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EPD®

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804

NewTechWood

Wood Plastic Composite

ECO PLATFORM EPD EN 15804 VERIFIED

NewTechWood®

Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

Product category rules (PCR):	*PCR 2019:14 Construction Products Version 1.0 (2019-12-20)*
PCR review was conducted by:	*IVL Swedish Environmental Research Institute* *Moderator: Martin Erlandsson, martin.erlandsson@ivl.se*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification	
Third party verifier:	*Marcus Wendin, Miljögiraff* *E-mail: Marcus@miljogiraff.se Telephone: +46-733-248185*
Approved by:	*The International EPD® System*
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The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Owner of the EPD:
Huidong Meixin Plastic Lumber Products Manufacturing Co., Ltd.
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Description of the organisation:
NewTechWood is a pioneer in the development and manufacture of composite decking, railing and site furnishings. Since its early beginning in 2004, NewTechWood has been on the cutting edge in wood plastic composite technology, to develop products that bring beauty and practicality to outdoor living experience. It fulfills people's demand for returning to nature, brings the new outdoor lifestyle represented by NewTechWood into the market, and guides people out of concrete jungle. Relying on the its advanced R&D capability, NewTechWood pioneers the surface treatment process. The unique co-extrusion molding technology gives each product 360-degree comprehensive protection and a natural color at the same time.

NewTechWood has been awarded certificates for compliance with the following standards:

– ISO 9001:2015 - Quality Management System
– ISO 14001:2015 - Environmental Management System
– ISO 50001:2018 - Energy management systems
– FSC Chain-of-Custody

NewTechWood reacts to the growing public concern for environmental sustainability by providing consumers with innovative eco-friendly building materials from a sustainable process. NewTechWood demonstrates its green principles and values through the following positive actions:

- All products are using recycled materials including plastic bottles, reclaimed wood fibers, and other products that would normally end up in landfill.
- Annual third-party audits are conducted to comply with environmental and health & safety guidelines and regulations.
- Reducing products' carbon footprint through waste reduction, energy conservation, and utilizing an optimum manufacturing process

Product information

Product name:
NewTechWood Wood Plastic Composite

UN CPC code:
36910 Floor coverings of plastics, in rolls or in the form of tiles; wall or ceiling coverings of plastics

Geographical scope: Global

Product description:
NewTechWood wood plastic composite combines the proven strength of high-density, recycled polyethylene plastic and realistic wood/bamboo fibers with an outer shell of polymer that completely encapsulates the board in an impermeable layer of protection from weather, sun, water, scuffs and scrapes. Using its unique manufacturing process, the products deliver convenience, reliability, natural look and feel of timber. The collection of colors and surface patterns delivers a palette of design options to create customized look that suits customers' needs.

Product Application:
NewTechWood wood plastic composite products provide durable, easy-to-install, and low-maintenance solutions to outdoor construction needs. They can be applied for decking, siding, porches, railing, and even fencing.

The products are available in solid and hollow profiles for both residential and commercial applications with a 25-year limited, transferable warranty.

Product identification:

