

# Environmental Product Declaration



THE INTERNATIONAL EPD® SYSTEM



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

## ***M-series Bamboo Product***

from

***Fujian Golden Bamboo Industry Co. Ltd.***

# REBO®

Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
EPD registration number:	S-P-11526
Publication date:	2023-12-08
Valid until:	2028-12-07

*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>

<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 – 2019:14 Construction products (EPD International), version 1.3.1</i> <i>UNCPC Code –31450 (Plywood, veneer panels and similar laminated wood of bamboo)</i>
PCR review was conducted by: <i>The Technical Committee of the International EPD® System. A full list of members available on <a href="http://www.environdec.com">www.environdec.com</a>. The review panel may be contacted via <a href="mailto:info@environdec.com">info@environdec.com</a></i> <i>Chair of the PCR review: No appointed chair</i>
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: Penny Pan, Intertek Building & Construction
<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>Dandan Li, Star Talers Environmental Technology</i>
Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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: Fujian Golden Bamboo Industry Co. Ltd.

Address: NO. 175, National RD.319, Nanjing High-Tech Zone, Zhangzhou, Fujian, China

Contact: Kevin Lee

Email: sales@fjgoldenbamboo.com

Tel: +86 0596-7661113

Description of the organisation:

REBO (Fujian Golden Bamboo Industry Co., Ltd.) founded in 2011, covers an area of 133,400 square meters, a total investment of 100million RMB. It is a modern bamboo industry and operation company with the mission of "promoting the global environmental protection process and reducing the consumption of ecological resources". REBO contains 10 experts who are dedicated in reconsolidated bamboo researching, 11 top designers, 26 technicians and 148 employees. There are nearly 100 national invention patents and practical patents.

The company is located at Nanjing town, Zhangzhou city, Fujian province where has abundant bamboo. Because of rich rain, sunshine and good drainage conditions, 800 million bamboo resources are available. REBO is devoted to the bamboo plank's optimization and upgrading, aims at green, eco-friendly and health.

Product-related or management system-related certifications:

REBO has got the authentication of ISO9001:2008, ISO14001:2004, ASTM and REACH test report.

Name and location of production site(s): Fujian (China).

### 3. Product information

Product name: M-series Bamboo Products



Product description:

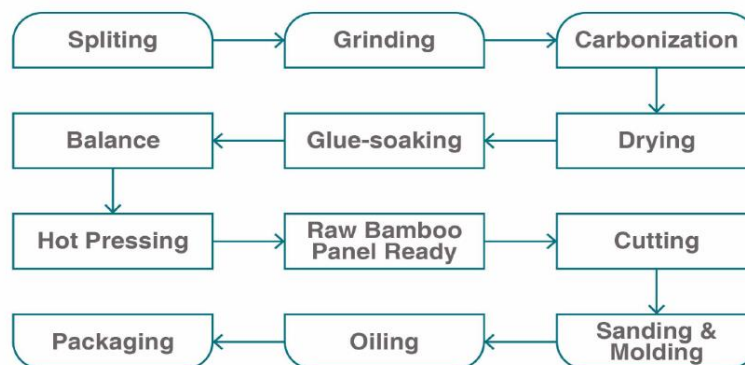
M-series Bamboo products is a new type of natural environmental protection material. With fast-growing bamboo as raw material, after 160°C carbonization temperature, but higher heat pressure and heating time, the sugar, worm eggs and nutrient in original bamboo can be removed efficiently, which makes the bamboo products with high hardness, good stability and corrosion resistance.

Product Application: The most widespread uses of bamboo products are outdoor decking, cladding, fencing and furniture etc.

UN CPC code: UNCPC Code –31450 (Plywood, veneer panels and similar laminated wood of bamboo)

Manufacturing process:

The production process starts with splitting flattened bamboo into strips, then carbonize the bamboo strips to remove sugar and organic matter to achieve the effect of mildew prevention. After carbonization, bamboo strips are soaking with phenolic resin, lay in a press form with a giant hydraulic press to a solid bamboo panel, and then cutting into shapes. Finally, the finished product is coated with outdoor water-based oil.



