B-EPD ENVIRONMENTAL PRODUCT DECLARATION

VestaEco
Straw Boards 280

1 m³ of low-density board for general uses (building, packaging, etc.) installed according to the manufacturers recommendations, and with a declared lifespan of 60 years.

Issued 17.03.2021
Valid until 17.03.2026

Third party verified
Conform to EN 15804+A2 and NBN/DTD B08-001
NBN EN 16783
ISO 14025

Modules declared (cradle to grave)					
A123	A4	A5	B	C	D
•	•	•	•	•	•

[B-EPD n° 21-0123-001.00.00-EN]

OWNER OF THIS ENVIRONMENTAL PRODUCT DECLARATION
VestaEco COMPOSITES Sp. Z o.o. (manufacturer)
Natura Mater SRL (distributor)

EPD PROGRAM OPERATOR
Federal Public Service of Health, Food Chain Safety and Environment
www.b-epd.be

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings. This EPD is only valid when registered on www.b-epd.be. The FPS Public Health cannot be held responsible for the information provided by the owner of the EPD.

PRODUCT DESCRIPTION

PRODUCT NAME

VestaEco straw boards 280: VestaEco LDF

PRODUCT DESCRIPTION AND INTENDED USE

VestaEco straw boards 280 products are made of straw and resin. It can be used for building, furniture, or packaging as a low-density board with acoustic and thermal insulation characteristics.

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Density (kg/m3)	Recommended uses	Thickness (mm)	Commercial product names
280	Construction / packaging / furniture as thermal and acoustic insulation board	30	VestaEco LDF

REFERENCE FLOW / DECLARED UNIT

The functional unit for VestaEco straw boards 280 is defined as below: "Ensure the function of low-density board with VestaEco straw boards 280 for construction (interior finishing, partition wall) with acoustic and thermal insulation characteristics, for 1 m^3 installed following the manufacturer recommendations, and with a designed lifespan of 60 years."

The reference flow and unit is 1 m^3 of straw boards. The weight per reference flow is 280 kg.

Packaging is included and consists of polyethylene film, cardboard, and wooden pallet. Material needed for mounting and installing the product is not included.

INSTALLATION

The scope of this B-EPD is the product as produced. Regarding installation, this EPD only includes the environmental impact related to the product itself. Therefore, materials for fixation and installation are not included. VestaEco straw boards 280 can be installed without any additional energy and/or emissions from the building. Material losses and packaging EoL shall be declared at this stage.
For installing the product, following scenarios are possible: for internal finishing and partition wall, VestaEco straw boards 280 can be installed with clay plaster, jute mesh, and staples.

IMAGE OF THE PRODUCT

Fig 1 : VestaEco straw boards 280

COMPOSITION AND CONTENT

Components	Composition / ingredients	Content / quantity
Product	- Straw (triticale and rye straw) - PMDI Resin	• 95% • 5%
Packaging	- Cardboard - PE film - Wood pallets	• 0,85 kg/m^3 • 0,55 kg/m^3 • 12,5 kg/m^3

The product does not contain materials listed in the "Candidate list of Substances of Very High Concern for authorization".

REFERENCE SERVICE LIFE

The reference service life is estimated at 60 years.

The conditions under which this RSL is valid are as following: if installed correctly according to manufacturer's guidelines, straw panel products need no further maintenance, repair, replacement, or refurbishment during the full life span of the product. If the product is applied and maintained following the installation and maintenance instructions, the life span of 60 years is applicable.

DESCRIPTION OF GEOGRAPHICAL REPRESENTATIVITY

The EPD is representative for the Belgian market.

DESCRIPTION OF THE PRODUCTION PROCESS AND TECHNOLOGY

This product is made following the production protocols of VestaEco.

Product stage (A1-3): Straw from Poland and PMDI resin from Hungary are transported by truck to the production plant located in Poland. The manufacturing includes fragmentation, defibration, pressing, loosening, drying, and assembling processes. The final product is packed and transported to the Belgium market.

