HempWood® Natural Flooring

Environmental Product Declaration

Conducted in accordance with ISO 14025, ISO 21930, and EN 15804

EPDs are not intended to make comparisons with other products due to varying background data in LCA softwares and/or varying Program Operator rules or Product Category Rules. An EPD is informational and does not warrant performance.

EPD SUMMARY

PROGRAM OPERATOR	ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA, 19428. https://www.astm.org/
DECLARATION NUMBER	360
DATE OF ISSUE	1 September 2022
VALID UNTIL	31 August 2027
MANUFACTURER	Fibonacci, LLC, 301 Rockwood Rd. Murray, KY 42071 https://hempwood.com.
DECL. PRODUCT, FUNCTIONAL UNIT	HempWood® Natural Flooring - 1 m^2 in use for 75 years
INTENDED APPLICATION	Commercial spaces
REFERENCE SERVICE LIFE	25 years
MARKET OF APPLICABILITY	North America
EPD TYPE	Product-specific
MANUFACTURER DATA	2021
LCA SOFTWARE	SimaPro 9.3
LCI DATABASES	DATASMART 2020, ecoinvent 3.8, US LCI database 2015
LCIA METHODOLOGY	TRACI 2.1
PCR SUBCATEGORY	Part B: PCR for Flooring EPD Requirements, UL 10010–7, Second Edition, dated September 28, 2018. Reviewed by: Jack Geibig, Ecoform, Chair; Tom Gloria, PhD, Industrial Ecology Consultants; and Thaddeus Owen.

This declaration was independently verified in accordance with ISO 14025: 2006. Core PCR: UL Environment Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, v3.2 (September 2018), based on ISO 21930:2017 and CEN Norm EN 15804 (2012), with additional considerations from the USGBC/UL Environment Part A Enhancement (2017). Verification was performed:

___ Internally _X__ Externally

Life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Anne Landfield Greig, Four Elements Consulting, LLC https://www.fourelementsllc.com.
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Tom Gloria, PhD, Industrial Ecology Consultants

FIBONACCI, LLC.

Based in Murray, Kentucky, Fibonacci, LLC, specializes in engineered lumber made of hemp that is used for flooring and other building products. The hemp-based engineered lumber was developed with the vision of creating a brighter future for the planet and stimulating American manufacturing by introducing sustainable building materials with a lower carbon footprint.

PRODUCT DESCRIPTION

Fibonacci's signature product, HempWood® Natural Flooring, is a durable flooring product that is made with a no-added formaldehyde (NAF) soy-based adhesive resin system such as those sold under the tradename Soyad™ Adhesive Technology by Solenis, LLC. The flooring product consists of a 4-mm HempWood veneer bonded to a 12-mm hardwood plywood manufactured by Columbia Forest Products, also made with NAF soy-based adhesive resin. HempWood flooring is offered in three options: site-finished, Natural, and Custom Color Collection, which includes the choice of Espresso, Bourbon, Ice, Granite, Carbon, and Cherry. This EPD presents HempWood flooring as factory-coated using the Natural finish and installed using nails, the most common installation method.

Table 1 HempWood Natural Flooring Technical Data

Name	Value
Floor product thickness	0.63 in (16 mm)
Floor product plank width	5 in (127 mm)
HempWood lumber density	1063 kg/m^3
CFP plywood density	500 kg/m^3
Finished floor product mass per functional unit	10.5 kg/m^2

LIFE CYCLE ASSESSMENT OVERVIEW

A cradle-to-grave Life Cycle Assessment (LCA) was completed on HempWood® Natural Flooring in accordance with ISO 14040 / ISO 14044, and the study was reviewed for conformance with ISO 14044 and the PCRs. The product assessed was based on 2021 data from Fibonacci's Murray, Kentucky, HempWood facility.

System Boundaries

The LCA evaluated the flooring system from cradle to grave. This includes: the production, installation, use, and end-of-life of the flooring. This is depicted below as defined in EN 15804, Section 5.2.

Table 2 EPD System Boundary Modules

Production Stage			Installation Stage		Use Stage							End-of-Life Stage			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/Demolition	Transport waste processing or disposal	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	X	X	MND	X	MND	X	MND	MND	MND	MND	X	MND	X

MND = "module not declared"

Functional Unit

The functional unit is one square meter (1 m^2) of floor covering used in a commercial space for the building's estimated service life (ESL) of 75 years. The product's reference service life (RSL) is 25 years. Maintenance and product replacements over 75 years are accounted for.

