

# Environmental Product Declaration



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

## ***OUTDOOR BAMBOO PRODUCT***

from

***ANJI JUN LAN BAMBOO AND WOOD INDUSTRY CO., LTD***



Programme:	The International EPD System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0031472
Version date:	2026-04-23
Valid until:	2031-04-22

*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)*



## 1. General information

### Programme information

<b>Programme:</b>	The International EPD® 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>

### 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 (EPD International), version 2.0.1*

*UNCPC Code – 31450 (Plywood, veneer panels and similar laminated wood of bamboo)*

PCR review was conducted by:

*The Technical Committee of the International EPD® System. A full list of members available on [www.environdec.com](http://www.environdec.com). The review panel may be contacted via [info@environdec.com](mailto:info@environdec.com)*

*Chair of the PCR review: Rob Rouwette (chair), Noa Meron (co-chair)*

#### Third-party verification

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

Individual EPD verification without a pre-verified LCA/EPD tool

Third-party verifier: Dr. Freddy Navarro, LCACHECK S.A.S. de C.V.

Approved by: The International EPD® System

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

Yes       No

[Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

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.

## 2. Company information

### **Owner of the EPD:**

ANJI JUN LAN BAMBOO AND WOOD INDUSTRY CO.,LTD

Address: Xinshangtang village, Hanggai Town, Anji County, Huzhou City, Zhejiang Province, China

Website: [www.joolan.cn](http://www.joolan.cn)

Contact: Michael Jiang

Email: [Michael@joolan.cn](mailto:Michael@joolan.cn)

Tel: +86 15088378300

### **Description of the organization:**

JOOLAN is a specialized manufacturer dedicated to the research, development, and production of outdoor bamboo products. Operating from a 30,000m<sup>2</sup> production facility, we prioritize continuous innovation through substantial annual investment, with oversight from a plant manager possessing nearly two decades of industry expertise.

To meet growing global demand, we expanded our operations with a new 15,000 m<sup>2</sup> facility in March 2021. This expansion increases our annual production capacity to 500,000 m<sup>2</sup> and supports our trajectory our path toward achieving annual sales exceeding US\$15 million, reinforcing our commitment to being a stable and reliable worldwide supplier in the outdoor bamboo sector.

### **Product-related or management system-related certifications:**

JOOLAN operates in compliance with international standards, including ISO and FSC, ensuring reliable quality and responsible manufacturing.

### **Name and location of production site(s):**

Xinshangtang village, Hanggai Town, Anji County, Huzhou City, Zhejiang Province, China

## 3. Product information

### **Product name:**

Outdoor bamboo product

### **Product description:**

Outdoor bamboo products are crafted from high-quality bamboo that has matured for over five years. The bamboo strips go a rigorous process including carbonization, drying, resin impregnation and shaping. Carbonization subjects bamboo to high temperature, steam and pressure, breaking down sugars and starches to eliminate nutrients for pests and fungi while eradicating insect eggs and mold. This process transforms the bamboo fibers into a rich coffee-brown hue, doubles the surface hardness, and significantly enhances waterproofing, decay resistance, mold resistance and dimensional stability—making it exceptionally durable for outdoor use.

Outdoor bamboo products are widely used for decking, fencing, cladding, bench, horse stable and outdoor furniture and landscape structures. Thanks to their durability, weather resistance and natural aesthetics, they are an ideal sustainable choice for both residential and commercial outdoor spaces, providing long-lasting performance even in demanding climates.

**Product photo:**



**UN CPC code:**

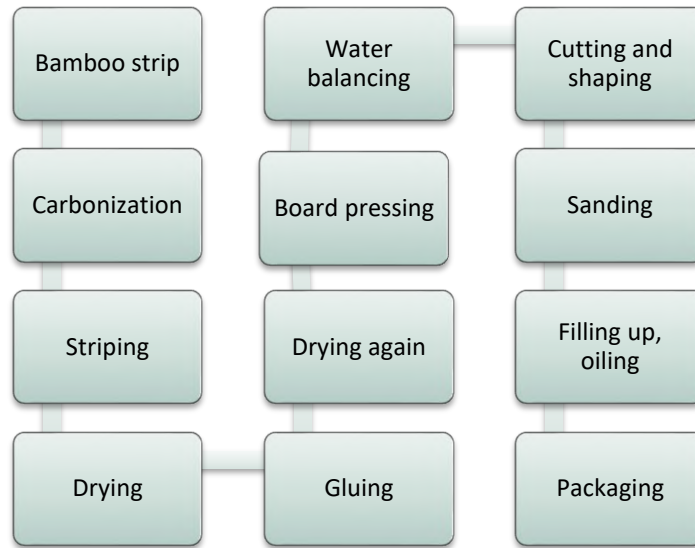
31450 (Plywood, veneer panels and similar laminated wood of bamboo)

