group (9 to 30 mm).

| Product components | Weight, kg | Post-consumer material, weight-% | Biogenic material, kg C/product |
|---------------------|-------------|----------------------------------|---|
| Wood, pine | 474 | 0% | 237.12 kgC/m ³ |
| Phenol-Formol resin | 27 | 0% | - |
| Wheat flour | 24 | 0% | 4.74 kgC/m ³ |
| TOTAL | 525 | 0% | 93% and 241.86 kgC/m³ |
| Packaging materials | Weight, kg | Weight-% (versus the product) | Weight biogenic carbon, kg C/kg |
| Wood pallets | 1.73 | 0.33% | 0.86 kgC/m ³ |
| Plastic corners | 0.02 | 0.004% | 0 |
| Steel wires | 0.72 | 0.14% | 0 |
| TOTAL | 2.47 | 0.47% | 0.86 kgC/m³ |

The product does not contain dangerous substances from the candidate list of SVHC that exceed the registration limits.

Results of the environmental performance indicators

The impact category indicators results are presented per 1m³ Lavrasul Pine Plywood, according to the characterisation factors (CFs) of EN 15804 reference package based on EF 3.1. 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. The use of the results of modules A1-A3 without considering the results of module C is discouraged. No variations above 10% were observed between the results of the products and the average result presented in any impact category (modules A-C).

Mandatory impact category indicators according to EN 15804

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---------------------------------|---|-----------|----------|-----------|----------|----------|----------|-----------|-----------|
| GWP-fossil | kg CO ₂ eq. | 1.92E+02 | 1.53E+02 | 4.68E-02 | 0.00E+00 | 4.06E+00 | 1.17E+00 | 3.52E+00 | -2.37E+01 |
| GWP-biogenic | kg CO ₂ eq. | -8.77E+02 | 1.07E-02 | 3.25E+00 | 0.00E+00 | 1.81E-04 | 3.03E+02 | 6.05E+02 | -8.22E-02 |
| GWP-luluc | kg CO ₂ eq. | 1.25E+01 | 9.05E-01 | 2.09E-05 | 0.00E+00 | 1.76E-03 | 3.43E-03 | 2.33E-03 | -1.22E-01 |
| GWP-total | kg CO ₂ eq. | -6.72E+02 | 1.54E+02 | 3.30E+00 | 0.00E+00 | 4.06E+00 | 3.04E+02 | 6.08E+02 | -2.39E+01 |
| ODP | kg CFC 11 eq. | 5.76E-06 | 2.89E-06 | 7.54E-10 | 0.00E+00 | 6.45E-08 | 1.66E-08 | 9.32E-08 | -6.77E-07 |
| AP | mol H ⁺ eq. | 3.99E+00 | 1.52E+00 | 1.94E-04 | 0.00E+00 | 1.07E-02 | 5.36E-03 | 2.60E-02 | -2.18E-01 |
| EP-freshwater | kg P eq. | 1.14E-02 | 2.91E-04 | 5.14E-07 | 0.00E+00 | 7.98E-06 | 1.09E-04 | 6.36E-05 | -2.63E-03 |
| EP-marine | kg N eq. | 6.32E-01 | 4.23E-01 | 1.03E-04 | 0.00E+00 | 3.97E-03 | 7.08E-04 | 1.71E-02 | -8.19E-02 |
| EP-terrestrial | mol N eq. | 6.10E+00 | 4.60E+00 | 8.30E-04 | 0.00E+00 | 4.34E-02 | 7.99E-03 | 1.12E-01 | -9.25E-01 |
| POCP | kg NMVOC eq. | 1.79E+00 | 1.36E+00 | 3.06E-04 | 0.00E+00 | 1.68E-02 | 2.74E-03 | 4.45E-02 | -2.83E-01 |
| ADP-minerals&metals* | kg Sb eq. | 6.00E-05 | 7.82E-06 | 6.63E-09 | 0.00E+00 | 2.09E-07 | 7.92E-08 | 1.30E-06 | -5.07E-06 |
| ADP-fossil* | MJ | 3.09E+03 | 2.00E+03 | -2.82E-01 | 0.00E+00 | 5.40E+01 | 2.74E+01 | 7.97E+01 | -5.24E+02 |
| WDP* | m ³ | 7.51E+01 | 1.64E+00 | -1.76E-01 | 0.00E+00 | 4.18E-02 | 3.02E-01 | -5.36E+01 | -4.33E+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 negative result for WDP is due to a background process (leachate from wood landfilling) and has a high level of associated uncertainty.