Life Cycle Stages

A1 Production: Raw Material Sourcing and Extraction

Module A1 accounts for the growing, harvesting, and processing of hemp, soybeans, and wood, plus extraction and production of the other materials in the product.

Table 3 Bill of Materials – HempWood Flooring

Flooring material or component	Percent by mass)	Distance to facility (mi)	Availability	
HempWood lumber	40.5%			
Industrial hemp stalks/fiber (~85%)		40	Abundant	Renewable
Soy-based adhesive system (~15%)		350	Abundant	Renewable
Plywood	57.5%	519	Abundant	Renewable
Bonding: hot melt adhesive	1%	450	Fossil limited	Non-renewable
Coating: acrylic resin	1%	500	Fossil limited	Non-renewable

The product contains no regulated hazardous substances or dangerous substances. The Tennessee Valley Authority (TVA), part of SERC, electricity grid was used for purchased electricity.

A2 Production: Transportation to Manufacturing

Module A2 models transportation of raw materials to the HempWood lumber and flooring manufacturing plant in Murray, KY. The distances of each material to the plant by heavy duty diesel truck was based on Fibonacci supplier locations.

A3 Production: Manufacturing

Module A3 includes HempWood lumber production and flooring assembly and finishing. 2021 energy use, emissions, and waste management were included in the model. Figure 1 presents A1-A3 as they pertain to HempWood® Natural Flooring and identifies aspects of production that are excluded.

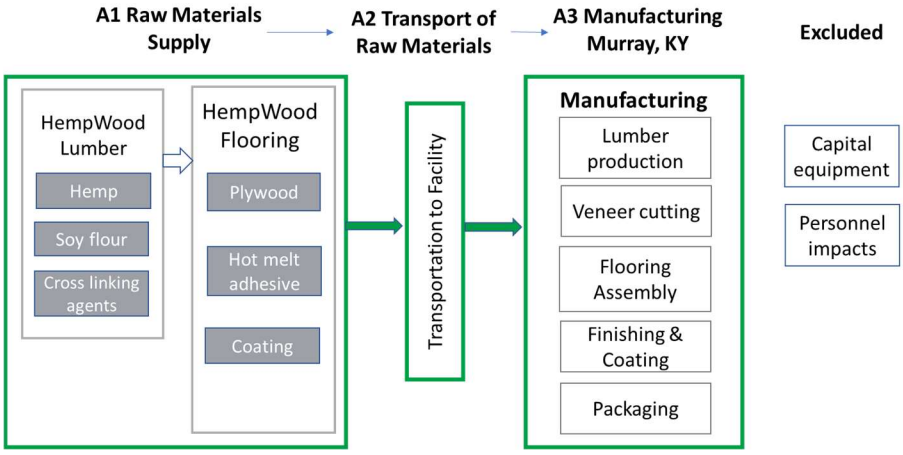

Figure 1 HempWood Flooring Production Stage System Boundary and Data

A4 Transport to Building Site

Transport to customers of the finished, packaged product is using diesel-powered truck. Since customers vary from year to year and may be located in any part of the U.S., the subcategory PCR (Part B) default distance of 800 km (497 mi) was used.

A5 Installation

HempWood flooring can be installed manually with nails, glue, or tongue and groove on oriented strand board or plywood, or as a floating floor. For this declaration, HempWood flooring is installed with nails, the most common installation method. The underlying flooring material is excluded.

Table 4 Installation into the Building (A5)

Name	Value	Unit/m2	Notes
Nails	0.0009	kg	Two 18-gauge trim or flooring nails
Flooring product loss	0.51	kg	Approximately 5% of the flooring; to landfill.
Packaging mass (recycled corrugated cardboard)	0.40	kg	
Biogenic carbon in the packaging	0.19	kg	47% biogenic C content (WARM v.15)
Packaging waste management			Recycle: 68%, incin: 5%, landfill: 20%. (PCR A)
Total stored biogenic C from the packaging, as CO2	0.076	kg	Based on landfilling rate of 20%
Transport distance to waste management	161	km	Default distance (PCR Part B)

Refer to https://hempwood.com/flooring/ for more detailed instruction on HempWood flooring installation.

B2 Maintenance

Maintenance is modeled using two scenarios: sweeping on a regular basis and vacuuming once per week. Results present these scenarios separately.