**Geographical scope:**

Geographical scope is China for Module A1-A3, i.e. all of the raw materials are sourced locally in China & the manufacturing site is also located in China. Module A4 represents the distribution to global. A5 and the end-of-life module is representative of a global scenario.

**Manufacturing process:**

The production process begins with high-quality bamboo strips, which undergo carbonization to enhance durability and color. The strips are then dried, mixed with eco-friendly resin, and shaped under high pressure into solid panels. After pressing, the boards undergo precision water-balancing, cutting and shaping to ensure dimensional stability. Finally, each piece is carefully inspected and packed, resulting in durable and sustainable outdoor bamboo products.



## 4. LCA information

### **Declared unit:**

1 kg of outdoor bamboo product with packaging (packaging is not included in the 1 kg.)

### **Time representativeness:**

1<sup>st</sup> January 2025 to 31<sup>st</sup> December 2025(12 months)

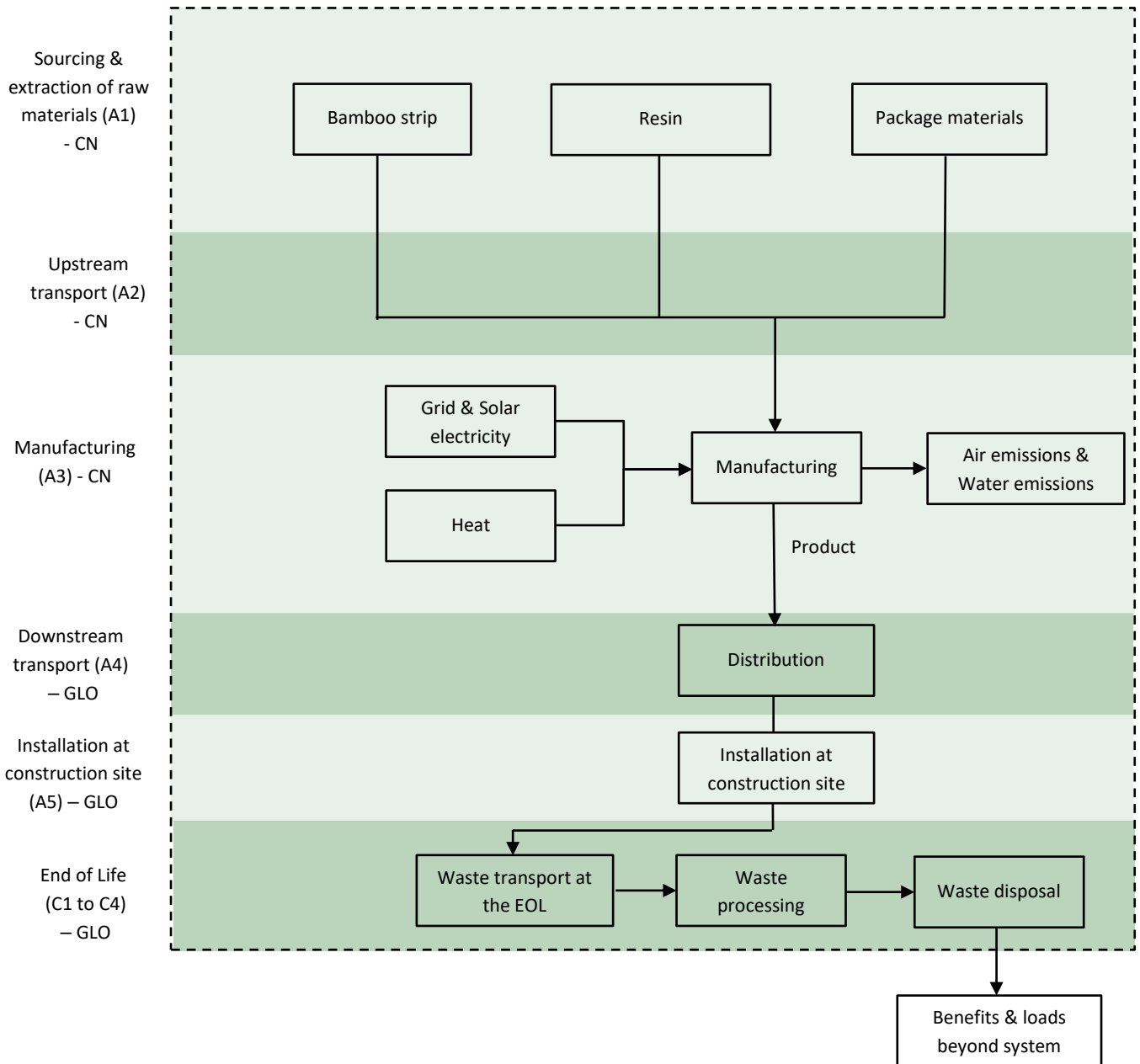
### **Database(s) and LCA software used:**