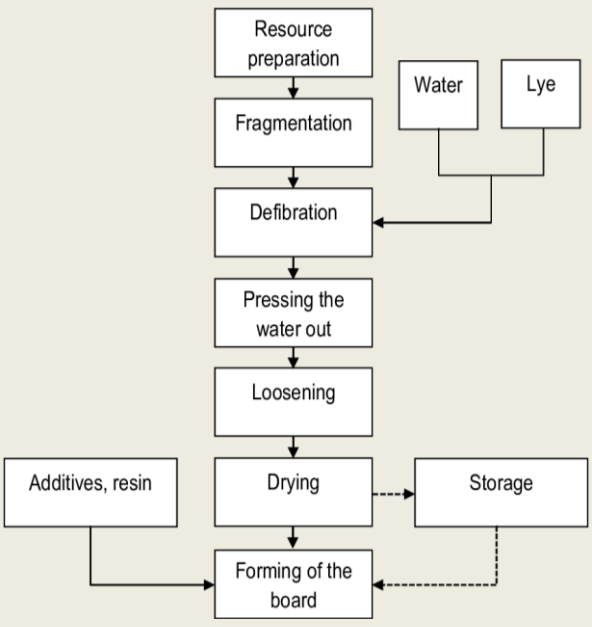

Fig 2: Flowchart illustrating the production process of straw panel

TECHNICAL DATA / PHYSICAL CHARACTERISTICS

Technical property	Standard	Value	Unit
Thermal capacity C		2100	J/(kg*K)
Short-term water absorption		<1	kg/m²
Fire resistance class (EN 13501-01)	EN 13501-01	E	
Average density		280	kg/m³
Lambda value (λ)		0,055	W/(mK)

LCA STUDY

DATE OF LCA STUDY

The LCA study is conducted in January-February 2021 and verified in February 2021. The information contained in this document is provided under the responsibility of VestaEco according to EN 15804.

SOFTWARE

SimaPro version 9.1.0.7 and Ecoinvent database version 3.6 were used.

INFORMATION ON ALLOCATION

No co-product allocation occurs in the product foreground system. The allocations from the background database are kept intact.

Allocation procedure of straw and crop from the Ecoinvent database

Straw is considered as a co-product of crop. Therefore, an economic allocation between the production of grains and straw is included in the Ecoinvent database from which comes the data “Straw {RER}| rye production | Cut-off” used for this study. The allocation factor for straw from IP and extensive production is 9,7% (Ecoinvent, Report No. 15a).

Product	Straw economic allocation factor (%)
Raw material “Straw {RER}| rye production	Cut-off”	9,7

Allocation procedure of energy and additives used during manufacturing

During the process of straw panels manufacturing, energy and additives are used. The quantities used per year has been given by VestaEco for two products: VestaEco straw insulation boards 140 and VestaEco straw boards 280. To calculate the energy and additives used for each type of straw panel, a mass allocation is used, as difference on prices is lower than 25%.

Product	Energy & Additives mass allocation factors (%)
VestaEco straw insulation boards 140	33,3
VestaEco straw boards 280	66,6

The allocation is applied for electricity, heat, and the manufacturing additives (module A3).

INFORMATION ON CUT OFF

The company reported the data. Some plausibility and completeness assessments, and some checks were conducted for some inputs. For a few remaining data, no extended assessment was conducted, therefore accepting data gaps. In all cases, it is assumed that the cut-off criteria of EN 15804 are met.

INFORMATION ON EXCLUDED PROCESSES
Following processes were excluded from the inventory:
- The effects of capital goods and infrastructural processes have been excluded.
- Flows related to human activities such as employee transport and administration activity.

INFORMATION ON BIOGENIC CARBON MODELLING
Biogenic carbon modelling for the product
VestaEco straw boards 280 are mainly made from straw, with high biogenic carbon content. As long as the product is in use, this carbon is stored in the product. For straw products, the amount is assessed based on the following formula and is provided in the overall LCA results:

CO2 content in air = (annual mass importation of straw before drying) x 0,85 (factor 15% > 0% moisture content) x 1,61 (Ecoinvent report No. 15b, 2007) (carbon dioxide in air per kg of dry straw) / (annual mass production of panels) presented in kg CO2 / kg straw panels.

Biogenic carbon modelling for the packaging
Packaging for VestaEco straw boards 280 includes wooden pallets and cardboard boxes, with high biogenic carbon content. As long as the packaging is in use, this carbon is stored in the packaging. For wooden pallets and cardboard boxes, the amount is assessed based on the following formula and is provided in the overall LCA results:

CO2 content in air = (annual mass importation of wooden pallets) x 0,8 (factor 20% > 0% moisture content) x 0,5 (IPCC, 2006) (carbon content) x 3,67 (mol ratio CO2 – C) / (annual mass production of straw panels)
+ (annual mass importation of cardboard boxes) x 0,92 (factor 8% > 0% moisture content) x 0,5 (IPCC, 2006) (carbon content) x 3,67 (mol ratio CO2 – C) / (annual mass production of straw panels)
presented in kg CO2 / kg straw panels.