Table 1 Product technical specifications

Property	Test Method	Test Results	
		WPC (Hollow)	WPC (Solid)
Abrasion Resistance	ASTM D4060-10	33 mg (1000cycles)	33 mg (1000cycles)
Brinell Hardness	EN15534	8.2 N/mm^2	8.2 N/mm^2
Boiling Test	EN15534	Water absorption in weight: 1.10%	Water absorption in weight: 0.49%
Bond Strength	EN319	Average Bond Strength > 2.3MPa No obvious abruption and damage after test	Average Bond Strength > 2.3MPa No obvious abruption and damage after test
Coefficient Linear Thermal Expansion	ASTM D696	38.9 x 10^{-6} mm/mm °C	35.6 x 10^{-6} mm/mm °C
	EN15534	32.2 x 10^{-6} K^{-1}	34.0 x 10^{-6} K^{-1}
Creep Behaviour	EN15534	Δ S: 4.70mm, Δ Sr: 2.81mm	Δ S: 4.39mm, Δ Sr: 4.35mm
Content of Pentachlorophenol	CE (EN14041(2004))	2.99ppm	2.99ppm
Creep Recovery	ASTM D7032	Creep Recovery after 24h: 93%	Creep Recovery after 24h: 82.2%
Degree of Chalking	EN15534	Rating 0, no chalking	Rating 0, no chalking
Fire Resistance	ASTM E84	Flame Spread Index (FSI): 85 Smoke Developed Index (SDI): 300	Flame Spread Index (FSI): 85 Smoke Developed Index (SDI): 300
Falling Mass Impact Resistance	EN15534	Max Crack Length (mm): No crack. Max Residual Indentation (mm): 0.14	Max Crack Length (mm): No crack. Max Residual Indentation (mm): 0.14
Formaldehyde Content	EN717-1	Non-Detectable	Non-Detectable
	ASTM D6007-14	Non-Detectable	Non-Detectable
Flexural Properties	EN15534	Bending Strength: 26.2 MPa Modulus of Elasticity: 3.10 GPa Maximum Load: 4537 N Deflection at 500N: 0.88mm	Bending Strength: 36.3 MPa Modulus of Elasticity: 3.72 GPa Maximum Load: 4286 N Deflection at 500N: 1.23mm
	ASTM D6109	MOR: 24.8 MPa MOE: 3495 MPa	MOR: 26.3 MPa MOE: 2620 MPa
Heavy Metal Content	EPA3051	Sb: ND; As: ND Se: ND; Sn: ND	Sb: ND; As: ND Se: ND; Sn: ND
Heat Reversion	EN15534 EN479	Test temperature: 100 °C; 0.17%	Test temperature: 100 °C; 0.20%
Heat Build-up	EN15534	Δ T=-2.7 °C	Δ T=-3.1 °C
Impact Resistance	ASTM D4226	MFE > 396 J	MFE > 396 J
Lead Content Test	EU No. 628/2015	No Detectable	No Detectable
Mould Resistance	ASTM G21	Rating 0	Rating 0
Moisture Content	EN15534 EN322	0.83 %	0.83 %
Moisture Resistance under Cyclic Test Conditions	EN15534	Original MOR: 27.4MPa After exposure, MOR:24.8 MPa, Decrease: 9.6%	Original MOR: 36.3MPa After exposure, MOR:32.1 MPa, Decrease: 11.7%
Neutral Salt Spray Test	ASTM B117-2011	After 200h test, there was no visible change appeared on the surface: Front surface: Δ E*=1.22 Grey Scale: 4-5 Back surface: Δ E*=1.06 Grey Scale: 4-5	After 200h test, there was no visible change appeared on the surface: Front surface: Δ E*=1.22 Grey Scale: 4-5 Back surface: Δ E*=1.06 Grey Scale: 4-5
	EN15534 ISO9227	Δ E*=1.42 Grey Scale: 4 (Exposure 96h)	Δ E*=1.42 Grey Scale: 4 (Exposure 96h)
Pb, Cd, Hg, Cr^{6+}	RoHs-IEC62321	Pb: ND; Cd: ND Hg: ND; Cr^{6+}: ND	Pb: ND; Cd: ND Hg: ND; Cr^{6+}: ND
Resistance to Scratch Test	ISO4586-2	Rating 2	Rating 2