SimaPro 10.2, Ecoinvent 3.11

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

Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and A4-A5)

**System diagram:**



**Figure 1: System boundary description for Outdoor bamboo product**

**Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):**

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

	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	CN	CN	CN	GLO	GLO	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	20.3%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 1 The declaration of data sources, reference years, data categories, and share of primary data

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG
Production of bamboo strip	Collected data	EPD owner	2025	Secondary data	0%
Production of phenolic resin	Collected data	EPD owner	2025	Secondary data	0%
Production of packaging	Collected data	EPD owner	2025	Secondary data	0%
Transport of Raw material	Collected data	EPD owner	2025	Primary data	4.96%
<b>Generation of solar electricity used in manufacturing site</b>	<b>Collected data</b>	<b>EPD owner</b>	2025	<b>Primary data</b>	<b>1.13%</b>
Generation of grid electricity used in manufacturing site	Collected data	EPD owner	2025	Primary data	8.61%
Generation of heat used in manufacturing site	Collected data	EPD owner	2025	Primary data	5.61%
Water consumption in manufacturing site	Collected data	EPD owner	2025	Secondary data	0%
Total share of primary data, of GWP-GHG results for A1-A3					20.3%

**Product stage (A1-A3):**

**Module A1** – The raw material and supply stage covers production and processing of raw materials and package material to outdoor bamboo product, the major raw materials include bamboo strip, phenolic resin and packaging materials. The company purchases all ingredients from China.

**Module A2** - All raw materials including package materials are transported to the plant. The transport distances and routes were calculated based on information provided by the manufacturer in 2025.

**Module A3** - The major production processes include carbonization, drying, gluing, pressing, cutting, sanding and packaging. The energy sources used in the production process include purchased electricity from the state grid, solar photovoltaic panels installed on the factory rooftop and heat. During the carbonization process, the factory utilizes heat generated partly from externally purchased biomass fuel and partly from waste bamboo strips produced during manufacturing. The related electricity emissions factors in Ecoinvent V3.11 were chosen in this study.

**Construction process stage (A4-A5):**

**Module A4** – The target markets of outdoor bamboo product include EU, Middle East and China. Based on plant’s declaration, 10% of the products are sold domestically in China. The remaining 90% of the products are first transported by road to Anji Port nearby plant and then shipped overseas. Ship transport

routes from plant to overseas were calculated by map. And it is assumed that the products will be transported in a lorry to distributor located at 500 km distance from port.

**Module A5** – The product is designed for installation on a ground, thus the products are connected together by clips, no glue is needed for the installation. Electrical saw is considered for the product cutting and electrical screwdriver for fastening.

After installation, the package material will be collected and sent to waste treatment centre. In this LCA study, 50% recycling and 50% landfill of waste package material is assumed and declared. The default data for transportation distance between construction site and sorting centre and the following waste sorting processes outline in Table 4 PCR 4.8.4 was used in this LCA modelling.

#### **Use stage (B1-B7):**

The product is used in various construction scenarios, and in many cases, it does not consume additional materials or energy during its use and maintenance. Therefore, this study does not include research on Stage B.