	Biogenic carbon content (kg CO2 / FU)
In product (at the gate)	3,97E+02
In packaging (at the gate)	4,06E+01

INFORMATION ON CARBON OFFSETTING
Carbon offsetting is not allowed in the EN 15804 and hence not taken into account in the calculations.

ADDITIONAL OR DEVIATING CHARACTERIZATION FACTORS
The characterization factors from EC-JRC were applied. No additional or deviating characterized factors were used.

DATA

SPECIFICITY
The data used for the LCA are specific for this product, which is manufactured by a single manufacturer (VestaEco) in a single production facility. The data for processes and products are based upon frequent contact with the company to guarantee that this EPD is based on the most up-to-date production data.

PERIOD OF DATA COLLECTION
Manufacturer-specific data have been collected for the year 2020.

INFORMATION ON DATA COLLECTION
No adaptations of the data were found necessary.

DATABASE USED FOR BACKGROUND DATA
Eco-invent version 3.6 was used.

ENERGY MIX
The Poland energy mix is used for the manufacturing.
The Belgian energy mix is used to declare the benefits beyond the system boundaries (module D).

PRODUCTION SITES

VestaEco COMPOSITES production plant, Wielki Leck 81A 13-230 Lidzbark Poland

SYSTEM BOUNDARIES

Product stage			Construction installation stage		Use stage							End of life stage					Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal		Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒		☒

X = included in the EPD
MND = module not declared

POTENTIAL ENVIRONMENTAL IMPACTS FOR 1M³ OF VESTAECO STRAW BOARDS 280

The Life Cycle Impact assessment results and the results for additional indicators are provided for **1m³ of VestaEco straw boards 280 product**. The average density used for the calculation is 280 kg/m³.

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
GWP total (kg CO2 equiv/FU)	-2.79E+02	2.86E+00	1.26E+02	6.02E+01	4.99E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.96E+00	4.12E+02	2.16E+01	-1.46E+02
GWP fossil (kg CO2 equiv/FU)	1.18E+02	2.86E+00	1.42E+02	6.01E+01	8.79E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E+00	3.48E+01	1.76E+00	-1.24E+02
GWP biogenic (kg CO2 equiv/FU)	-3.97E+02	1.52E-03	-1.59E+01	3.21E-02	4.11E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.18E-03	3.77E+02	1.98E+01	-2.16E+01
GWP luluc (kg CO2 equiv/FU)	7.99E-02	9.99E-04	6.89E-02	2.10E-02	3.68E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-03	1.35E-03	4.14E-05	-1.12E-01
ODP (kg CFC 11 equiv/FU)	2.13E-05	6.49E-07	1.27E-05	1.37E-05	1.10E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-06	6.41E-07	4.82E-08	-1.70E-05
AP (mol H^+ eq)	8.69E-01	1.17E-02	8.26E-01	2.46E-01	4.77E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-02	9.84E-02	1.43E-03	-1.90E-01
EP - freshwater (kg P equiv/FU)	8.62E-03	2.24E-05	1.24E-02	4.72E-04	4.48E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.67E-05	1.63E-04	2.21E-06	-1.34E-03
EP - marine (kg N equiv/FU)	6.65E-01	3.46E-03	1.10E-01	7.29E-02	2.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-03	4.34E-02	9.50E-04	-4.04E-02
EP - terrestrial (mol N equiv/FU)	2.07E+00	3.83E-02	1.26E+00	8.06E-01	1.24E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98E-02	4.95E-01	6.12E-03	-4.68E-01
POCP (kg NMVOC equiv/FU)	5.21E-01	1.17E-02	3.77E-01	2.47E-01	3.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-02	1.30E-01	1.98E-03	-1.65E-01

ADP Elements (kg Sb equiv/FU)	1.92E-03	7.73E-05	4.37E-04	1.63E-03	9.37E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-04	1.94E-05	1.87E-06	-3.50E-04
ADP fossil fuels (MJ/FU)	1.86E+03	4.31E+01	1.78E+03	9.06E+02	1.01E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.97E+01	4.51E+01	3.52E+00	-2.77E+03
WDP (m^3 water eq deprived /FU)	3.47E+02	1.20E-01	2.18E+01	2.52E+00	7.67E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-01	1.29E+00	9.20E-02	-1.62E+01