Resistance to Indentation	EN15534	Apply 2000N load Brinell hardness: 72MPa, rate of elastic recovery: 65%	Apply 2000N load Brinell hardness: 72MPa, rate of elastic recovery: 65%
Resistance to Artificial Weathering	EN15534 ISO4892-2	After 2000h exposure Δ E*=1,09, Grey Scale=4-5	After 2000h exposure Δ E*=1,09, Grey Scale=4-5
Rockwell Hardness	ASTM D785	78.7 R	78.7 R
Slip Resistance	AS/NZS 4586	1. Wet Pendulum Testing: Longitudinal: 30; Horizontal: 42 2. Oil Ramp Testing: Longitudinal: Rating R11 Horizontal: Rating R11	1. Wet Pendulum Testing: Longitudinal: 30; Horizontal: 42 2. Oil Ramp Testing: Longitudinal: Rating R11 Horizontal: Rating R11
	CENTS12633 (2014) CENTS16165 (2012)	Pendulum Testing: Dry condition: PTV 46 Wet condition: PTV 34	Pendulum Testing: Dry condition: PTV 46 Wet condition: PTV 34
	EN15534-1 EN15534-4	Pendulum testing: Longitudinal: 44; Horizontal: 56 Inclination plan test: Angle: 25.0 °, Rating: Class C	Pendulum testing: Longitudinal: 44; Horizontal: 56 Inclination plan test: Angle: 25.0 °, Rating: Class C
	DIN51130	Oil-wet ramp test: Angle: 19.7 ° Rating: R11	Oil-wet ramp test: Angle: 19.7 ° Rating: R11
	DIN51097	Wet-load ramp test: Front View: Angle: 31.2° Rating: C Back View: Angle: 29.0°, Rating: C	Wet-load ramp test: Front View: Angle: 31.2° Rating: C Back View: Angle: 29.0°, Rating: C
	EN15534 CEN/TS15676	Pendulum test: Longitudinal: 59; Horizontal: 69 Inclination plan test: Angle: 38.2 °, Rating: Class C	Pendulum test: Longitudinal: 59; Horizontal: 69 Inclination plan test: Angle: 38.2 °, Rating: Class C
Swelling and Water Absorption (24h immersion)	EN15534	Swelling: =0.06% in thickness, 0.03% in width, 0.03% in length. Water absorption: 0.49%	Swelling: =0.06% in thickness, 0.03% in width, 0.03% in length. Water absorption: 0.49%
Swelling and Water Absorption (28d immersion)	EN15534	Swelling: =0.78% in thickness, 0.07% in width, 0.12% in length. Water absorption: 1.66%	Swelling: =0.67% in thickness, 0.04% in width, 0.07% in length. Water absorption: 0.27%
Surface Bond Quality	EN319	> 2.08MPa	> 2.08MPa
Thermal Resistance	ASTM C518-2010	Thermal conductivity: 0.1589 W/m·K Thermal resistance: 0.0830 (m^2·K)/W	Thermal conductivity: 0.1589 W/m·K Thermal resistance: 0.0830 (m^2·K)/W
Thermal Conductivity	CE (EN14041(2004))	0.19738 W/m·K	0.19738 W/m·K
UV Weathering Test	ASTM G154	After 3000h test, Grey Scale: 3, Δ E*=3.56	After 3000h test, Grey Scale: 3, Δ E*=3.56
Uplift Resistance	ICC-ES AC174 ASTM E330	Average ultimate load ≥ 427psf	Average ultimate load ≥ 430psf
VOC&TVOC	ASTM D5116-11	Non-Detectable	Non-Detectable
Water Absorption	ASTM D1037-12B(24h)	Water absorption(24h): 0.2%	Water absorption(24h): 0.12%

Manufacturing Process:

The production process of WPC consists of mainly blending, granulating, extrusion, cutting and packaging. First of all, pre-consumer recycled wood/bamboo powders are mixed together with post-consumer recycled polyethylene plastic powder, colorants, and some other additives, to make WPC pellets with the granulating machines. Afterwards, the WPC granules will be made into profiles by extrusion and moulding, which is the core of a WPC processing system. After proper surface treatment, the profiles will be cut into required lengths and packaged for further transportation.

Content declaration

Product

Table 2 Product content

Materials / chemical substances	Percentage	Environmental / hazardous properties
Recycled Ethylene Polymer	37.9%	No
Natural Fiber	55.7%	No
Lubricant	1.9%	Non-hazardous
MAH (Maleic Anhydride)	4.5%	Not a hazardous substance or mixture

Packaging

The packaging materials include tray, wrapping film, and PE film. For each kg of NewTechWood WPC product, the following amounts of packaging materials are consumed.

Table 3 Packaging information

Materials	Amount per unit
Pallet	1.4415 g
Corrugated board	7.0373 g
PE wrapping film	14.2259 g
Waterproof glue cushion	9.0804 g

Transportation

The transportation mainly takes place on the upstream of raw material supply and downstream of product delivery. According to the production site in Huizhou, Guangdong province, the raw materials are mainly sourced from Guangdong, Jiangxi and Fujian province, and delivered by lorry. As it was not possible to define specific distances, justified estimates and web map service were used to the best of our knowledge. For all transportation vehicles, if not specified, 32-tonne-truck scenario was used for LCA modelling for simplification purpose.

Products are transported to both domestic and foreign markets, the mode of transportation involves land transportation and sea transportation.

Product Installation

Plastic clips and metal screws are required for installation stage of wood plastic composite. The amount of related materials is shown in Table 4.

Table 4 Inputs for Installation

Materials	Amount per unit
Plastic clips	0.0021 kg
Metal screws	0.0010 kg

Use and Maintenance

After installation, very little effort is required in order to use wood plastic composite products. However, routine vacuuming, cleaning and surface conditioning is required for regular maintenance and upkeep of the product. The cleaning schedule depends on multiple factors, including weight capacity, terminal function, the amount of dust, and more. For the purposes of this EPD, average maintenance is presented based on typical installations. According to information from NewTechWood, weekly vacuuming and mopping are considered. The water and electricity consumption are 5.2 L/m^2/year and 0.02 kWh/m^2/year.

Reference Service Life

To calculate the LCA results for the product maintenance stage, a 25-year reference service life (RSL) was assumed for the declared products. According to information from NewTechWood, 25-year-warranty was provided to the customers.