#### **End of Life Module (C1-C4 & D):**

**Module C1** - The default data for demounting and demolition at C1 stage outlined in PCR table 4 was used in this LCA modelling.

**Module C2** - It is assumed that waste products will be transported in a lorry to the waste processing/disposal site located at 130km distance specified in PCR table 4.

**Module C3&C4** - As per general rule outlined in PCR 4.8.4, the end-of life scenario shall be realistic and representative for the most probable end-of-life treatment alternative considering the geographic scope of the EPD, with the exception that relevant 100% scenarios shall be declared even if they are not realist. In this analysis it is assumed that 45% of waste products are incinerated to generate heat and electricity, the remaining 55% of the waste products are sent for landfill at the end of life as representative scenario. And 100% incineration and 100% landfill were declared as the additional LCA information.

As per PCR section 4.5.2, If the thermal efficiency is lower than 60%, the incineration process is a disposal process and shall be assigned to C4. In this study, it is assumed that gross electric efficiency technology mix is 15.84% and gross thermal efficiency technology mix is 28.51% followed by Ecoinvent 3 data. Hence, 100% incineration process shall be assigned to C4 stage in this LCA study.

**Module D** - It is assumed that some heat and electricity which benefited from incineration at C4 stage are accounted in Module D, and the recycling of 50% package material will contribute the benefit and credit at Module D.

#### **Data Sources and Data Quality Assessment**

The EPD covers Outdoor bamboo product from one factory in Zhejiang province, China, which provided data for the period 1<sup>st</sup> January 2025 to 31<sup>st</sup> December 2025 and is therefore up to date. Background data was sourced from LCA database (Ecoinvent v3.11) and the database was updated in year 2025.

Technically, the product is made from bamboo strip and resin that undergo carbonization, gluing and shaping at one plant. The manufacturing-related data is based on plant averages, and mass allocation has been applied. The specific datasets and the most representative proxy datasets were selected and used in LCA modelling.

Geographically, material production and transportation data used in the LCA modeling is provided by manufacturer and the site is powered by grid electricity and solar PV. The datasets related to the grid electricity consumed in production were chosen from Zhejiang Province where the factory is located, while global datasets were selected for the transportation and end-of-life stages representing global end-of-life scenarios.

The data quality is classified as fair and no poor or very poor data was found during the assessment of relevant data using EN15804:2012+A2:2019, Annex E, only E.2.

### **Electricity source**

This LCA study, electricity sourced from grid mix and electricity produced from solar panel at the plant were considered based on primary data provided by client. LCI data for the generation of grid electricity used in the manufacturing process is from Ecoinvent v3.11 based on the year 2022. The grid mix electricity data set used for CN is 0.763kg CO<sub>2</sub> eq./kWh. In 2022, the source of power supply is 65.95% thermal power, 15.55% hydropower, 8.77% wind power, 4.80% nuclear and 4.92% solar. The electricity data set used in solar panel is 0.0936kg CO<sub>2</sub> eq./kWh.

### **Cut-off rule**

LCI data in this study adhere to the cut-off rule outline in PCR and EN 15804 including a minimum of 99% of total inflows (mass and energy) per unit process and 95% of total inflows (mass and energy) per life-cycle stages A1-A3, A4-A5 and C1-C4, aggregated modules B1-B5 and B6-B7, and module D.

In this, Outdoor bamboo product incorporate less than 1% vegetable oil to meet specific requirements. In this study, less than 1% vegetable oil is not taken into consideration following the sensitive analysis. Hence, all the inflows are included and there is no cut-off used in this study, except for less than 1% vegetable oil in the product.

Further, the following general exclusions from the scope of the study were made:

- Human and animal energy inputs to processes.
- Production and disposal of infrastructure (machines, transport vehicles, roads, etc.) and their maintenance.
- Transport of employees to and from their normal place of work and business travel; and
- Environmental impacts associated with support functions (e.g., R&D, marketing, finance, management etc.).

### **Allocation**

The allocation of the inputs which involved coupled processes was generally carried out via mass. The consumption and transportation of raw materials were allocated by mass ration.

