Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	Verotec GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000428-EN
Issue date:	19.02.2025
Valid to:	19.02.2030

VeroBoard® Element

Lightweight panels & lightweight elements made of Verolith®
for industrial and construction applications

1. General information

Verotec GmbH	VeroBoard® Element
Programme operator: Kiwa-Ecobility Experts Kiwa GmbH, Ecobility Experts Wattstraße 11-13 13355 Berlin Germany	**Owner of the declaration:** Verotec GmbH Hanns-Martin-Schleyer-Str. 1 89415 Lauingen Germany
Registration number: EPD-Kiwa-EE-000428-EN	**Declared product / declared unit:** 1 m^2 of VeroBoard® Element with a thickness of 15 mm.
This declaration is based on the Product Category Rules: Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)	**Scope:** VeroBoard® Element is a lightweight construction board made of expanded perlite granulate (Verolith) produced by Verotec in Lauingen, Germany. Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA data and evidence.
Issue date: 19.02.2025	
Valid to: 19.02.2030	
	Verification: The European standard EN 15804+A2:2019 serves as the core PCR. Independent verification of the declaration and data, according to EN ISO 14025:2010. ☐internal ☒external
Raoul Mancke (Head of programme operations, Kiwa-Ecobility Experts)	
Kripanshi Gupta (Verification body, Kiwa-Ecobility Experts)	Lucas Pedro Berman, Senda (Third party verifier)

2. Product

2.1 Product description

VeroBoard® Element is a construction board made of expanded perlite granulate (Verolith®) produced by Verotec in Lauingen, Germany. Verolith® consists of hollow and closed mineral micro beads, making the product versatile and lightweight. VeroBoard® Element is produced in a format of 2420 x 1210 mm and 2440 x 1080 mm. The thickness can vary between between 15 mm and 100 mm. This EPD uses a format variation of 2440 x 1080 mm and a thickness of 15 mm to calculate VeroBoard® Element per m^2. It can be used for individual facade designs elements in exterior and interor application. VeroBoard® Element consists of up to 96 % Verolith and epoxy resin as a binder.

Raw material	Weight (%)
Verolith	≤ 96
Binder	< 10

1. This product does not contain substances listed in the candidate list (17 January 2023) exceeding 0.1 % by mass.

2. This product does not contain other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 % by mass.

3. There are no Biocide products added to this construction product or has it been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012.)

4. This product does not contain fire retardants.

2.2 Application (Intended Use of the product)

VeroBoard® Element has the following application attributes:

- Exterior and interior application possible
- Versatile, lightweight and easy-to-install board
- Initial material for design elements in interiors and in ship refitting
- Milling of moulded parts in model construction
- Base board for furniture construction, wide range of surfaces possible

VeroBoard® Element can be applied manually.
A detailed description of the application process can be found on the Technical Data Sheet on www.verotec.de

2.3 Reference Service Life (RSL)

According to the Bewertungssystem Nachhaltiges Bauen (BNB) Sustainable Building assessment system of 24 February 2017, Veroboard® Element approximately corresponds to Code Nr. 335.915 (BNB) wall coverings with a service life of 40 years. The board structure of recycled glass granulate and binding agent is extremely stable and can therefore be synonymous with the service life of the structure/building element which is equivalent to 50+ years

2.4 Technical Data

Criterion	Standard/ test specification	Class
Reaction to fire	EN 13501-1	A2-s1, d0
Thermal conductivity	EN 12667	ca. 0.18 W/(m*K)
Bulk density		550 kg/m³

The characteristic values stated here are average values or approximate values. Further information regarding the technical properties of VeroBoard® Element can be found on the Technical Data Sheet on www.verotec.de