Table 5 Maintenance (B2)

Maintenance Schedule		
Maintenance recommendations: Vacuum 1x/wk, Sweep 5x/week	Source: National Wood Flooring Association (NWFA): https://www.woodfloors.org/maintenance.aspx	
Vacuuming cycle per product lifetime	1,300	Cycles/RSL
Vacuuming cycle per building service life	3,900	Cycles/ESL
Maintenance Inputs and Outputs	**Quantity per m2/year**	**Quantity per m2/75 yrs (ESL)**
Vacuum	0.21 kWh	15.6 kWh
Sweeping / Solid waste from the vacuum	0.40 kg	29.9 kg

B4 Replacement

The manufacturer warrants for HempWood flooring a period of 25 years from the date of purchase, which is used as the reference service life (RSL) in this EPD. However, according to the manufacturer, the potential product lifetime when properly used and maintained can last longer. For the EPD, the flooring product is replaced two times over 75 years: at years 25 and 50. The B4 results therefore present two cycles of production, transport to building, installation, and end-of-life. Replacement of worn parts or a partial floor is assumed not applicable.

C2 Transportation to Disposal

Transportation of HempWood flooring to a landfill is 161 km by heavy-duty diesel-fuel powered truck.

C4 End-of-Life

While the product may be recycled or reused at EOL, there is currently not enough information on this relatively new product that assures these practices by its users. The product is thus modeled as disposed of in a landfill – the subcategory PCR (Part B) default end of life disposition. Sequestration of carbon from the biomass has been accounted for in the global warming potential (GWP) category, based on quantity of biomass carbon in the flooring and long-term storage rate at end-of-life. Carbon storage rates and emissions from biogenic material in a landfill are based on the EPA WARM v.15 model. Table *6* summarizes the product's biomass carbon emissions and removals, specifying where in the results these are accounted.

Table 6 Biomass Carbon Emissions and Removals

Name	Value	Unit/m2	Notes
Biogenic C removal from HempWood flooring	15.7	kg CO2	Accounted for in C4
Biogenic C emission from HempWood flooring	1.82	kg CO2	Accounted for in C4
Biogenic C removal from packaging	0.38	kg CO2	Accounted for in A5
Biogenic C emission from packaging	2.53	kg CO2	Accounted for in A5

Note: removals are negative values in the LCA.

Cut-off Criteria

All efforts were made to include all known inputs of mass and energy flows and all known outputs. No known flows have been deliberately excluded. Data gaps on materials were filled by proxy data deemed appropriate. Care was taken to include material flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this standard.

Allocation

Data for HempWood lumber was provided on a total facility basis. A mass allocation was made for the portion of the lumber going to flooring. For industrial hemp production, economic allocation was applied as there is currently lower demand for hemp fiber from the stalk relative to the grain in the U.S. Resulting allocation based on Fibonacci purchasing data was 29.2% for the entire hemp stalk (including the fiber and hurds by-product), and 70.8% for grain (hemp seeds).

Software and Data Used

The SimaPro LCA software was used to model the HempWood flooring system. Data came from sources appropriate for North America and with the highest data quality in mind. Secondary data came from U.S. LCI database, DATASMART, and ecoinvent.

Data Quality

The data applied to this study represent the current HempWood flooring system. Fibonacci's manufacturing facility supplied 2021 process data. Energy and transportation data are based on the late 2010's, and production data for materials are based on mid 2010's through 2020. Data for energy and transportation are North American based. Data for materials and processes are based on a combination of North American and European sources which, where possible, were customized to reflect North American conditions. Technological coverage for the upstream materials and processes are generally industry average, and in some instances, it is typical technology.

RESULTS AND CONTRIBUTION ANALYSIS

The Life Cycle Impact Assessment (LCIA) results were calculated using TRACI v.2.1. The six categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. EPD users shall not use additional measures for comparative purposes. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Results are presented for the RSL of 75 years and for one product installment plus one year of use, for sweeping only and for vacuum only.