GWP total = total Global Warming Potential (Climate Change); GWP-luluc = Global Warming Potential (Climate Change) land use and land use change; ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; WDP = water use (Water (user) deprivation potential, deprivation-weighted water consumption)

RESOURCE USE FOR 1M^3 OF VESTAECO STRAW BOARDS 280

	Production			Construction process		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PERE (MJ/FU, net calorific value)	8.11E+02	6.08E-01	9.00E+02	1.28E+01	-2.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+00	-4.80E+03	-2.53E+02	-4.65E+02
PERM (MJ/FU, net calorific value)	5.05E+03	0.00E+00	6.45E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.91E+02
PERT (MJ/FU, net calorific value)	5.87E+03	6.08E-01	1.55E+03	1.28E+01	-2.18E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+00	-4.80E+03	-2.53E+02	-8.56E+02
PENRE (MJ/FU, net calorific value)	2.16E+03	4.34E+01	2.25E+03	9.14E+02	1.03E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.05E+01	-2.52E+02	-1.25E+01	-3.02E+03
PENRM (MJ/FU, net calorific value)	3.22E+02	0.00E+00	2.29E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.01E+00

PENRT (MJ/FU, net calorific value)	2.48E+03	4.34E+01	2.27E+03	9.14E+02	1.03E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.05E+01	-2.52E+02	-1.25E+01	-3.03E+03
SM (kg/FU)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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/FU, net calorific value)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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/FU, net calorific value)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW (m^3 water eq/FU)	2.87E+00	3.29E-03	2.62E+00	6.93E-02	1.24E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.86E-03	1.55E-01	6.03E-03	-4.85E-01

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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

WASTE CATEGORIES & OUTPUT FLOWS FOR 1M^3 OF VESTAECO STRAW BOARDS 280

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed kg/FU	1.77E-03	1.13E-04	2.24E-03	2.38E-03	1.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-04	1.16E-04	5.15E-06	-1.88E-03
Non-hazardous waste disposed kg/FU	1.48E+01	2.06E+00	9.44E+00	4.33E+01	2.11E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E+00	1.99E+00	1.34E+01	-3.82E+00
Radioactive waste disposed kg/FU	5.39E-03	2.94E-04	6.01E-03	6.18E-03	4.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.12E-04	1.54E-04	2.19E-05	-1.54E-02

Components for re-use kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+02	0.00E+00	0.00E+00
Exported energy heat MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.02E+03	0.00E+00	0.00E+00
Exported energy electricity MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.11E+02	0.00E+00	0.00E+00

IMPACT CATEGORIES ADDITIONAL TO EN 15804 FOR 1M^3 OF VESTAECO STRAW BOARDS 280

		Production			Construction process		Use stage							End-of-life stage				
		A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
	PM (disease incidence)	5.94E-06	1.99E-07	6.84E-06	4.18E-06	4.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07	8.69E-07	2.40E-08	-1.20E-06
	IRHH (kg U235 eq/FU)	5.34E+00	1.88E-01	4.50E+00	3.96E+00	3.15E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.92E-01	1.24E-01	1.55E-02	-1.80E+01
	ETF (CTUe/FU)	8.63E+03	3.45E+01	2.12E+03	7.26E+02	2.46E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.18E+01	1.59E+02	6.04E+00	-1.01E+03

	HTCE (CTUh/FU)	1.56E-06	9.70E-10	6.35E-08	2.04E-08	3.96E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-09	8.18E-08	2.25E-10	-3.50E-08
	HTnCE (CTUh/FU)	1.57E-05	3.76E-08	1.83E-06	7.91E-07	4.00E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.83E-08	3.14E-07	8.77E-09	-5.10E-07
	Land Use Related impacts (dimensionl ess)	2.54E+03	2.97E+01	5.66E+03	6.25E+02	1.86E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.19E+01	5.47E+01	8.02E+00	-2.64E+03

HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; ETF = Ecotoxicity – freshwater; PM = Particulate Matter (Potential incidence of disease due to PM emissions); IRHH = Ionizing Radiation – human health effects (Potential Human exposure efficiency relative to U235);