Reuse, Recycling, Energy Recovery, and Disposal

For the waste scenario, the transport distance from installation site to final waste processing site was assumed to be 100 km (C2). According to information from NewTechWood, demounting and demolition were assumed to be conducted manually, so there is no energy and material input involved in de-construction (C1) and waste processing (C3) stages. The current EU 25 waste management scenario of landfill, incineration and recycling was used as there is not a readily available waste management scenario to follow. 95% of the waste product will be recycled, for the rest 5% of waste product, 2.5% incineration and 2.5% landfill was considered for stage C4 in the LCA modelling. Waste WPC products can be melted and recycled through granulating and extrusion to make new WPC products.

LCA information

Functional unit:
The functional unit is 1 kg of wood plastic composite.

Time representativeness:
The study used primary data collected from January 2019 to December 2019.

Database(s) and LCA software used:

In the study, the key parameters for producer-specific foreground data were based on one year (January 2019 – December 2019) of averaged data from NewTechWood. The life-cycle inventory includes data collected from a variety of publicly available sources, taking into consideration the degree to which it was technologically, temporally and geographically representative. The study utilized the Chinese-regionalized LCI database to the greatest extent possible. In the case when data was missing from or not available in the LCI database, the study referred to Ecoinvent and regional databases such as USLCI, ELCD and other relevant databases. The study then conducted sensitivity analyses to validate the data and outputs using realistic parameters.

SimaPro9.1 was used for the LCA modelling.

The data quality requirements for this study were as follows:

- Existing LCI data were, at most, 10 years old. Newly collected LCI data were current or up to 3 years old;
- The LCI data related to the geographical locations where the processes took place, e.g. electricity and transportation data from China, disposal data from China and Europe were utilized;
- The scenarios represented the average technologies at the time of data collection.

System diagram:

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE NOT DECLARED)

	Product Stage			Construction process stage		Use Stage							End of life stage				Resource recovery stage
	Raw Material	Transport	Manufacturing	Transport	Assembly / Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and 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	X	X	X	X	X	ND	ND	X	X	X	X	X
Specific data	>95%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Description of system boundaries:
This is a "cradle to gate with module C1-C4, module D and with optional modules" EPD. The LCA study traced all energy and material inputs back to the extraction of resources for each life-cycle stage of the products. In addition, the study quantified emissions from the whole system.
The life cycle stages below have been covered:

- A1-A3: Product stage (raw material acquisition, transport to manufacturing site and manufacturing)
- A4: Construction stage (transport to user site)
- A5: Assembly
- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- C1-C4: End-of-life stage (deconstruction, transport, waste processing and disposal)
- D: Reuse, recovery and/or recycling potentials

Assumption and limitations:
For certain aspects of wood plastic composite studied, the following assumptions were made:

- For missing background data, substitution of missing data using similar background data approach was taken to shorten the gap. For instance, metal screw used in the study was replaced by stainless steel. When the contribution from replaced material was more than 5%, modification or further quality enhancement approach such as supplier data collection was adopted to enhance data accuracy and modelling quality;
- Assumptions about transport were made where it was not possible to obtain the specific data, for instance from distribution centre to outlet and from outlet to consumer. When this occurred, it was clearly stated in the report;
- Electricity consumption data was not obtained for certain processes, so assumptions were made for these. When this occurred, it was clearly stated in the report;
- A modification of the global background database was done by replacing all the energy data, especially electricity production data, by Chinese energy data, and the study used the modified background data to get better indication of the potential environmental impact results by using more localized dataset of energy supply.

Allocation:
Allocation refers to partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. In this study, there are three types of allocation procedures considered:

(1) Multi-input processes.
For data sets in this study, the allocation of the inputs from coupled processes was generally carried out via the mass. The consumption and transportation of raw materials were allocated by mass ratio.

(2) Multi-output processes.
During the production process of wood plastic composite, there are no other by-products produced from the production line, hence there is quite little occasion that requires allocation for multi-output processes.

(3) Allocation for recovery processes.
For the allocation of residuals, the model "allocation cut-off by classification" according to ISO standard (called "Allocation Recycled Content", alloc rec, by Ecoinvent) was used. The underlying philosophy of this approach is that primary (first) production of materials is always allocated to the primary user of a material. If a material is recycled, the primary producer does not receive any credit for the provision of any recyclable materials. Consequently, recyclable materials are available burden-free for recycling processes, and secondary (recycled) materials bear only the impacts of the recycling processes.