**Figure 1: Manufacturing process of M-series Bamboo Product**

Geographical scope:

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

Product technical properties:

Table 1 Product technical properties

No.	Property	Test Method	Test results
1	Density	GB/T 17657-2013	1.2g/cm <sup>3</sup>
2	4h Circulating boiled thickness expansion rate	EN15534	≤10%
3	Brinell hardness	EN1534: 2011	107N/mm <sup>2</sup>
4	Bending strength	EN408: 2012	87N/mm <sup>2</sup>
5	Modulus of elasticity in bending (mean value)	EN408: 2012	18700N/mm <sup>2</sup>
6	Durability	EN350	Class 1/ ENV807 ENV12308
7	Use class	EN335	Class 4
8	Reaction to fire	EN13501-1	Bfl-s1
9	Slip resistance (Oil-wet ramp test)	DIN 51130:2014	R10
10	Slip resistance(PTV20)	CEN/TS 16165:2012 Annex C	86(Dry) 53(Wet)
11	Formaldehyde Emission	EN717-1:2014	E1

## 4. LCA information

Declared unit: 1 kg of M-series Bamboo products.

Time representativeness: 1<sup>st</sup> January 2022 to 31<sup>st</sup> December 2022 (12 months)

Database(s) and LCA software used: SimaPro 9.5.0, Ecoinvent 3.9.1

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:

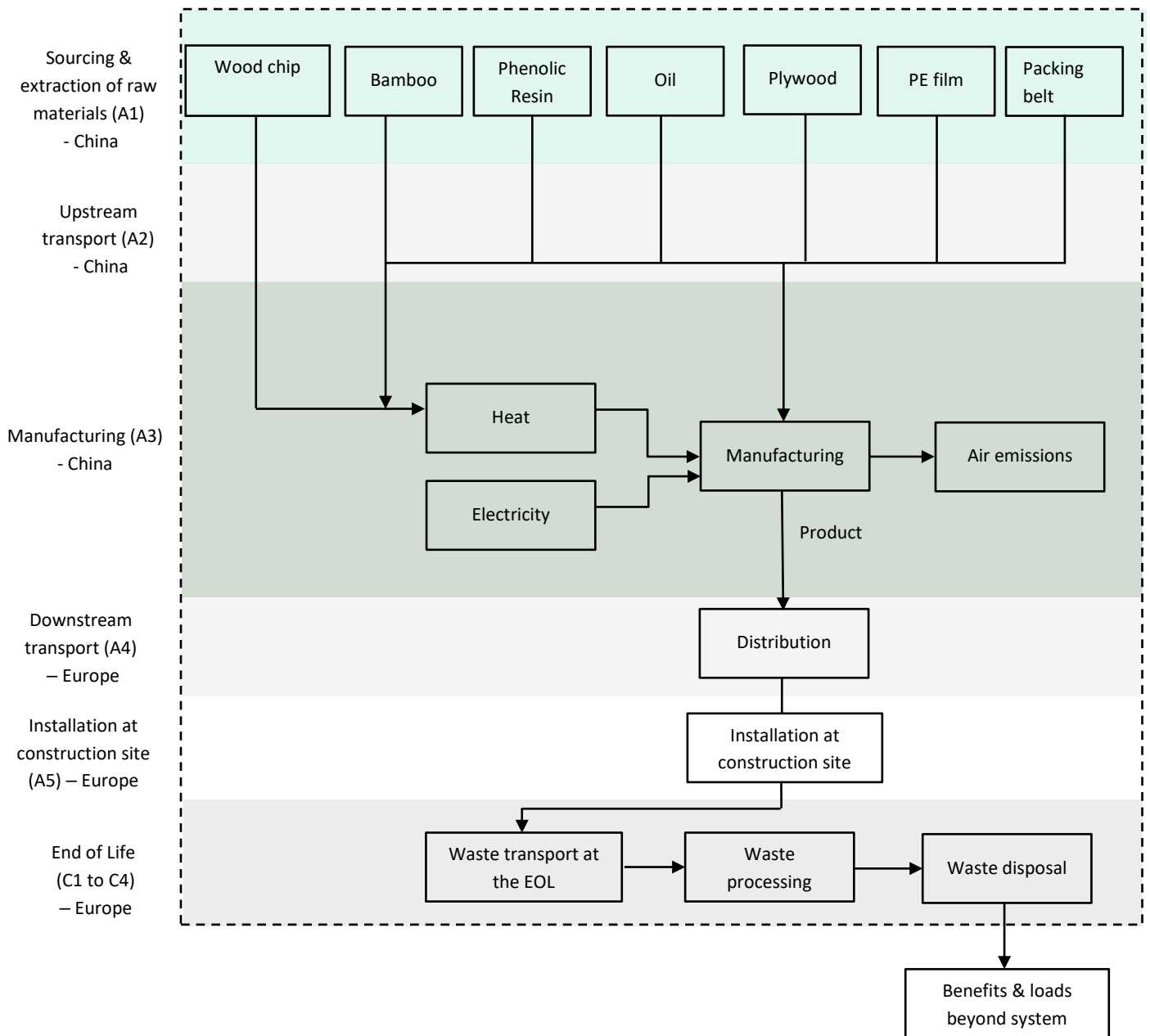


Figure 2: System boundary description for M-series Bamboo Product

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	CN	CN	CN	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

**Module A1** – The raw material and supply stage covers production and processing of raw materials and package material to bamboo products, and generation of electricity. The major materials include flattened bamboo, phenolic resin and vegetable oil. The company purchases flattened bamboo from local plantations and all other ingredients are 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 for 2022.

**Module A3** - The production process starts at the drying and carbonization with bamboo stripe, then connected with phenolic resin followed by surface finishing processes and package.

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

**Module A4** - Transport of the final product to customers located at EU is considered and the routes and distances are calculated accordingly. Transport routes were provided by the manufacturer for 2022.

Table 2 Transport to building site

Scenario information	Value		Units (expressed per declared unit)
	Lorry	Ship	
Fuel type and consumption	Diesel, 31.11	Heavy oil, 12.48	L/100km or t/100km
Distance	CN: 100 EU: 500	20000	km
Capacity utilisation (including empty returns)	80	80	%
Bulk density of transportation	1,200	1,200	kg/m <sup>3</sup>
Volume capacity utilisation factor	<1	<1	Not applicable

**Module A5** – The product is designed for installation on a subfloor, 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 for fastening. It is assumed that no mass loss at installation, all plywood pallet goes to reuse, and 50% plastic packaging materials go to recycling, the rest goes to landfill.

Table 3 – Installation of the product in the building

Scenario information	Value	Units (expressed per declared unit)
Ancillary materials for installation (specified by material)	Stainless steel screw: 0.001 Stainless steel clip: 0.005	kg
Water use	-	m <sup>3</sup>
Other resource use	-	kg
Quantitative description of energy type (regional mix) and consumption during the installation process	0.0503	kWh
Waste materials on the building site before waste processing, generated by the product's installation (specified by type)	-	kg
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	Plywood: 0.0282 PE film: 0.000473 PET belt: 0.000721	kg
Direct emissions to ambient air, soil and water	-	kg



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

**Module C1** - Demounting and demolition are assumed to be conducted with electrical saw and electrical screwdriver.

**Module C2** - It is assumed that waste products will be transported in a lorry to the waste processing/ disposal site located at 100 km distance (C2).

**Module C3&C4** - In this analysis, it is assumed that 45% wasted bamboo products are incinerated to generate heat and electricity and 55% of the waste bamboo products are sent for landfill followed by Product Environmental Footprint(PEF) method.

As per PCR section 4.5.3, for waste that has not reached the end-of-waste state prior to its incineration, the thermal efficiency of the incineration process determines whether it shall be assigned to modules C3 or C4. If the thermal efficiency is higher than 60%, the incineration process is an energy recovery process and shall be assigned to C3. 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% following by Ecoinvent 3 incineration data. Hence, 45% incineration and 55% landfill process shall be assigned to C4 stage in this study. As the waste contains biogenic carbon, it was adjusted manually by showing virtual biogenic CO2 emissions as per PCR requirements.