Table 7 HempWood Flooring LCIA Results – 75 Yrs No Vacuum

75 years - no vacuum		Produc-tion	Transport to install	Install-ation	Mainten-ance	Replace-ment	Transport to EOL	EOL	TOTAL
Impact Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B4**	**C2**	**C4**	
Global warming potential (with biogenic C)	kg CO2-e	11.62	0.87	0.30	0.52	0.88	0.35	-12.70	**1.84**
Acidification potential	kg SO2-e	0.04	0.01	1.94 E-04	4.44 E-03	0.12	2.05 E-03	9.82 E-04	**0.18**
Eutrophication potential	kg N-e	0.01	6.90 E-04	4.29 E-03	7.75 E-04	0.18	3.94 E-04	0.07	**0.27**
Smog creation potential	kg O3-e	0.78	0.29	4.83 E-03	0.12	2.32	0.06	0.03	**3.60**
Ozone depletion potential	kg CFC11-e	3.30 E-07	3.66 E-11	2.50 E-09	2.64 E-07	7.50 E-07	1.71 E-10	4.20 E-08	**1.39 E-06**
Abiotic depletion potential for fossil resources	MJ	93.55	12.41	0.43	16.12	227.31	4.23	3.05	**357.09**

Note: the B4 (Replacement) column accounts for two cycles of production, transport to installation, installation, and end-of-life.

Table 8 HempWood Flooring Other Results Categories – 75 Yrs No Vacuum

75 years - no vacuum		Produc-tion	Transport to install	Install-ation	Mainten-ance	Replace-ment	Transport to EOL	EOL	TOTAL
Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B4**	**C2**	**C4**	
Resource Use: Energy									
Non-renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	122.38	13.18	0.47	17.38	287.82	4.49	3.39	**449.10**
Non-renewable primary energy resources used as raw materials	MJ (LHV)	0	0	0	0	0	0	0	**0**
Renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	52.21	0	2.53 E-03	0.33	104.48	1.02 E-04	0.03	**157.05**
Renewable primary energy resources used as raw materials	MJ (LHV)	177.60	0	0	0	355.20	0	0	**532.81**
Resource use: Materials									
Use of secondary materials	Kg	0	0	0	0	0	0	0	**0**
Use of renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	0	**0**
Use of non-renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	0	**0**
Use of recovered energy	MJ (LHV)	0	0	0	0	0	0	0	
Use of net fresh water (inputs minus outputs)	m3	0.12	0	1.89 E-04	0.02	0.24	1.07 E-05	2.84 E-03	**0.38**
Waste categories									
Non-hazardous waste disposed	Kg	0.93	0	0.61	119.30	24.62	0.51	10.25	**156.23**
Hazardous waste disposed	Kg	0	0	0	0	0	0	0	**0**
Radioactive waste disposed	Kg	0	0	0	0	0	0	0	**0**
Other output flows									
Components for reuse	Kg	0	0	0	0	0	0	0	**0**
Materials for recycling	Kg	2.48	0	0	0	4.96	0	0	**7.43**
Materials for energy recovery	Kg	0	0	0	0	0	0	0	**0**
Exported energy	MJ (LHV)	0	0	0	0	0	0	0	**0**

Table 9 HempWood Flooring LCIA Results – 1 Installation No Vacuum

1 installation, 1 year - no vacuum		Produc-tion	Transport to install	Install-ation	Mainten-ance	Transport to EOL	EOL	TOTAL
Impact Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C4**	
Global warming potential (with biogenic C)	kg CO2-e	11.62	0.87	0.30	0.01	0.35	-12.70	**0.45**
Acidification potential	kg SO2-e	0.04	0.01	1.94 E-04	5.92 E-05	2.05 E-03	9.82 E-04	**0.06**
Eutrophication potential	kg N-e	0.01	6.90 E-04	4.29 E-03	1.03 E-05	3.94 E-04	0.07	**0.09**
Smog creation potential	kg O3-e	0.78	0.29	4.83 E-03	1.58 E-03	0.06	0.03	**1.16**
Ozone depletion potential	kg CFC11-e	3.30 E-07	3.66 E-11	2.50 E-09	3.52 E-09	1.71 E-10	4.20 E-08	**3.78 E-07**
Abiotic depletion potential for fossil resources	MJ	93.55	12.41	0.43	0.21	4.23	3.05	**113.87**