During the end-of-life stage of WPC, along with the benefit, the load from waste treatment for recycling purpose such as de-pollution and crushing etc. was allocated to the next life cycle of substituted products, but not the primary producers, hence no burden or benefit was allocated to the primary producer of the WPC products.

Cut-off rules:
The following procedures were followed for the exclusion of inputs and outputs: All inputs and outputs to a (unit) process were included in the calculation where data was available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions for such choices were documented. In case of insufficient input data or data gaps for a unit process, according to the PCR requirement, the cut-off criteria chosen is 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The

total neglected input flows of the cradle to grave stage, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass.

Electricity source:

As required in PCR Section 5.3.3, "If the electricity in A3 accounts for more than 30% of the total energy in stage A1 to A3, the energy sources behind the electricity grid in module A3 shall be documented in the EPD and given in g CO_2 e/kWh".

In this LCA, the grid mix data on electricity for the site Guangdong Province was based on grid mixes of southern China. The electricity inventory is based on the year of 2015 for Chinese electricity generation (China Energy Statistics).

In Chinese map of electricity generation, thermal power is the principal part of total national installed capacity and electricity generation. Development of hydropower is slower than that of thermal power, and nuclear power is still in its initial step. Power generation from renewable energy resources, such as wind, solar energy, and tide, are usually not included due to the small share in electricity generation in China. However, the renewable energy was also considered in this study by taking a small ratio of wind, solar, and other renewable energy generation in China into account.

In 2015, the source of power supply is 73.3% thermal power, 19.4% hydropower and 2.9% nuclear power. The transmission of electricity in all cases is taken from the power station via a high voltage electricity grid to low voltage electricity suitable for domestic use, with a loss factor of 7.52% of the electricity produced at the power station, and a loss of 6.15% by the electricity consumption at the power plants.

The applied electricity data set used in the manufacturing phase is 579 g CO_2 e/kWh.

Life cycle assessment scenarios

According to NewTechWood, the majority of the wood plastic composite products are purchased and used in Europe, North America and Asia. The study estimated oceanic and road transportation distance for product delivery by referring to external resources. Table 5 below demonstrates the data used for stage A4 in the LCA modelling. Table 6 shows the data used for the installation phase A5 in the LCA modeling, including information about substance resource depletion and product consumption. Table 7 and Table 8 show maintenance and waste scenario respectively. The LCA study used the end-of-life disposal treatment process (C4) from Ecoinvent and USLCI.

Table 5 Transport to the construction Site (A4)

NAME	VALUE		UNIT
	ROAD	OCEAN	
Fuel type	DIESEL	HEAVY OIL	
Liters of fuel	31.11 l/100km	12.483 t/100km	l/100km or t/100km
Vehicle type	LORRY (32t)	SHIP (50,000DWT)	
Transport distance	764.5	10,045	km
Capacity utilization (including empty runs, mass based	80	80	%
Gross density of products transported	1,180	1,180	kg/m^3
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	< 1	< 1	-

Table 6 Installation into the building (A5)

NAME	VALUE	UNIT
Ancillary materials	Plastic clips 0.0021 Metal screws 0.001	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m^3
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Product loss per functional unit	-	kg
Waste materials at the construction site before waste processing, generated by product installation	-	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	-	kg
Mass of packaging waste specified by type	Corrugated board: 0.0704 Pallet: 0.0144 PE wrapping film: 0.1423 Waterproof glue cushion: 0.0908	kg
Biogenic carbon contained in packaging	2.36	kg CO_2
Direct emissions to ambient air, soil and water	-	kg
VOC emissions	N/A	μg/m^3

Table 7 Maintenance (B2)

NAME	VALUE	UNIT
Maintenance process information (cite source in report)	Weekly vacuum and weekly mopping	-
Maintenance cycle	Weekly vacuum and weekly mopping	Cycles/ RSL
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0.0052 city water disposed to sewer	m^3/m^2 floor/year
Ancillary materials specified by type (e.g. cleaning agent)	-	g/m^2/year
Other resources	-	kg
Energy input, specified by activity, type and amount	Electricity consumption 0.02	kWh/m^2/year
Other energy carriers specified by type	-	kWh
Power output of equipment	-	kW
Waste materials from maintenance (specify materials)	-	kg
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	-	-

Table 8 End of Life (C1-C4)

Name		Value	Unit
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)		See description above	
Collection process (specified by type)	Collected separately	-	kg
	Collected with mixed construction waste	-	kg
Recovery (specified by type)	Reuse	-	kg
	Recycling	0.95	kg
	Landfill	0.025	kg
	Incineration	0.025	kg
	Incineration with energy recovery	-	kg
	Energy conversion efficiency rate	-	
Disposal (specified by type)	Product or material for final deposition	0	kg CO_2
Removals of biogenic carbon (excluding packaging)		-	kg CO_2

Environmental performance

To analyse the environmental impacts of each process, LCIA was conducted using the EN 15804+A2 method, CML-IA (baseline) method, and north American TRACI method. The TRACI method was considered because the products are also applied in the USA market. The impact results are allocated by stages, as shown in tables below.