In terms of generic data, the main database used, Ecoinvent v3.11 (cut-off), defaults to an economic allocation for most processes. However, in some cases a mass-based allocation is used, where there is a direct physical relationship (e.g., biomass related flows). The allocation approach of specific Ecoinvent modules is documented on their website and method reports (see [www.Ecoinvent.org](http://www.Ecoinvent.org)).

In the case of end-of-life allocation of generic data, the Ecoinvent v3.11 with a cut-off by classification end-of-life allocation method (100:0) was used.

### **Assumptions**

In this study, some assumptions were made:

- When there is missing background data in Ecoinvent 3.11, the similar background data approach was used to substitute the missing background data, i.e. Packaging belt and steel clips for installation.

- Assumption about transport were made where it was not possible to obtain the specific data. For instance, the distance from port to distribution centre and the mass loss during installation and demolition. When this occurred, it is clearly shown in the report.
- Electricity consumption data were not obtained during installation and demolition processes, so assumption was made for these. When this occurred, it is clearly shown in the report.

## 5. Content information

Product components	Weight, kg	Post-consumer recycled material, weight % of product	Biogenic material, weight- % of product	Biogenic material, kg C/product
Bamboo	0.83	-	100	0.41
Resin	0.17	-	-	
Sum	1	-	83	0.3705
Packaging materials	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C/product	
Package film	0.0002	0.02	-	
Packing belt	0.0005	0.05	-	
Corrugated board box	0.0008	0.08	0.00036	
Wood pallet	0.0043	0.43	0.002021	
Sum	0.0058	0.58		

### Substances, REACH – Very High Concern:

Hazardous substances from the candidate list of SVHC	EC No.	CAS No.	Mass-% per product or declared unit
NA	NA	NA	NA

## 6. Results of the environmental performance indicators

### 6.1 Mandatory impact category indicators according to EN 15804

Results per declared unit for 1 kg of Wood Plastic Composite products									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq.	1.38E+00	2.47E-01	7.36E-02	3.75E-04	2.03E-02	4.11E-03	1.01E-02	-1.31E-02
GWP-biogenic	kg CO <sub>2</sub> eq.	-1.26E+00	1.08E-05	8.73E-03	1.88E-08	8.99E-07	2.74E-06	1.25E+00	-9.85E-06
GWP-luluc	kg CO <sub>2</sub> eq.	3.08E-03	8.09E-06	1.21E-04	1.54E-08	5.42E-07	3.20E-06	3.16E-06	-5.12E-06
GWP-total	kg CO <sub>2</sub> eq.	1.31E-01	2.47E-01	8.24E-02	3.75E-04	2.03E-02	4.12E-03	1.26E+00	-1.31E-02
ODP	kg CFC 11 eq.	2.69E-08	3.90E-09	4.78E-10	5.70E-12	3.92E-10	4.87E-11	2.02E-10	-3.84E-09
AP	mol H <sup>+</sup> eq.	8.07E-03	5.09E-03	3.69E-04	3.46E-06	5.39E-05	3.17E-05	1.03E-04	-5.25E-05
EP-freshwater	kg P eq.	7.18E-05	4.17E-07	4.65E-06	3.53E-10	5.26E-08	7.99E-08	1.13E-07	-3.87E-07
EP-marine	kg N eq.	1.53E-03	1.30E-03	6.97E-05	1.63E-06	1.99E-05	1.29E-05	5.25E-05	-1.37E-05
EP-terrestrial	mol N eq.	1.75E-02	1.44E-02	7.53E-04	1.79E-05	2.18E-04	1.41E-04	5.13E-04	-1.51E-04
POCP	kg NMVOC eq.	6.28E-03	3.96E-03	2.33E-04	5.34E-06	8.50E-05	4.21E-05	1.54E-04	-4.94E-05
ADP-fossil*	MJ	2.31E+01	3.12E+00	9.24E-01	4.90E-03	2.68E-01	5.44E-02	1.64E-01	-1.43E-01
ADP-minerals & metals*	kg Sb eq.	1.44E-06	5.74E-09	7.24E-07	1.31E-11	8.80E-10	1.36E-10	2.74E-09	-2.77E-09
WDP*	m <sup>3</sup>	3.77E-01	1.54E-03	1.47E-02	3.66E-06	1.71E-04	2.19E-04	-8.57E-02	-1.57E-03
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:**

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.
2. Module C is included in this EPD, and care shall be taken to avoid using of the results of modules A1-A3 without considering the results of module C.
3. \*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.
4. EN 15804 reference package was based on EF 3.1 version published in July 2022.
5. This LCIA data excludes infrastructure processes embedded in the generic LCI datasets used in modelling the entire life cycle of our products (A1-C4) except for A3, which may include manufacturing, transportation and energy infrastructure plants outside manufacturer's direct control.