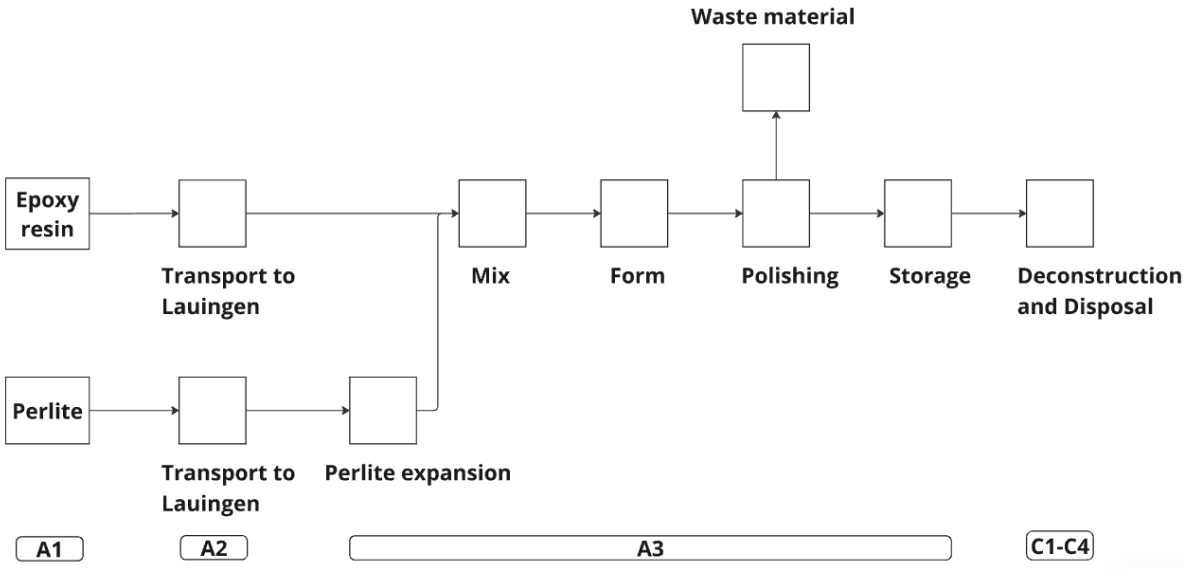
For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration EN 15286:2013 and the CE-marking. For the application and use the respective national provisions apply.

2.5 Substances of very high concern

The product does not contain substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency in a concentration more than 0.1 % (by unit weight).

2.6 Description production process

VeroBoard® Element is produced in a plant in Lauingen, Germany. The raw materials are produced by and transported from suppliers located in Europe. A purely thermal expansion method is used to turn the raw material perlite into a granular form of Verolith. The Verolith is mixed with epoxy resin and placed into a mould. Pressure and heat are applied to bring the board into shape. The edges are polished to straighten uneven surfaces. The board is brought into shape according to the customers wishes.



2.7 Other Information

For further information regarding this product please visit the webpage under the following link: www.verotec.de

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is 1 m^2 of VeroBoard® Element with a thickness of 15 mm and a RSL of 40 years in exterior application. The scope of this LCA is cradle to gate, modules C1-C4 and module D. Technical life span of the products raw materials is the same as for the whole product.

Reference unit: square meter (m^2)

3.2 Conversion factors

Product	Unit	Value
Declared Unit	1	m^2
Weight per reference unit	10.1	kg/m^2
Conversion factor to 1 kg	0.099	m^2

3.3 Scope of declaration and system boundaries

This is a Cradle to gate, modules C1– C4, and module D EPD. The life cycle stages included are as shown below:

Description of the system boundary																
Product stage			Construction process stage			Use stage						End of life stage			Benefits and loads beyond the system boundaries	
Raw material supply	Transport	Manu-facturing	Transport to constructin site	Installation	Use	Main-tenance	Repair	Replaceme nt	Refur-bishment	Operational energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
X=Module declared | ND= Module not declared																

The modules of the EN15804 contain the following:

A1 = Raw material supply Module
A2 = Transport Module
A3 = Manufacturing Module
A4 = Transport Module
A5 = Construction - Installation process Module
B1 = Use Module
B2 = Maintenance Module
B3 = Repair Module
B4 = Replacement Module
B5 = Refurbishment Module
B6 = Operational energy use Module
B7 = Operational water use Module
C1 = De-construction / Demolition Module
C2 = Transport Module
C3 = Waste Processing Module
C4 = Disposal Module
D = Benefits and loads beyond the product system boundaries

3.4 Representativeness

This EPD is representative for VeroBoard® Element, a product of Verotec GmbH. The data used is representative for Germany. The scenarios included in this life cycle analysis are currently in use and are representative for one of the most likely scenario alternatives.