EN 15804+A2 impact results for NewTechWood WPC

IMPACT CATEGORY	UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Climate change - total	kg CO_2 eq.	4.02E-01	5.10E-02	6.44E-01	2.58E-01	4.59E-03	4.89E-02	9.21E-04	1.01E-02	7.47E-03
Climate change - fossil	kg CO_2 eq.	7.13E-01	5.13E-02	6.48E-01	2.58E-01	4.62E-03	4.74E-02	9.22E-04	9.04E-03	-2.20E-02
Climate change - biogenic	kg CO_2 eq.	-3.12E-01	-3.26E-04	-3.65E-03	-1.86E-05	-2.62E-05	1.45E-03	-7.42E-07	1.05E-03	2.95E-02
Climate change - land use and land use change	kg CO_2 eq.	1.20E-03	2.81E-06	9.95E-06	8.70E-05	1.11E-07	2.15E-07	3.54E-07	4.42E-07	-4.28E-05
Ozone Depletion	kg CFC 11 eq.	7.69E-08	1.18E-08	1.08E-08	5.83E-08	3.75E-11	2.74E-09	2.18E-10	5.37E-10	-2.31E-09
Acidification	kg SO_2 eq.	2.93E-03	7.24E-04	3.44E-03	3.03E-03	1.41E-05	4.14E-04	4.22E-06	2.05E-05	-1.30E-04
Eutrophication aquatic freshwater	kg PO_4^{3-} eq.	2.21E-04	7.10E-06	7.58E-05	1.59E-05	1.58E-07	6.64E-06	7.25E-08	4.60E-05	-1.19E-05
Eutrophication aquatic marine	kg N eq.	8.78E-04	1.87E-04	6.34E-04	8.10E-04	3.27E-06	5.65E-05	1.56E-06	6.73E-06	-3.16E-05
Eutrophication terrestrial	mol N eq.	7.79E-03	2.07E-03	6.77E-03	8.98E-03	3.46E-05	6.06E-04	1.70E-05	7.59E-05	-3.47E-04
Photochemical ozone formation	kg NMVOC eq.	2.48E-03	5.67E-04	1.83E-03	2.45E-03	1.72E-05	1.72E-04	5.10E-06	2.04E-05	-1.55E-04
Depletion of abiotic resources – minerals and metals	kg Sb eq.	1.32E-06	2.43E-08	1.82E-07	6.69E-07	1.25E-07	4.44E-08	1.57E-09	1.78E-08	-7.70E-07
Depletion of abiotic resources – fossil fuels	MJ, net calorific value	1.18E+01	7.61E-01	5.87E+00	3.80E+00	2.05E-01	3.70E-01	1.43E-02	4.33E-02	-3.07E-01
Water use	m^3	1.60E-01	5.84E-03	1.39E+00	1.93E-02	3.14E-01	5.69E+00	1.00E-04	1.06E-03	-9.83E-03