	*Global Warming Potential*	*The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.* *It is split up in 4:* - *Global Warming Potential total (GWP-total) which is the sum of GWP-fossil, GWP-biogenic and GWP-luluc* - *Global Warming Potential fossil fuels (GWP-fossil) : The global warming potential related to greenhouse gas (GHG) emissions to any media originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc).* - *Global Warming Potential biogenic (GWP-biogenic) : The global warming potential related to carbon emissions to air (CO2, CO and CH4) originating from the oxidation and/or reduction of aboveground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO2 uptake from the atmosphere through photosynthesis during biomass growth – i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood.[1]* - *Global Warming Potential land use and land use change (GWP-luluc): The global warming potential related to carbon uptakes and emissions (CO2, CO and CH4) originating from carbon stock changes caused by land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).*
	*Ozone Depletion*	*Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.*
	*Acidification potential*	*Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.*
	*Eutrophication potential*	*The potential to cause over-fertilization of water and soil, which can result in increased growth of biomass and following adverse effects.* *It is split up in 3:* - *Eutrophication potential – freshwater: The potential to cause over-fertilization of freshwater, which can result in increased growth of biomass and following adverse effects.* - *Eutrophication potential – marine: The potential to cause over-fertilization of marine water, which can result in increased growth of biomass and following adverse effects.* - *Eutrophication potential – terrestrial: The potential to cause over-fertilization of soil, which can result in increased growth of biomass and following adverse effects.*
	*Photochemical ozone creation*	*Chemical reactions brought about by the light energy of the sun creating photochemical smog. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.*
	*Abiotic depletion potential for non-fossil ressources*	*Consumption of non-renewable resources, thereby lowering their availability for future generations. Expressed in comparison to Antimonium (Sb).* *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.*
	*Abiotic depletion potential for fossil ressources*	*Measure for the depletion of fossil fuels such as oil, natural gas, and coal. The stock of the fossil fuels is formed by the total amount of fossil fuels, expressed in Megajoules (MJ).* *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.*
	*Ecotoxicity for aquatic fresh water*	*The impacts of chemical substances on ecosystems (freshwater).* *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.*
	*Human toxicity (carcinogenic effects)*	*The impacts of chemical substances on human health via three parts of the environment: air, soil and water.*

[1] Carbon exchanges from native forests shall be modelled under GWP - luluc (including connected soil emissions, derived products or residues), while their CO2 uptake is excluded.

		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.
	*Human toxicity (non-carcinogenic effects)*	*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.*
	*Particulate matter*	*Accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)*
	*Resource depletion (water)*	*Accounts for water use related to local scarcity of water as freshwater is a scarce resource in some regions, while in others it is not.* *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.*
	*Ionizing radiation - human health effects*	*This impact category deals mainly with the eventual impact on human health of low dose ionizing radiation 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.*
	*Land use related impacts*	*The indicator is the "soil quality index" which is the result of an aggregation of following four aspects:* - *Biotic production* - *Erosion resistance* - *Mechanical filtration* - *Groundwater* *The aggregation is done based on a JRC model. The four aspects are quantified through the LANCA model for land use.* *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.*

DETAILS OF THE UNDERLYING SCENARIOS USED TO CALCULATE THE IMPACTS

A1 – A3 RAW MATERIAL SUPPLY

The module A1 includes raw material extraction and processing, and processing of additives. The product is mainly made from straw (95% of straw with a humidity of 15% before drying and 7,5% after drying) and 5% of pMDI resin.

A2 – TRANSPORT TO THE MANUFACTURER

The straw and additives are transported to the straw panel production plant. Transportation distances from the raw material manufacturer to the factory gate are given by the manufacturer.

A3 – MANUFACTURING

The manufacturing is composed of fragmentation, defibration (including water and lye use), pressing, loosening, drying and assembly processes. The straw panel is then packed.

A4 – TRANSPORT TO THE BUILDING SITE

Market	Type of Transport	Distance	Empty return
Belgium	100% Lorry 16-32 ton (EURO5)	1288 km	Default Ecoinvent 3.6

The final product transport from Poland to the Belgium market has been modelled with primary data given by VestaEco and secondary data coming from Ecoinvent v.3.6.

A5 – INSTALLATION IN THE BUILDING

Materials for fixation and installation are not included. This EPD only includes the environmental impact related to the product itself. Straw panel products can be installed without any additional energy and/or emissions from the building. Therefore, only material losses and packaging EoL are declared at this stage.

At the construction site, packaging materials are released and receive specific EoL treatment according to the table below. Also, 2% material losses have been considered.