3.5 Cut-off Criteria

Product Stage (A1-A3)

The production stage consists of the extraction of raw materials, transportation of the raw materials, processing the raw materials into materials and the production of the product. The required energy for production, ancillary materials, packaging materials and production emissions are included. All substantial raw materials and types of energy during production are included. Raw materials added to the product in very small amounts (less than 1%) are not included. These cut-off limits do not apply to hazardous materials or substances.

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass. The degree of landfill is assumed to be 100%.

Benefits and Loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

Excluded processes

Following processes has not been taken into account in this life cycle analysis:

- The manufacture of equipment used in production, buildings or any other capital goods;
- The transportation of personnel to the production plant;
- The transportation of personnel within the production plant;
- Research and development activities;
- Transport to construction site
- Construction
- Packaging (negligible)

3.6 Allocation

The amount of electricity and natural gas at the production site for VeroBoard® Element derives from figures concerning the total amount of electricity being used at the site (for all products produced) and is then recalculated into the amount only used for the production of VeroBoard® Element. The amount of electricity and natural gas is then shown per declared unit.

Modularity principle has been taken into account. There are no co-products that have to be taken into account.

The producer of VeroBoard® Element is under regulation from national authorities and follows the polluter pays principle.

3.7 Data collection and reference time period

This EPD project has been performed during the year 2024. Production data is from the year 2023.

3.8 Estimates and assumptions

VeroBoard® Element is categorized under the European Waste Catalogue (EWC), category 17.09 "Other Construction and Demolition Waste" and is categorized as non-hazardous waste.

1% cut off criteria has been applied for formulation and production data when applicable according to ISO 15604+A2.

- A payload factor of 50 % was used for all truck transports, which in fact corresponds to a full delivery and empty return trip. A data set for a non-specific truck was used.
- An amount of 0.013 kWh/m^2 has been assumed for deconstruction.

3.9 Data Quality

Datasets from Ecoinvent 3.6 from 2019, as well as third party verified EPDs, have been used for calculation with R<think. Data concerning production has been from the Production Management System used at the production site. The data and scenarios used are representative for the European Union. The figures shown in this report are from January to December 2023. The data from the production site as well as the used scenarios are chosen in accordance with EN 15804.

3.10 Power mix

Data has been collected at production site in Lauingen. The energy used consists of 100% hydropower (market based approach) and covers the foreground processes in Lauingen. The electricity supplier is bound by state regulations in Germany for electricity labelling. The electricity labelling indicates 100 % renewable energy from hydropower. Hydropower is calculated with an environmental impact of 0.042 kg CO2-eq/kWh.

3.11 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used , functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

4. LCA: Scenarios and additional technical information

4.1 De-construction/Demolition (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
Electricity (DE) – low voltage (max 1kV)	0.013	kWh

4.2 Transport end-of-life (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Reuse [km]
Debris - mixed with 100% landfill	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.3 End of life (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work)[%]	Landfill [%]	Incineration [%]	Recycling [%]	Reuse [%]
Debris - mixed with 100% landfill	DE	0	100	0	0	0

Waste Scenario	Not removed (stays in work)[kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Reuse [kg]
Debris - mixed with 100% landfill	0	10.1	0	0	0
Total	**0**	**10.1**	**0**	**0**	**0**

4.4 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste scenario	Net output flow [kg]	Energy recovery [MJ]
Debris - mixed with 100% landfill	0	0
Total	**0**	**0**