CML-IA (baseline) impact results for NewTechWood WPC

IMPACT CATEGORY	UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Abiotic depletion	kg Sb eq.	1.32E-06	2.44E-08	1.84E-07	6.69E-07	1.25E-07	4.44E-08	1.57E-09	1.78E-08	-7.70E-07
Abiotic depletion (fossil fuels)	MJ	1.17E+01	8.14E-01	5.27E+00	3.97E+00	2.02E-01	3.77E-01	1.50E-02	4.58E-02	-2.91E-01
Global warming (GWP100a)	kg CO_2 eq.	7.24E-01	5.08E-02	6.24E-01	2.56E-01	4.43E-03	4.57E-02	9.13E-04	8.98E-03	-2.13E-02
Ozone layer depletion (ODP)	kg CFC-11 eq.	6.51E-08	9.37E-09	1.34E-08	4.64E-08	3.04E-11	2.81E-09	1.74E-10	4.29E-10	-2.13E-09
Human toxicity	kg 1,4-DB eq.	4.14E-01	2.07E-02	1.26E-01	8.15E-02	2.17E-04	1.01E-02	3.56E-04	1.72E-01	-2.62E-02
Fresh water aquatic ecotox.	kg 1,4-DB eq.	6.35E-01	5.31E-03	7.60E-02	2.05E-02	1.59E-04	5.19E-03	6.99E-05	9.71E-02	-3.88E-02
Marine aquatic ecotoxicity	kg 1,4-DB eq.	2.14E+03	1.82E+01	7.29E+02	7.12E+01	7.98E-01	4.66E+01	2.60E-01	3.38E+02	-4.90E+01
Terrestrial ecotoxicity	kg 1,4-DB eq.	2.56E-03	7.40E-05	1.26E-03	3.74E-04	2.07E-06	1.39E-04	1.36E-06	1.05E-04	-1.17E-04
Photochemical oxidation	kg C_2H_4 eq.	1.59E-04	2.38E-05	1.31E-04	1.01E-04	9.36E-07	1.67E-05	1.54E-07	8.41E-07	-8.72E-06
Acidification	kg SO_2 eq.	2.75E-03	7.02E-04	3.40E-03	2.91E-03	1.41E-05	4.36E-04	3.68E-06	1.85E-05	-1.25E-04
Eutrophication	kg PO_4^{3-} eq.	1.81E-03	8.95E-05	4.50E-04	3.44E-04	1.68E-06	4.00E-05	8.22E-07	2.18E-04	-4.89E-05

TRACI impact results for NewTechWood WPC

IMPACT CATEGORY	UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Ozone depletion	kg CFC-11 eq	8.54E-08	1.25E-08	1.90E-08	6.17E-08	4.00E-11	2.84E-09	2.31E-10	5.68E-10	-2.63E-09
Carcinogenics	CTUh	4.98E-08	1.24E-09	1.05E-08	7.55E-09	2.62E-10	1.08E-09	2.40E-11	1.48E-07	-5.04E-09
Non carcinogenics	CTUh	2.65E-07	8.35E-09	5.30E-08	4.23E-08	8.88E-11	6.01E-09	2.15E-10	5.83E-08	-3.36E-08
Respiratory effects	kg PM2.5 eq	8.30E-04	7.08E-05	3.67E-04	2.33E-04	1.14E-06	4.50E-05	7.15E-07	1.91E-06	-3.32E-05
Eutrophication	kg N eq	4.18E-03	9.09E-05	6.45E-04	2.94E-04	1.85E-06	5.61E-05	1.03E-06	5.61E-04	-9.60E-05
Acidification	kg SO_2 eq.	2.91E-03	7.24E-04	3.43E-03	3.03E-03	1.41E-05	4.14E-04	4.22E-06	2.05E-05	-1.29E-04
Smog	kg O_3 eq	4.21E-02	1.18E-02	3.92E-02	5.13E-02	1.98E-04	3.56E-03	9.82E-05	4.19E-04	-1.85E-03
Global warming	kg CO_2 eq	7.08E-01	5.06E-02	6.07E-01	2.55E-01	4.31E-03	4.45E-02	9.09E-04	8.95E-03	-2.09E-02
Fossil fuel depletion	MJ surplus	1.29E+00	1.10E-01	1.38E-01	5.47E-01	2.49E-02	8.10E-03	2.05E-03	5.32E-03	-2.25E-02
Ecotoxicity	CTUe	1.34E+01	1.86E-01	2.17E+00	1.10E+00	8.36E-03	1.34E-01	4.90E-03	8.08E+00	-1.63E+00

* Zero input and output were assumed for Use (B1), Repair (B3), Replacement (B4), Refurbishment (B5), deconstruction of the WPC products (C1) and waste processing (C3). Therefore, values for these modules are zero and not included in the above tables.

Use of resources for NewTechWood WPC

PARAMETER		UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	4.68E+00	2.68E-02	1.87E+00	4.08E-02	4.79E-03	1.99E-02	2.01E-04	1.17E-03	-2.14E-01
	Used as raw materials	MJ, net calorific value	2.60E+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
	TOTAL	MJ, net calorific value	7.29E+00	2.68E-02	1.87E+00	4.08E-02	4.79E-03	1.99E-02	2.01E-04	1.17E-03	-2.14E-01
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	1.20E+01	7.29E-01	8.02E+00	3.67E+00	1.94E-01	5.83E-01	1.38E-02	4.78E-02	-3.50E-01
	Used as raw materials	MJ, 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
	TOTAL	MJ, net calorific value	1.20E+01	7.29E-01	8.02E+00	3.67E+00	1.94E-01	5.83E-01	1.38E-02	4.78E-02	-3.50E-01
Secondary material		kg	4.75E-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
Renewable secondary fuels		MJ, 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
Non-renewable secondary fuels		MJ, 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
Net use of fresh water		m^3	8.22E-01	9.29E-03	2.46E-02	3.09E-02	3.89E-03	8.93E-03	1.85E-04	5.35E-03	-2.90E-02