## 6.2 Additional mandatory and voluntary impact category indicators

Results per declared unit for 1 kg of Outdoor bamboo product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	1.39E+00	2.47E-01	7.43E-02	3.75E-04	2.03E-02	4.12E-03	4.37E-02	-1.31E-02
Particulate matter	disease inc.	1.01E-07	9.60E-09	4.62E-09	9.97E-11	1.33E-09	7.71E-10	1.52E-09	-1.21E-09
Ionizing radiation <sup>2</sup>	kBq U-235 eq	2.82E-02	2.51E-04	3.23E-03	4.07E-07	2.42E-05	8.17E-05	3.77E-05	-4.79E-05
Ecotoxicity, freshwater <sup>3</sup>	CTUe	1.51E+01	1.35E-01	5.02E-01	1.40E-04	1.49E-02	3.93E-03	9.77E-02	-5.06E-02
Human toxicity, non-cancer <sup>3</sup>	CTUh	1.49E-08	9.10E-10	7.61E-10	3.68E-13	1.33E-10	9.54E-12	9.57E-10	-1.50E-10
Human toxicity, cancer <sup>3</sup>	CTUh	2.08E-09	2.90E-11	4.61E-11	2.00E-14	1.39E-12	2.63E-13	1.25E-11	-2.13E-11
Land use <sup>3</sup>	Pt	9.88E+01	8.48E-03	1.53E-01	8.32E-06	1.11E-03	1.82E-03	3.02E-01	-5.93E-02

Disclaimer :

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<sub>2</sub> is set to zero.
2. 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.
3. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## 6.3 Resource use indicators

Results per declared unit for 1 kg of Outdoor bamboo product based on option A									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.92E+01	3.86E-02	2.52E-01	3.18E-05	5.34E-03	2.84E-03	1.47E+01	-5.31E-02
PERM	MJ	1.47E+01	0.00E+00	-6.74E-02	0.00E+00	0.00E+00	0.00E+00	-1.47E+01	0.00E+00
PERT	MJ	3.40E+01	3.86E-02	1.84E-01	3.18E-05	5.34E-03	2.84E-03	3.28E-03	-5.31E-02
PENRE	MJ	1.87E+01	3.63E+00	9.76E-01	5.19E-03	3.55E-01	5.68E-02	5.90E+00	-1.59E-01
PENRM	MJ	5.71E+00	0.00E+00	-7.16E-03	0.00E+00	0.00E+00	0.00E+00	-5.71E+00	0.00E+00
PENRT	MJ	2.44E+01	3.63E+00	9.69E-01	5.19E-03	3.55E-01	5.68E-02	1.95E-01	-1.59E-01
SM	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
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 <sup>3</sup>	8.90E-03	7.10E-05	5.64E-04	1.48E-07	7.26E-06	9.64E-06	-1.97E-03	-4.93E-05
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								

## 6.4 Waste indicators

Results per declared unit for 1 kg of Outdoor bamboo product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	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
Non-hazardous waste disposed	kg	3.58E-01	0.00E+00	5.80E-03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
Radioactive waste disposed	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

## 6.5 Output flow indicators

Results per declared unit for 1 kg of Outdoor bamboo product									
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	0.00E+00	0.00E+00	2.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	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
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.88E-01	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	1.58E+00	0.00E+00

## Additional LCA results

In this study, a waste treatment mix of 45% incineration and 55% landfilling was selected as the representative scenario. Additionally, 100% incineration and 100% landfill scenario were calculated and presented in the table below.