	LHV (MJ/kg)	Recycling	Incineration	Landfill	Reuse	Source
Plastic packaging	43.0	35%	60%	5%	0%	Data provided by NBN/DTD B 08_001:2017
Carboard packaging	13.7	95%	5%	0%	0%	Data provided by NBN/DTD B 08_001:2017
Wooden pallets	19	40%	40%	0%	20%	Data provided by NBN/DTD B 08_001:2017

EoL transport for packaging	Distance	Unit
From the construction site to the sorting plant	30	km
To recycling	150	km
To incineration	100	km
To landfill	50	km

B – USE STAGE (EXCLUDING POTENTIAL SAVINGS)

If installed correctly according to the manufacturers' and suppliers' guidelines, straw panel products need no further maintenance, repair, replacement, or refurbishment during the full life span of the product. If the product is applied following the installation instructions, the life span of 60 years is applicable.

C: END OF LIFE

For the dismantling of straw panel products, they can be extracted without any additional energy and/or emissions from the building. Therefore, no impact is considered for the deconstruction phase. The product is sorted (Belgium scenario of a sorting plant without crusher) before receiving its EoL treatment. 95% of incineration with energy recovery in Belgium and 5% of landfilling are considered for the EoL of the product.

Module C2 – Transport to waste processing			
Type of vehicle (truck/boat/etc.)	Part of the product	Distance (km)	Empty return
Lorry 16-32 ton (EURO5)	95%	100 km	Default Ecoinvent 3.6
Lorry 16-32 ton (EURO5)	5%	50 km	Default Ecoinvent 3.6

End-of-life modules – C3 and C4		
Parameter	Unit	Value
Wastes collected separately	kg	0,95
Wastes collected as mixed construction waste	kg	0,05
Waste for re-use	kg	
Waste for recycling	kg	
Waste for energy recovery for 1 kg of product	kg	0,95
Waste for final disposal for 1 kg of product	kg	0,05

D: BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The energy recovery from incineration of the product and packaging is considered as benefits beyond system boundary, calculated in module D. For incineration with energy recovery, heating value of 19,15 MJ/kg was applied. Credits are assigned for power and heat outputs using the Belgian grid mix and thermal energy from natural gas. The latter represents the cleanest fossil fuel and therefore results in a conservative estimation of avoided burdens. For regional efficiencies and heat-to-power output ratios, 20% is considered for avoided heat from natural gas and 10% is considered fort the electricity production.

There are no benefits or loads of allocated co-products in module D.

ADDITIONAL INFORMATION ON RELEASE OF DANGEROUS SUBSTANCES TO INDOOR AIR, SOIL AND WATER DURING THE USE STAGE

INDOOR AIR

Not applicable as this product is not in contact with indoor air.

SOIL AND WATER

Not applicable as this product is not in contact with drinking water, runoff water, seepage water, and surface water.

DEMONSTRATION OF VERIFICATION

EN 15804+A2 serves as the core PCR
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External☒
Third party verifier: Evert Vermaut Jan Olieslagerslaan 35 1800 Vilvoorde evermaut@vincotte.be

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General information

Owner of the EPD, Responsible for the data, LCA and information	**VestaEco COMPOSITES Sp. z o.o.** **ul. Domaniewska 37 lok. 2.43, 02-672 Warszawa** **Poland** Tel: +48 5 72 43 82 31 ; *For more information, you can contact info@vestaeco.pl*
EPD program Program operator Publisher of this EPD	**B-EPD** **FPS Health** Galileelaan 5/2 1210 Brussel Belgium www.environmentalproductdeclarations.eu
Contact program operator	epd@environment.belgium.be
Based on following PCR documents	EN 15804+A2:2019 NBN/DTD B 08-001 and its complement EN 16783
PCR review conducted by	Federal Public Service of Health and Environment & PCR Review committee
Author(s) of the LCA and EPD	Stella LAPALUS Dr Carolina SZABLEWSLI Dr Naeem ADIBI WeLOOP - info@weloop.org
Identification of the project report	Confidential Background Report – Natura Mater v1.0
Verification	External independent verification of the declaration and data according to EN ISO 14025 and relevant PCR documents
Name of the third-party verifier Date of verification	Evert Vermaut Vinçotte 22.02.2021
www.b-epd.be	**www.environmentalproductdeclarations.eu**

Comparing EPDs is not possible unless they are conform to the same PCR and taking into account the building context.
The program operator cannot be held responsible for the information supplied by the owner of the EPD nor LCA practitioner.

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