

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017, OPT. EN 15804+A2

SmartEPD-2024-009-0131-01

Plyboo® Bamboo Plywood



Date of Issue:
May 23, 2024

Expiration:
May 23, 2029

Last updated:
May 24, 2024

General Information	3
Reference Standards	3
Verification Information	3
Limitations, Liability, and Ownership	4
Organization Information	4
Product Information	5
Plants	5
Product Specifications	5
Material Composition	5
Software and LCI Data Sources	6
EPD Data Specificity	6
Renewable Electricity	6
System Boundary	7
Product Flow Diagram	8
Life Cycle Module Descriptions	8
LCA Discussion	8
Results	10
Environmental Impact Assessment	10
Resource Use Indicators	11
Waste and output Flow Indicators	11
Carbon Emissions and Removals	12
Interpretation	13
Additional Environmental Information	13
Further Information	14
References	14

General Information

Smith & Fong

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Product Name:	Plyboo® Bamboo Plywood
Declared Unit:	1 kg
Declaration Number:	SmartEPD-2024-009-0131-01
Date of Issue:	May 23, 2024
Expiration:	May 23, 2029
Last updated:	May 24, 2024
EPD Scope:	Cradle to gate A1 - A3
Market(s) of Applicability:	North America, China

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017, opt. EN 15804+A2
Core PCR:	Smart EPD® Part A Product Category Rules for Building and Construction Products and Services, v1.01 v.1.01 Date of issue: January 15, 2024 Valid until: January 15, 2029
Sub-category PCR review panel:	📄 Contact Smart EPD for more information.
General Program Instructions:	📄 Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

ACLCA PCR Guidance Version:	1.0
ACLCA PCR Conformance Level:	Transparency
LCA Author/Creator:	🌐 Maria Amaya ✉ maria.amaya@beath.us
EPD Program Operator:	📄 Smart EPD ✉ info@smartepd.com 🌐 www.smartepd.com 📍 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 :

External

🌐 Nicole Kennard | 🏢 Consultant | ✉ nicolejjk.17@gmail.com

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) :

External

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Limitations, Liability, and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

Smith & Fong (S&F) was founded in 1989 on the premise that bamboo offered unique opportunities and solutions to some of the world's social and environmental challenges. S&F began with laminated bamboo boxes and accessory items, integrating form and function, aesthetics and utility. Within four years, S&F had begun manufacturing bamboo flooring and quickly exhausted manufacturing capacity at their Taiwan facility. Shortly after moving operations to China, S&F converted a tea-processing plant and began producing bamboo flooring there. In 1996, S&F developed a bamboo panel product, introducing the first such product to the North American market. Since then, S&F has continued to develop the laminate bamboo panel product, introducing new sizes, uses and applications for this versatile and highly sustainable material.

Further information can be found at: plyboo.com

Product Description

Bamboo plywood panels can be used in a wide range of applications both commercial and residential. Applications include cabinetry and casework, furniture, store fixtures and displays, wall and ceiling panel systems, doors and many other applications where plywood is typically utilized.

Further information can be found at: plyboo.com

Product Information

Declared Unit:	1 kg
Mass:	1 kg
Product Specificity:	✗ Product Average ✓ Product Specific

Averaging:

This product-specific EPD was developed based on primary annual manufacturing data for bamboo plywood products. The EPD represents products manufactured at one facility. This is deemed to be an accurate representation of an average bamboo plywood product within this product category.

Plants



China Facility
Zhejiang, China

Product Specifications

Product Classification Codes:	Masterformat - 097413 EC3 - Finishes -> WallFinishes
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Material Composition

Material/Component Category	Origin	% Mass
Bamboo Poles	None	95
Adhesive	None	5

Packaging Material	Origin	kg Mass
Wood Pallet	None	8.21E-03
Nylon Strap	None	9.67E-02
Steel Corners	None	8.79E-02
Stretch Wrap (plastic film)	None	3.71E-03
Plastic Sheets	None	2.30E-01
Cardboard	None	8.15E-01

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year: 2022

Manufacturing Specificity:

- Industry Average
- Manufacturer Average
- Facility Specific

Software and LCI Data Sources

LCA Software:  openLCA v. 1.11

LCI Foreground Database(s):  Ecoinvent v. 3.9.1 |  China, US |  Cut-off system models

LCI Background Database(s):  Ecoinvent v. 3.9.1 |  China |  Cut-off system models