Table 10 HempWood Flooring Other Results Categories – 1 Installation No Vacuum

1 installation, 1 year - no vacuum		Produc-tion A1-A3	Transport to install A4	Install-ation A5	Mainten-ance B2	Transport to EOL C2	EOL C4	TOTAL
Category	**Unit**							
Resource Use: Energy								
Non-renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	122.38	13.18	0.47	0.23	4.49	3.39	**144.14**
Non-renewable primary energy resources used as raw materials	MJ (LHV)	0	0	0	0	0	0	**0**
Renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	52.21	0	2.53 E-03	0.00	1.02 E-04	0.03	**52.24**
Renewable primary energy resources used as raw materials	MJ (LHV)	177.60	0	0	0	0	0	**177.60**
Resource use: Materials								
Use of secondary materials	Kg	0	0	0	0	0	0	**0**
Use of renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	**0**
Use of non-renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	**0**
Use of recovered energy	MJ (LHV)	0	0	0	0	0	0	
Use of net fresh water (inputs minus outputs)	m3	0.12	0	1.89 E-04	2.52 E-04	1.07 E-05	2.84 E-03	**0.12**
Waste categories								
Non-hazardous waste disposed	Kg	0.93	0	0.61	1.59	0.51	10.25	**13.90**
Hazardous waste disposed	Kg	0	0	0	0	0	0	**0**
Radioactive waste disposed	Kg	0	0	0	0	0	0	**0**
Other output flows								
Components for reuse	Kg	0	0	0	0	0	0	**0**
Materials for recycling	Kg	2.48	0	0	0	0	0	**2.48**
Materials for energy recovery	Kg	0	0	0	0	0	0	**0**
Exported energy	MJ (LHV)	0	0	0	0	0	0	**0**

Table 11 HempWood Flooring LCIA Results – 75 Yrs With Vacuum

75 years - with vacuuming		Produc-tion	Transport to install	Install-ation	Mainten-ance	Replace-ment	Transport to EOL	EOL	TOTAL
Impact Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B4**	**C2**	**C4**	
Global warming potential (with biogenic C)	kg CO2-e	11.62	0.87	0.30	39.44	0.88	0.35	-12.70	**40.77**
Acidification potential	kg SO2-e	0.04	0.01	1.94 E-04	0.17	0.12	2.05 E-03	9.82 E-04	**0.35**
Eutrophication potential	kg N-e	0.01	6.90 E-04	4.29 E-03	0.01	0.18	3.94 E-04	0.07	**0.28**
Smog creation potential	kg O3-e	0.78	0.29	4.83 E-03	1.98	2.32	0.06	0.03	**5.47**
Ozone depletion potential	kg CFC11-e	3.30 E-07	3.66 E-11	2.50 E-09	1.25 E-06	7.50 E-07	1.71 E-10	4.20 E-08	**2.37 E-06**
Abiotic depletion potential for fossil resources	MJ	93.55	12.41	0.43	511.73	227.31	4.23	3.05	**852.70**

Note: the B4 (Replacement) column accounts for two cycles of production, transport to installation, installation, and end-of-life.

Table 12 HempWood Flooring Other Results Categories – 75 Yrs With Vacuum

75 years - with vacuuming		Produc-tion	Transport to install	Install-ation	Mainten-ance	Replace-ment	Transport to EOL	EOL	TOTAL
Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B4**	**C2**	**C4**	
Resource Use: Energy									
Non-renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	122.38	13.18	0.47	762.33	287.82	4.49	3.39	**1194.05**
Non-renewable primary energy resources used as raw materials	MJ (LHV)	0	0	0	0	0	0	0	**0**
Renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	52.21	0	2.53 E-03	40.92	104.48	1.02 E-04	0.03	**197.64**
Renewable primary energy resources used as raw materials	MJ (LHV)	177.60	0	0	0	355.20	0	0	**532.81**
Resource use: Materials									
Use of secondary materials	Kg	0	0	0	0	0	0	0	**0**
Use of renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	0	**0**
Use of non-renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	0	**0**
Use of recovered energy	MJ (LHV)	0	0	0	0	0	0	0	**0**
Use of net fresh water (inputs minus outputs)	m3	0.12	0	1.89 E-04	0.07	0.24	1.07 E-05	2.84 E-03	**0.43**
Waste categories									
Non-hazardous waste disposed	Kg	0.93	0	0.61	119.30	24.62	0.51	10.25	**156.23**
Hazardous waste disposed	Kg	0	0	0	0	0	0	0	**0**
Radioactive waste disposed	Kg	0	0	0	0	0	0	0	**0**
Other output flows									
Components for reuse	Kg	0	0	0	0	0	0	0	**0**
Materials for recycling	Kg	2.48	0	0	0	4.96	0	0	**7.43**
Materials for energy recovery	Kg	0	0	0	0	0	0	0	**0**
Exported energy	MJ (LHV)	0	0	0	0	0	0	0	**0**