Table 4 - End-of life

Process		Value	Units (expressed per declared unit)
Collection process specified type	Collected separately	1	kg
	Collected with mixed construction waste	-	kg
Recovery system specified by type	Reuse	-	kg
	Recycling	-	kg
	Energy recovery	-	kg
Disposal specified by type	Product or material for final deposition	1	kg
Assumption for scenario development, e.g. transportation	See description above		

**Module D** - It is assumed that some heat and electricity which benefited from incineration at C4 stage are accounted in Module D, and the reuse of 100% plywood pallet as package material and recycling of 50% plastic package material will contribute the benefit and credit at Module D.

**Data Sources**

Most of the data used in the modeling is of primary data from manufacturing site in China, supplemental datasets from an LCA database (Ecoinvent v3.9.1) were used where necessary.

### **Electricity source**

In this LCA study, the grid mix data on electricity for the site Fujian Province was based on grid mixes of eastern China. LCI data for the generation of electricity used in the manufacturing process is from ecoinvent v3.9.1 based on the year 2020.

In 2020, the source of power supply is 71.16% thermal power, 16.36% hydropower and 5.6% wind power. The transmission of electricity in all cases is taken from power station via a high voltage electricity grid to low voltage electricity suitable for domestic use, with a loss factor of 4.69% of the electricity produced at the power station, and a loss of 3.75% by the electricity consumption at the power plants.

The applied electricity data set used in the manufacturing process is 0.852kg CO<sub>2</sub> eq./kWh.

### **Cut off rule**

All the inflows are included and there is no cut-off used in this study, except for the waste process of ancillary materials for installation. 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**

In terms of the specific data, all the data is specific to M-series Bamboo product. Therefore, no allocation procedures were adopted.

In terms of generic data, the main database used, Ecoinvent v3.9.1 (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 v3.9.1 with a cut-off by classification end-of-life allocation method (100:0) was used.

## 5. Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Bamboo	0.841	-	100%, 0.410 kg C/kg
Phenolic Resin	0.157	-	-
Oil	0.002	-	-
Total	1.000	-	84.1%, 0.345 kg C/kg
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Package film (PE)	4.73E-04	0.047%	-
Plywood	2.82 E-02	2.82%	0.383kg C/kg
Packing Belt (PET)	7.21E-04	0.072%	-

### **Substances, REACH – Very High Concern:**

The product does not contain any REACH SVHC substances in amounts greater than 0.1%(1000ppm)

## 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 M-series Bamboo Product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq.	1.45E+00	3.25E-01	5.70E-02	1.81E-02	1.88E-02	0.00E+00	1.34E-02	-1.71E-02
GWP-biogenic	kg CO <sub>2</sub> eq.	-1.15E+00	5.02E-05	4.15E-02	6.14E-04	1.70E-05	0.00E+00	1.26E+00	-4.76E-02
GWP-luluc	kg CO <sub>2</sub> eq.	6.79E-03	2.18E-04	9.26E-05	4.52E-05	9.14E-06	0.00E+00	6.80E-06	-8.03E-05
GWP-total	kg CO <sub>2</sub> eq.	3.00E-01	3.25E-01	9.85E-02	1.87E-02	1.89E-02	0.00E+00	1.28E+00	-6.48E-02
ODP	kg CFC 11 eq.	2.33E-08	5.55E-09	7.83E-10	3.44E-10	4.10E-10	0.00E+00	2.72E-10	-5.79E-09
AP	mol H <sup>+</sup> eq.	1.01E-02	6.61E-03	3.18E-04	1.04E-04	6.14E-05	0.00E+00	1.20E-04	-1.50E-04
EP-freshwater	kg P eq.	4.21E-04	1.53E-05	3.21E-05	1.71E-05	1.32E-06	0.00E+00	4.36E-06	-1.17E-05
EP-marine	kg N eq.	2.43E-03	1.69E-03	5.87E-05	1.68E-05	2.11E-05	0.00E+00	2.46E-04	-5.62E-05
EP-terrestrial	mol N eq.	2.70E-02	1.86E-02	5.69E-04	1.52E-04	2.23E-04	0.00E+00	5.58E-04	-6.01E-04
POCP	kg NMVOC eq.	9.10E-03	5.21E-03	1.89E-04	4.87E-05	9.17E-05	0.00E+00	1.70E-04	-1.83E-04
ADP-fossil*	MJ	2.33E+01	4.20E+00	8.68E-01	4.09E-01	2.67E-01	0.00E+00	2.00E-01	-3.49E-01
ADP-minerals & metals*	kg Sb eq.	2.25E-05	5.73E-07	1.02E-06	2.16E-07	6.04E-08	0.00E+00	2.55E-08	-2.20E-07
WDP*	m <sup>3</sup>	5.25E-01	1.25E-02	1.18E-02	4.62E-03	1.09E-03	0.00E+00	6.82E-04	-2.41E-02
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 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.