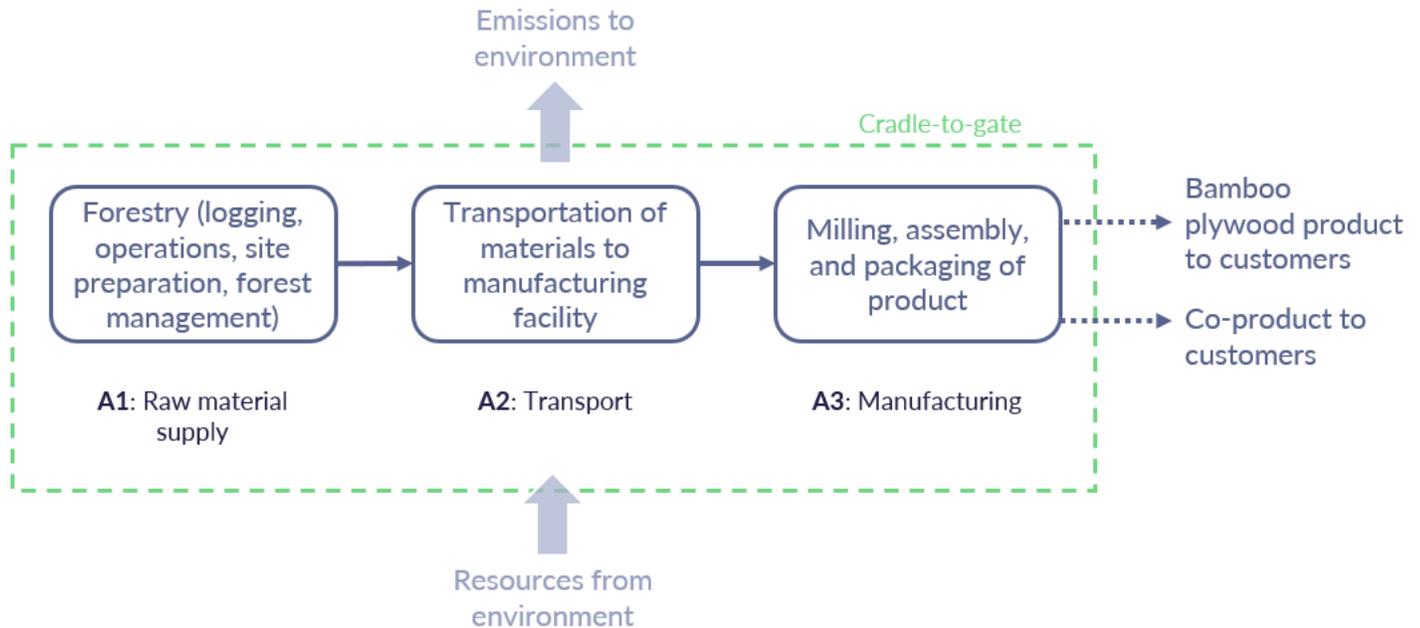
Renewable Electricity

Renewable electricity is used: No

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	ND
	A5	Assembly / Install	ND
Use	B1	Use	ND
	B2	Maintenance	ND
	B3	Repair	ND
	B4	Replacement	ND
	B5	Refurbishment	ND
	B6	Operational Energy Use	ND
	B7	Operational Water Use	ND
End of Life	C1	Deconstruction	ND
	C2	Transport	ND
	C3	Waste Processing	ND
	C4	Disposal	ND
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

The bamboo plywood manufacturing process starts with growing and harvesting the bamboo poles, followed by a milling process and an assembly process. The raw bamboo is split and then milled through a double milling process and is kiln dried. Once the bamboo strips are dried, adhesive is applied to the strips and pressed face to face to produce a raw bamboo blank. This blank is then refined and multiple blanks are pressed together to form a piece of bamboo plywood during the assembly process. Module A1 includes raw materials (bamboo). Module A2 includes the transport of raw materials to from the field to the manufacturing facility in Zhejiang, China. Module A3 includes the manufacturing, packaging, and waste management.

LCA Discussion

Allocation Procedure

Annual production volume and product mass were used to allocate facility-level inputs, outputs, and emissions. At each of the manufacturing plants in Zhejiang, China, a portion of the bamboo trimmings/sawdust generated is used internally as fuel at the plants to generate steam. The waste bamboo products were burned to heat boilers used during the milling process in Zhejiang, China. For the bamboo plywood production process, mass-based allocation procedure was used. The rest of the bamboo coproducts generated are sold to make energy pellets and other products.

Cut-off Procedure

No cut-off criteria were defined for this analysis. All available energy and material flow data were included in accordance with the system boundary.