Table 13 HempWood Flooring LCIA Results – 1 Installation With Vacuum

1 installation, 1 year - with vacuuming		Produc-tion	Transport to install	Install-ation	Mainten-ance	Transport to EOL	EOL	TOTAL
Impact Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C4**	
Global warming potential (with biogenic C)	kg CO2-e	11.62	0.87	0.30	0.53	0.35	-12.70	**0.97**
Acidification potential	kg SO2-e	0.04	0.01	1.94 E-04	2.25 E-03	2.05 E-03	9.82 E-04	**0.06**
Eutrophication potential	kg N-e	0.01	6.90 E-04	4.29 E-03	1.78 E-04	3.94 E-04	0.07	**0.09**
Smog creation potential	kg O3-e	0.78	0.29	4.83 E-03	0.03	0.06	0.03	**1.19**
Ozone depletion potential	kg CFC11-e	3.30 E-07	3.66 E-11	2.50 E-09	1.66 E-08	1.71 E-10	4.20 E-08	**3.91 E-07**
Abiotic depletion potential for fossil resources	MJ	93.55	12.41	0.43	6.82	4.23	3.05	**120.48**

Table 14 HempWood Flooring Other Categories Results – 1 Installation With Vacuum

1 installation, 1 year - with vacuuming		Produc-tion	Transport to install	Install-ation	Mainten-ance	Transport to EOL	EOL	TOTAL
Category	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C4**	
Resource Use: Energy								
Non-renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	122.38	13.18	0.47	10.16	4.49	3.39	**154.07**
Non-renewable primary energy resources used as raw materials	MJ (LHV)	0	0	0	0	0	0	**0**
Renewable primary energy used as an energy carrier (fuel)	MJ (LHV)	52.21	0	2.53 E-03	0.55	1.02 E-04	0.03	**52.79**
Renewable primary energy resources used as raw materials	MJ (LHV)	177.60	0	0	0	0	0	**177.60**
Resource use: Materials								
Use of secondary materials	Kg	0	0	0	0	0	0	**0**
Use of renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	**0**
Use of non-renewable secondary fuels	MJ (LHV)	0	0	0	0	0	0	**0**
Use of recovered energy	MJ (LHV)	0	0	0	0	0	0	**0**
Use of net fresh water (inputs minus outputs)	m3	0.12	0	1.89 E-04	9.12 E-04	1.07 E-05	2.84 E-03	**0.12**
Waste categories								
Non-hazardous waste disposed	Kg	0.93	0	0.61	1.59	0.51	10.25	**13.90**
Hazardous waste disposed	Kg	0	0	0	0	0	0	**0**
Radioactive waste disposed	Kg	0	0	0	0	0	0	**0**
Other output flows								
Components for reuse	Kg	0	0	0	0	0	0	**0**
Materials for recycling	Kg	2.48	0	0	0	0	0	**2.48**
Materials for energy recovery	Kg	0	0	0	0	0	0	**0**
Exported energy	MJ (LHV)	0	0	0	0	0	0	**0**

INTERPRETATION

The figures below present the life cycle stages for GWP, highlighting the effect of the removal of biomass carbon.