Module C is included in this EPD, and care shall be taken to avoid using of the results of modules A1-A5 without considering the results of module C.

\*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.

## 6.2 Additional mandatory and voluntary impact category indicators

Results per declared unit for 1 kg of M-series Bamboo Product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	1.50E+00	3.25E-01	5.78E-02	1.82E-02	1.88E-02	0.00E+00	4.78E-02	-1.73E-02
Particulate matter	disease inc.	2.01E-07	1.53E-08	3.41E-09	3.78E-11	1.50E-09	0.00E+00	1.80E-09	-3.17E-09
Ionizing radiation <sup>2</sup>	kBq U-235 eq	5.91E-02	3.29E-03	1.51E-02	1.14E-02	3.57E-04	0.00E+00	2.66E-04	-4.40E-03
Ecotoxicity, freshwater <sup>3</sup>	CTUe	1.57E+01	2.09E+00	2.48E-01	6.87E-02	1.32E-01	0.00E+00	1.40E-01	-9.13E-02
Human toxicity, non-cancer <sup>3</sup>	CTUh	4.62E-08	1.90E-09	1.16E-09	3.35E-10	1.88E-10	0.00E+00	1.00E-09	-4.19E-10
Human toxicity, cancer <sup>3</sup>	CTUh	7.65E-09	1.43E-10	2.12E-10	8.44E-12	8.55E-12	0.00E+00	2.26E-11	-1.51E-10
Land use <sup>3</sup>	Pt	7.22E+01	1.17E+00	2.98E-01	8.00E-02	1.59E-01	0.00E+00	3.36E-01	-4.42E+00

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.

Disclaimer 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.

Disclaimer 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 M-series Bamboo Product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.90E+01	4.29E-02	5.16E-01	8.95E-02	4.15E-03	0.00E+00	1.49E+01	-9.35E-01
PERM	MJ	1.52E+01	0.00E+00	-3.29E-01	0.00E+00	0.00E+00	0.00E+00	-1.49E+01	0.00E+00
PERT	MJ	3.42E+01	4.29E-02	1.87E-01	8.95E-02	4.15E-03	0.00E+00	4.07E-03	-9.35E-01
PENRE	MJ	1.79E+01	4.20E+00	9.05E-01	4.09E-01	2.67E-01	0.00E+00	5.47E+00	-3.49E-01
PENRM	MJ	5.31E+00	0.00E+00	-3.66E-02	0.00E+00	0.00E+00	0.00E+00	-5.27E+00	0.00E+00
PENRT	MJ	2.32E+01	4.20E+00	8.68E-01	4.09E-01	2.67E-01	0.00E+00	2.00E-01	-3.49E-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	7.07E+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>	1.34E-02	4.39E-04	6.27E-04	3.24E-04	3.80E-05	0.00E+00	4.58E-05	-6.66E-04
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 M-series 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	0.00E+00	0.00E+00	0.00E+00	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 M-series Bamboo Product									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	2.82E-02	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	5.97E-04	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	7.83E-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	1.57E+00	0.00E+00

## References

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