Data Quality Discussion

Primary data in combination with representative, secondary literature, and consistent background life cycle inventory (LCI) information from ecoinvent version 3.9.1 (Wernet, et al., 2016) and other sources were used. Primary data are from the calendar year 2022. Primary and secondary data were assessed for temporal coverage, geographical coverage, technology coverage, precision, completeness, representativeness, consistency, and reproducibility.

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1, CML 2016 v4.8

per 1 kg of product.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Unit	A1A2A3
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	3.68e-1
ODP	TRACI 2.1	kg CFC 11 eq	4.95e-9
AP	TRACI 2.1	kg SO2 eq	1.78e-3
EP	TRACI 2.1	kg N eq	6.38e-4
POCP	TRACI 2.1	kg O3 eq	2.65e-2
FFD	TRACI 2.1	MJ	2.93e-1
ODP	CML 2016 v4.8	kg CFC 11 eq	2.65e-9
AP	CML 2016 v4.8	kg SO2 eq	1.68e-3
EP	CML 2016 v4.8	kg PO4 eq	4.71e-4
POCP	CML 2016 v4.8	kg ethylene eq	8.39e-5
ADP-fossil	CML 2016 v4.8	MJ	4.08e+0

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicators
per 1 kg of product.

Indicator	Unit	A1A2A3
PERE	MJ, net calorific value	7.33e-1
PERM	MJ, net calorific value	2.07e+2
PERT	MJ, net calorific value	2.08e+2
PENRE	MJ, net calorific value	8.88e+0
PENRM	MJ, net calorific value	0
PENRT	MJ, net calorific value	8.88e+0
SM	kg	0
RSF	MJ, net calorific value	0
NRSF	MJ, net calorific value	0
RE	MJ	0
FW	m3	2.79e+0

Abbreviations:
 RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRM or PENRM = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators
per 1 kg of product.

Indicator	Unit	A1A2A3
HWD	kg	0
NHWD	kg	0
RWD	kg	0
CRU	kg	0
MFR	kg	2.72e+1
MER	kg	0
EEE	MJ	0
EET	MJ	0

Abbreviations:
 HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals
per 1 kg of product.

Indicator	Unit	A1A2A3	A5	C3	C4
BCRP	kg CO2	-8.17e+0	0	0	0
BCEP	kg CO2	4.82e+0	0	0	1.83e+0
BCRK	kg CO2	-8.37e-4	0	0	0
BCEK	kg CO2	0	8.37e-4	0	0
BCEW	kg CO2	1.52e+0	0	0	0
CCE	kg CO2	0	0	0	0
CCR	kg CO2	0	0	0	0
CWNR	kg CO2	0	0	0	0

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Interpretation

Results Summary

The results of the LCA indicate that the electricity and steam generation for the milling and assembly plant are the largest contributors to the Smith & Fong product footprint across impact categories. The adhesive is also a significant contributor. Impacts of adhesive are driven by the adhesive feedstocks. Inbound transport of bamboo and adhesive to the plant is included and is a small contributor to the product footprint. The study timeframe is for the year 2022 for Smith & Fong manufacturing in Zhejiang, China.

This study does not include comparisons or benchmarking. Environmental declarations from different programs based upon different PCRs may not be comparable.

Forest Management Impacts

While this EPD does not address landscape level forest management impacts, potential impacts may be addressed through requirements put forth in regional regulatory frameworks, ASTM 7612-15 guidance, and ISO 21930 Section 7.2.11 including notes therein. These documents, combined with this EPD, may provide a more complete picture of environmental and social performance of wood products. While this EPD does not address all forest management activities that influence forest carbon, wildlife habitat, endangered species, and soil and water quality, these potential impacts may be addressed through other mechanisms such as regulatory frameworks and/or forest certification systems which, combined with this EPD, will give a more complete picture of environmental and social performance of wood products. EPDs can complement but cannot replace tools and certifications that are designed to address environmental impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, etc. National or regional life cycle averaged data for raw material extraction does not distinguish between extraction practices at specific sites and can greatly affect the resulting impacts.

Accuracy of Results

EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact when averaging data. Variability was estimated in this EPD by mass allocation.

Additional Environmental Information

Smith & Fong have the following certifications: FSC Chain of Custody Certificate, Plyboo® Health Product Declaration, and a Declare Certificate. Please contact Dan Smith at dan@plyboo.com for copies of certifications.

Environmental Activities and Certifications

Certification
FSC Chain of Custody Certificate
Declare
Health Product Declaration (HPD)

Further Information

Declared Unit Attributes

Category	Value
Thickness to achieve declared unit	6-38 mm
Density	690 kg/m ³
Moisture content	6-9 %

References

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