Waste production and output flows for NewTechWood WPC

Waste production

PARAMETER	UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Hazardous waste disposed	kg	0.00E+00	0.00E+00	3.94E-04	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	0.00E+00	0.00E+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	0.00E+00

Output flows

PARAMETER	UNIT	A1	A2	A3	A4	A5	B2	C2	C4	D
Components for reuse	kg	-	-	-	-	-	-	-	-	0.00E+00
Material for recycling	kg	-	-	-	-	-	-	-	-	9.50E-01
Materials for energy recovery	kg	-	-	-	-	-	-	-	-	2.50E-02
Exported energy, electricity	MJ	-	-	-	-	-	-	-	-	3.27E-01
Exported energy, thermal	MJ	-	-	-	-	-	-	-	-	0.00E+00

Interpretation of the LCA results

The LCA results show that the main contributors for environmental impacts are stage A1 raw materials acquisition, A3 manufacturing and A4 transport to the site. The impact of stage D reuse and recycling is positive. Each environmental impact has a different characteristic of life cycle stage contribution. When considering the stage of end-of-life, all impacts are negative except for stage D reuse and recycling. The most influential indicators are marine aquatic ecotoxicity and abiotic depletion (fossil fuels). Environmental impact results are shown in Figure 1.

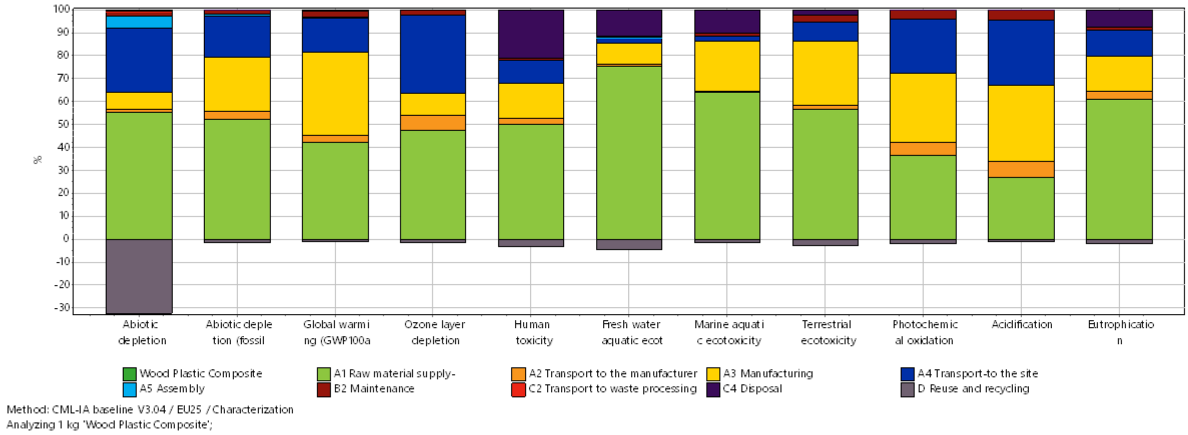

Figure 1 Contribution analysis of environmental impact results

Up until this report is published, there is no significant change in raw materials, technology, manufacturing process, and relevant data since data collected from NewTechWood. So the LCA results are reliable and representative.

Additional environmental information

NewTechWood is Chain of Custody certified to purchase FSC 100% wood flour, manufacture and sell FSC 100% wood-plastic composite products. The assessments have been conducted by SGS in accordance with the following standards: FSC-STD-40-003, FSC-STD-40-004, and FSC-STD-50-001.

NewTechWood wood plastic composites are compliant with the EU REACH regulation (EC) No. 1907/2006. No substances of very high concern (SVHC) exceed 0.1% (w/w) in the articles of the submitted sample from NewTechWood.

References

Life cycle assessment (LCA) report of NewTechWood Wood Plastic Composite.

INTERNATIONAL EPD SYSTEM

General Programme Instructions of the International EPD® System. Version 3.0.

PCR 2019:14 Construction Products, Version 1.0

UL ENVIRONMENT

PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment (September 2018, version 3.2)

SUSTAINABILITY REPORTING STANDARDS

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 21930:2017 Environmental declaration of building products

ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations -Principles and procedures

ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework

ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines

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