5. LCA: Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows. Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

LCA results – Indicators describing environmental impacts based on the impact assessment (LCIA) (EN 15804+A2)									
Parameter	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804+A2)									
GWP-total	kg CO2 eqv.	3,19E+00	4,69E-01	4,33E-01	8,09E-03	1,36E-01	0,00E+00	4,07E-01	0,00E+00
GWP-f	kg CO2 eqv.	3,30E+00	4,69E-01	4,30E-01	7,48E-03	1,36E-01	0,00E+00	5,32E-02	0,00E+00
GWP-b	kg CO2 eqv.	-1,76E-01	2,21E-04	2,01E-03	6,03E-04	6,29E-05	0,00E+00	1,76E-01	0,00E+00
GWP-luluc	kg CO2 eqv.	6,58E-02	1,71E-04	1,74E-04	9,07E-06	4,99E-05	0,00E+00	1,48E-05	0,00E+00
ODP	kg CFC 11 eq.	6,29E-08	1,04E-07	5,58E-08	2,93E-10	3,01E-08	0,00E+00	2,19E-08	0,00E+00
AP	mol H+ eq.	1,26E-02	2,67E-03	5,75E-04	2,17E-05	7,91E-04	0,00E+00	5,05E-04	0,00E+00
EP-fw	kg P eqv.	1,69E-05	4,59E-06	5,78E-06	1,13E-06	1,37E-06	0,00E+00	5,96E-07	0,00E+00
EP-m	kg N eqv.	3,41E-03	9,38E-04	1,20E-04	3,36E-06	2,79E-04	0,00E+00	1,74E-04	0,00E+00
EP-T	mol N eqv.	3,92E-02	1,03E-02	1,41E-03	5,32E-05	3,07E-03	0,00E+00	1,92E-03	0,00E+00
POCP	kg NMVOC eqv.	1,20E-02	2,95E-03	4,43E-04	1,01E-05	8,77E-04	0,00E+00	5,57E-04	0,00E+00
ADP-mm	kg Sb-eqv.	4,06E-06	1,20E-05	2,17E-06	6,22E-08	3,45E-06	0,00E+00	4,87E-07	0,00E+00
ADP-f	MJ	6,71E+01	7,08E+00	6,69E+00	1,02E-01	2,06E+00	0,00E+00	1,49E+00	0,00E+00
WDP	m3 world eqv.	6,24E-02	2,46E-02	6,43E-03	3,88E-04	7,35E-03	0,00E+00	6,66E-02	0,00E+00

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI) (EN 15804+A2)									
Parameter	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	6,85E+00	9,02E-02	3,91E+00	1,85E-02	2,57E-02	0,00E+00	1,20E-02	0,00E+00
PERM	MJ	1,23E+00	0,00E+00	2,28E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	8,05E+00	9,02E-02	3,92E+00	1,85E-02	2,57E-02	0,00E+00	1,20E-02	0,00E+00
PENRE	MJ	4,92E+01	7,52E+00	7,35E+00	1,09E-01	2,18E+00	0,00E+00	1,58E+00	0,00E+00
PENRM	MJ	1,82E+01	0,00E+00	3,39E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	6,74E+01	7,52E+00	7,38E+00	1,09E-01	2,18E+00	0,00E+00	1,58E+00	0,00E+00
SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	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	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	1,51E-02	8,46E-04	3,88E-04	4,63E-05	2,50E-04	0,00E+00	1,59E-03	0,00E+00
HWD	Kg	1,06E-05	1,80E-05	8,36E-06	1,28E-07	5,21E-06	0,00E+00	2,22E-06	0,00E+00
NHWD	Kg	2,73E-01	4,34E-01	3,20E-02	4,28E-04	1,30E-01	0,00E+00	1,01E+01	0,00E+00
RWD	Kg	1,20E-03	4,68E-05	7,90E-06	4,11E-07	1,35E-05	0,00E+00	9,77E-06	0,00E+00
CRU	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
MFR	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
MER	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
EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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**=Use of fresh water | **HWD**=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed | **CRU**=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported energy, thermical | **EE**=Exported energy, electrical

Information on biogenic carbon content per square meter

Biogenic carbon content

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per square meter:

LCA results - information on biogenic carbon content at the factory gate (EN 15804+A2)		
Parameter	**Unit**	**Value**
Biogenic carbon content in product	kg C	0.03565
Biogenic carbon content in accompanying packaging	kg C	0