Environmental Impacts Indicators	Units	100% incineration					
		A5	C1	C2	C3	C4	D
GWP-GHG	kg CO <sub>2</sub> eq.	7.58E-02	3.75E-04	2.03E-02	4.12E-03	1.07E-02	-1.35E-02
GWP- Fossil	kg CO <sub>2</sub> eq.	7.51E-02	3.75E-04	2.03E-02	4.11E-03	1.07E-02	-1.35E-02
GWP - Biogenic	kg CO <sub>2</sub> eq.	8.73E-03	1.88E-08	8.99E-07	2.74E-06	1.25E+00	-4.28E-06
GWP - luluc	kg CO <sub>2</sub> eq.	1.21E-04	1.54E-08	5.42E-07	3.20E-06	1.26E-06	-6.32E-06
GWP - Total	kg CO <sub>2</sub> eq.	8.39E-02	3.75E-04	2.03E-02	4.12E-03	1.26E+00	-1.35E-02
ODP	kg CFC-11 eq.	4.79E-10	5.70E-12	3.92E-10	4.87E-11	1.34E-10	-6.83E-11
AP	mol H+ eq.	3.70E-04	3.46E-06	5.39E-05	3.17E-05	1.44E-04	-6.07E-05
EP -freshwater	kg P eq.	4.65E-06	3.53E-10	5.26E-08	7.99E-08	8.25E-08	-3.83E-07
EP -marine	kg N eq.	7.01E-05	1.63E-06	1.99E-05	1.29E-05	7.29E-05	-1.89E-05
EP -terrestrial	mol N eq.	7.57E-04	1.79E-05	2.18E-04	1.41E-04	7.73E-04	-2.03E-04
POCP	kg NMVOC eq.	2.34E-04	5.34E-06	8.50E-05	4.21E-05	1.89E-04	-5.90E-05
ADP - fossils	MJ	9.25E-01	4.90E-03	2.68E-01	5.44E-02	8.79E-02	-1.25E-01
ADP - minerals and metals	kg Sb eq.	7.24E-07	1.31E-11	8.80E-10	1.36E-10	3.52E-09	-2.64E-09
WDP	m <sup>3</sup>	1.48E-02	3.66E-06	1.71E-04	2.19E-04	4.86E-03	-1.74E-03
Particulate matter	disease inc.	4.63E-09	9.97E-11	1.33E-09	7.71E-10	1.39E-09	-1.26E-09
Ionizing radiation	kBq U-235 eq	3.24E-03	4.07E-07	2.42E-05	8.17E-05	2.07E-05	-3.34E-05
Ecotoxicity, freshwater	CTUe	5.07E-01	1.40E-04	1.49E-02	3.93E-03	9.11E-02	-6.23E-02
Human toxicity, non-cancer	CTUh	7.77E-10	3.68E-13	1.33E-10	9.54E-12	1.90E-09	-2.92E-10
Human toxicity, cancer	CTUh	4.67E-11	2.00E-14	1.39E-12	2.63E-13	2.57E-11	-2.11E-11
Land use	Pt	1.54E-01	8.32E-06	1.11E-03	1.82E-03	7.00E-03	-1.57E-02
PERE	MJ	2.52E-01	3.18E-05	5.34E-03	2.84E-03	1.47E+01	-3.07E-03
PERM	MJ	-6.74E-02	0.00E+00	0.00E+00	0.00E+00	-1.47E+01	0.00E+00
PERT	MJ	1.84E-01	3.18E-05	5.34E-03	2.84E-03	3.47E-03	-3.07E-03
PENRE	MJ	9.77E-01	5.19E-03	3.55E-01	5.68E-02	5.84E+00	-1.38E-01
PENRM	MJ	-7.16E-03	0.00E+00	0.00E+00	0.00E+00	-5.71E+00	0.00E+00
PENRT	MJ	9.70E-01	5.19E-03	3.55E-01	5.68E-02	1.38E-01	-1.38E-01
SM	kg	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m <sup>3</sup>	5.66E-04	1.48E-07	7.26E-06	9.64E-06	1.60E-04	-5.36E-05
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	5.80E-03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E+00	0.00E+00