Additional mandatory and voluntary impact category indicators

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|----------------------------|--|----------|----------|----------|----------|----------|----------|----------|-----------|
| GWP-GHG¹ | kg CO ₂ eq. | 2.18E+02 | 1.54E+02 | 1.27E-01 | 0.00E+00 | 4.06E+00 | 1.18E+00 | 2.41E+01 | -2.39E+01 |
| PM | disease inc. | 1.35E-05 | 8.72E-06 | 4.00E-09 | 0.00E+00 | 2.70E-07 | 1.33E-08 | 5.68E-07 | -5.28E-06 |
| IRP^{**} | kBq U-235 eq | 1.57E+00 | 1.70E-01 | 7.18E-04 | 0.00E+00 | 4.88E-03 | 2.47E-01 | 4.18E-02 | -2.44E+00 |
| ETP-fw[*] | CTUe | 4.93E+03 | 9.96E+02 | 1.87E-01 | 0.00E+00 | 4.64E+00 | 2.20E+00 | 3.90E+01 | -8.82E+01 |
| HTP-c[*] | CTUh | 1.85E-06 | 1.66E-08 | 2.31E-11 | 0.00E+00 | 3.31E-10 | 5.52E-10 | 4.04E-09 | -2.95E-07 |
| HTP-nc[*] | CTUh | 1.83E-06 | 9.39E-07 | 7.88E-10 | 0.00E+00 | 2.69E-08 | 6.51E-09 | 9.90E-08 | -3.37E-07 |
| SQP[*] | Pt | 5.83E+04 | 2.37E+01 | 7.47E-01 | 0.00E+00 | 2.21E-01 | 3.79E+00 | 1.84E+02 | -8.20E+03 |
| Acronyms | GWP-GHG = Global Warming Potential greenhouse gases; PM = Particulate Matter; IRP = Ionizing Radiation Potential; ETP-fw = Ecotoxicity freshwater; HTP-c = Human Toxicity Potential cancer; HTP-nc = Human Toxicity Potential non-cancer; 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.

^{**} Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation of 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

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.

Resource use indicators

The separation of primary energy use flows into energy used as raw material (PERM and PENRM) and energy used as an energy carrier (PERE and PENRE), was carried out according to the interpretation described in option A of PCR 2019:14 (v .1.3.4, Annex 3). The energy used as raw material that leaves the product system (i.e. module A5 for packaging content and module C3 and C4 for product content) is reported as an input in the indicator for energy used as energy carrier, in the modules that it occurs.

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|-----------|--|----------|----------|-----------|----------|----------|-----------|-----------|-----------|
| PERE | MJ | 2.67E+03 | 1.27E+01 | -1.45E+00 | 0.00E+00 | 1.36E-01 | -6.78E+02 | -1.23E+03 | -1.76E+03 |
| PERM | MJ | 6.45E+03 | 0.00E+00 | -2.34E+01 | 0.00E+00 | 0.00E+00 | -2.19E+03 | -4.23E+03 | 0.00E+00 |
| PERT | MJ | 9.12E+03 | 1.27E+01 | -2.76E+01 | 0.00E+00 | 1.36E-01 | -2.87E+03 | -5.55E+03 | -1.76E+03 |
| PENRE | MJ | 3.31E+03 | 2.12E+03 | 7.68E-01 | 0.00E+00 | 5.74E+01 | 2.86E+01 | 8.48E+01 | -5.60E+02 |
| PENRM | MJ | 9.31E-01 | 0.00E+00 | -9.31E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PENRT | MJ | 3.31E+03 | 2.12E+03 | -2.88E-01 | 0.00E+00 | 5.74E+01 | 2.86E+01 | 8.48E+01 | -5.60E+02 |
| SM | kg | 2.14E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW | m ³ | 5.04E+00 | 9.71E-02 | -4.98E-03 | 0.00E+00 | 1.75E-03 | 2.15E-02 | -1.25E+00 | -1.18E+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 | | | | | | | | |



Waste indicators

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|------------------------------|------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Hazardous waste disposed | kg | 3.29E-02 | 1.29E-02 | 4.25E-06 | 0.00E+00 | 3.66E-04 | 3.80E-05 | 5.21E-04 | -1.65E-03 |
| Non-hazardous waste disposed | kg | 7.38E-01 | 6.35E-02 | 1.64E+00 | 0.00E+00 | 2.04E-03 | 1.50E-02 | 3.37E+02 | -3.30E-01 |
| Radioactive waste disposed | kg | 9.94E-04 | 9.74E-05 | 5.24E-07 | 0.00E+00 | 2.93E-06 | 1.92E-04 | 2.75E-05 | -1.89E-03 |

Output flow indicators

| Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|-------------------------------|------|----------|----------|----------|----------|----------|----------|----------|----------|
| Components for re-use | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Material for recycling | kg | 1.50E+02 | 0.00E+00 | 5.95E-01 | 0.00E+00 | 0.00E+00 | 8.51E+01 | 0.00E+00 | 0.00E+00 |
| Materials for energy recovery | kg | 9.83E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.48E+01 | 0.00E+00 | 0.00E+00 |
| Exported energy, electricity | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy, thermal | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Version History

| Revision | Version Date | Amendments |
|----------|--------------|-----------------------------|
| 0 | 2025-03-10 | Original version of the EPD |

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