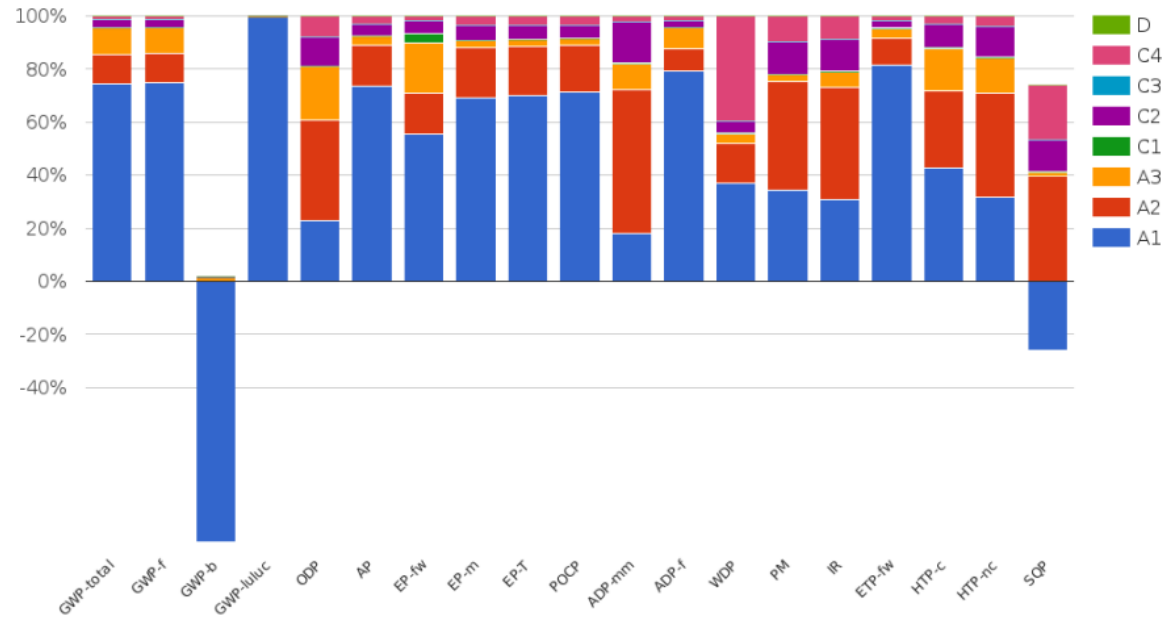
Uptake Biogenic Carbon dioxide

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	**Unit**	**Value**
biogenic carbon content in product	kg CO_2 (biogenic)	0.1302

6. LCA: Interpretation

6.1 Dominance analysis



The figure above shows the impact of different life stages on the LCA results in accordance to their respective environmental impact indicator. The impact of the raw materials (A1) for Veroboard® Element dominate every indicator but Soil quality potential (SQP) which is influenced to a higher degree by the transport of the raw materials (A2). The manufacturing modul (A3) is, in comparison to moduls A1 and A2, only responsible for a relatively small impact. This can be, at least partly, assigned to the use of hydropower during production. The four GWP indicators are dominated by the raw materials. The results vary from 70 % of GWP-total and GWP-fossil to almost 100 % of GWP-luluc. The negative value for GWP-biogenic is caused by the carbon intake of organic materials during their growth phase. The end-of-life stages are negligible in their impact on all indicators but WDP.

7. References

ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14044:2006

ISO 14025
ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

EPD-DBC-20220174-IBF1-EN
Owner of the declaration: DBC, EFCC, FEICA, IVK; published by IBU – Institut Bauen und Umwelt e.V. (29.08.2022)

Code Nr. 335.915
Code Nr. 335.915 (BNB); FederalOffice for Building and Regional Planning (BBSR), 2017: Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltige Bauen (BNB)

NMD
The NMD waste scenario is based on a waste scenario from the National Milieu Database (NMD); finishes (adhered to wood, plastic, metal)

DIN EN 13501-1
DIN EN 13501-1 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007+A1:2009,2010-01

DIN EN 12667:2001-05
Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

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