Environmental Impacts Indicators	Units	100% landfill					
		A5	C1	C2	C3	C4	D
GWP-GHG	kg CO <sub>2</sub> eq.	7.63E-02	3.75E-04	2.03E-02	4.12E-03	1.07E-02	0.00E+00
GWP- Fossil	kg CO <sub>2</sub> eq.	7.23E-02	3.75E-04	2.03E-02	4.11E-03	1.07E-02	0.00E+00
GWP - Biogenic	kg CO <sub>2</sub> eq.	8.73E-03	1.88E-08	8.99E-07	2.74E-06	1.25E+00	0.00E+00
GWP - luluc	kg CO <sub>2</sub> eq.	1.21E-04	1.54E-08	5.42E-07	3.20E-06	1.26E-06	0.00E+00
GWP - Total	kg CO <sub>2</sub> eq.	8.12E-02	3.75E-04	2.03E-02	4.12E-03	1.26E+00	0.00E+00
ODP	kg CFC-11 eq.	4.79E-10	5.70E-12	3.92E-10	4.87E-11	1.34E-10	0.00E+00
AP	mol H+ eq.	3.69E-04	3.46E-06	5.39E-05	3.17E-05	1.44E-04	0.00E+00
EP -freshwater	kg P eq.	4.70E-06	3.53E-10	5.26E-08	7.99E-08	8.25E-08	0.00E+00
EP -marine	kg N eq.	7.16E-05	1.63E-06	1.99E-05	1.29E-05	7.29E-05	0.00E+00
EP -terrestrial	mol N eq.	7.52E-04	1.79E-05	2.18E-04	1.41E-04	7.73E-04	0.00E+00
POCP	kg NMVOC eq.	2.34E-04	5.34E-06	8.50E-05	4.21E-05	1.89E-04	0.00E+00
ADP - fossils	MJ	9.25E-01	4.90E-03	2.68E-01	5.44E-02	8.79E-02	0.00E+00
ADP - minerals and metals	kg Sb eq.	7.24E-07	1.31E-11	8.80E-10	1.36E-10	3.52E-09	0.00E+00
WDP	m <sup>3</sup>	1.37E-02	3.66E-06	1.71E-04	2.19E-04	4.86E-03	0.00E+00
Particulate matter	disease inc.	4.63E-09	9.97E-11	1.33E-09	7.71E-10	1.39E-09	0.00E+00
Ionizing radiation	kBq U-235 eq	3.24E-03	4.07E-07	2.42E-05	8.17E-05	2.07E-05	0.00E+00
Ecotoxicity, freshwater	CTUe	5.51E-01	1.40E-04	1.49E-02	3.93E-03	9.11E-02	0.00E+00
Human toxicity, non-cancer	CTUh	7.60E-10	3.68E-13	1.33E-10	9.54E-12	1.90E-09	0.00E+00
Human toxicity, cancer	CTUh	4.55E-11	2.00E-14	1.39E-12	2.63E-13	2.57E-11	0.00E+00
Land use	Pt	1.56E-01	8.32E-06	1.11E-03	1.82E-03	7.00E-03	0.00E+00
PERE	MJ	2.52E-01	3.18E-05	5.34E-03	2.84E-03	1.47E+01	0.00E+00
PERM	MJ	-6.74E-02	0.00E+00	0.00E+00	0.00E+00	-1.47E+01	0.00E+00
PERT	MJ	1.84E-01	3.18E-05	5.34E-03	2.84E-03	3.47E-03	0.00E+00
PENRE	MJ	9.77E-01	5.19E-03	3.55E-01	5.68E-02	5.84E+00	0.00E+00
PENRM	MJ	-7.16E-03	0.00E+00	0.00E+00	0.00E+00	-5.71E+00	0.00E+00
PENRT	MJ	9.70E-01	5.19E-03	3.55E-01	5.68E-02	1.38E-01	0.00E+00
SM	kg	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
NRSF	MJ	0.00E+00	1.68E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m <sup>3</sup>	5.39E-04	1.48E-07	7.26E-06	9.64E-06	1.60E-04	0.00E+00
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	5.80E-03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Disclaimer: 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.

## Abbreviations

Abbreviation	Definition
<b>General Abbreviations</b>	
CEN	European Committee for Standardization
CO <sub>2</sub>	Carbon dioxide
c-PCR	Complementary product category rules
EF	Environmental Footprint
EN	European Norm (Standard)
EPD	Environmental product declaration
GHG	Greenhouse gas
GPI	General Programme Instructions
GWP	Global warming potential
ISO	International Organization for Standardization
LCA	Life cycle assessment
LCI	Life cycle inventory
ND	Not Declared
NA	Not applicable
PCR	Product category rules
SVHC	Substances of Very High Concern

## References

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