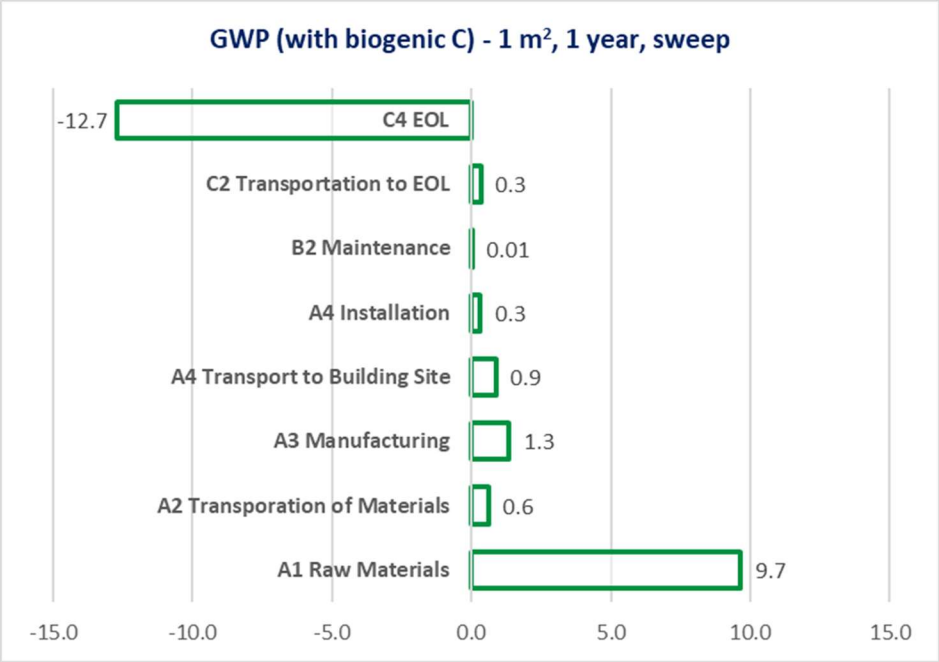

Figure 2 Breakdown of Life Cycle Stages for GWP – No Vacuum

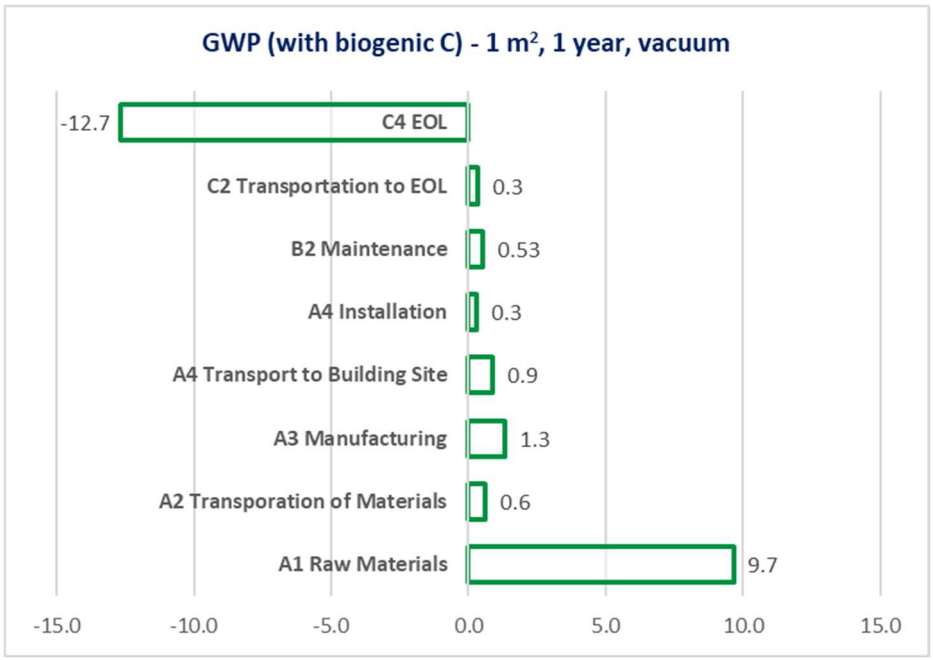

Figure 3 Breakdown of Life Cycle Stages for GWP – With Vacuum

PERFORMANCE STANDARDS & OTHER ENVIRONMENTAL INFORMATION

HempWood® Natural Flooring is tested, certified & labeled for the following performance standards.

Table 15 Product Performance Standards

Standard	Item	Results
ASTM D1037 -6a (Janka Ball)	Hardness	2,200 lbf
ASTM D1037 (20-90% RH)	Dimensional stability	Swell 0.02/0.06/0.77%
ASTM E648	Fire rating	Rating: Class 1
ASTM 1037	Abrasion resistance	1600-1800 revs (WRO)
ASTM 1037	Scratch resistance	21N
BGR 151/DIN 51 130	Slip resistance	R10
CARB 2 & TSCA VI	Formaldehyde emissions	Compliant
ASTM D6007-14	VOC emissions	BLQ => 0.008 ppm

LIMITATIONS & COMPARABILITY

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of flooring 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 building energy use phase as instructed under this PCR.

Full conformance with the PCR for products allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. For example, different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared. If comparisons to other EPDs are done, these variations and deviations must be acknowledged.

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