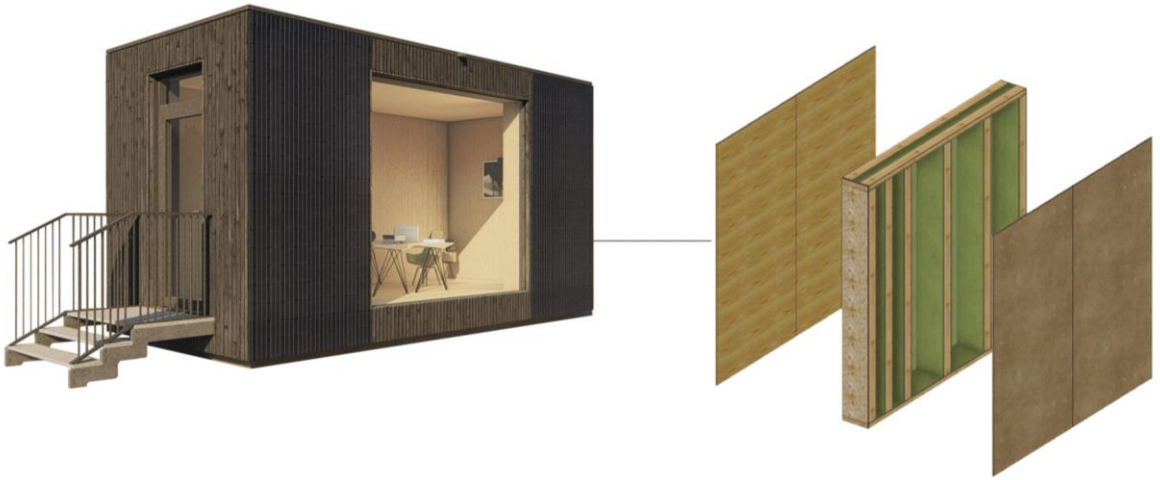
ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Biobuilds External Walls

Biobuilds



EPD HUB, HUB-0050

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Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Biobuilds
Address	Tăuții Măgherăuș, str. 66, nr. 16, județ Maramureș, Romania
Contact details	structure@biobuilds.com
Website	www.biobuilds.com

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR version 1.0, 1 Feb 2022
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with modules C1-C4 and D
EPD author	Anca R. - Biobuilds
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	E.A, as an authorized verifier acting for EPD Hub Limited

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Biobuilds External Walls
Place of production	Romania
Period for data	August 2021 - April 2022

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m2
Declared unit mass	74.89 kg
GWP-fossil, A1-A3 (kgCO2e)	34,8
GWP-total, A1-A3 (kgCO2e)	-101
Secondary material, inputs (%)	16,7
Secondary material, outputs (%)	99,7
Total energy use, A1-A3 (kWh)	269
Total water use, A1-A3 (m3e)	0,643

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

BIOBUILDS is a Romanian company that aims to redefine construction standards through innovation. It uses natural materials, has a vision for the next generation of homes, while working as a fully operational and interdisciplinary team.

We specialise in prefabricated and modular construction. The technology is based on an automated production line that allows high precision, while also reducing waste and execution errors. The company relies on its own custom designed machines for the factory, involving automation to achieve the highest technical characteristics for the products.

On a larger scale, BIOBUILDS is continuously striving to lower its environmental impact. Precision, fast building process, cost optimization, sustainable workflow and guaranteed quality are some of the company's advantages.

PRODUCT DESCRIPTION

The Biobuilds modular system is a sustainable timber volumetric construction system consisting of prefabricated elements: external walls, internal walls and slabs. The process of prefabrication enables a higher level of accuracy and quality control as well as reducing waste and ensuring higher safety standards. Additionally, the period of time until the customer receives the final product is greatly reduced.

The modular system is assembled within the factory and then delivered on-site as fully functional modular units that just need to be installed. The units can be installed on any type of terrain, and just need to be craned into position on prepared foundations.

They can either be used as standalone units for storage/backyard office or by linking several ones to form a larger dwelling.

This EPD covers the environmental impacts of the external walls, which form the envelope of the modular units. The panels have a timber frame structure with cellulose insulation. They are closed off with an Oriented Strand Board (OSB) on one side and a Sheathing Board (DWD) on the other. Additionally, a lining membrane is fixed to the external side, to manage moisture. The external side is finished with a timber ventilated facade (charred timber).

Once assembled, the External Wall panels are placed vertically on the ground floor slabs, within the factory premises. Subsequently, the roof slab is installed on top of the external walls and the modular unit is ready to be transported to site for installation. Windows and doors are also fitted within the factory, however, these were excluded from the scope of the LCA for simplicity.

The panels are designed in accordance with Eurocode 5 (EN-1995).

Further information can be found at www.Biobuilds.com.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	-	-
Minerals	-	-
Fossil materials	0.3%	Europe
Bio-based materials	99.7%	Europe

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	36.31
Biogenic carbon content in packaging, kg C	0

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 m2
Mass per declared unit	74.89 kg

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

(Raw material supply - A1)
Manufacturing materials consist of timber studs and Oriented Strand Board (OSB) which form the frame (timber joists) with cellulose insulation in between. On the inner side, the panels are closed with a layer of OSB board, while on the external side there is a layer of Sheathing Board (DWD) and a lining membrane. The ventilated facade consists of timber battens which support the charred timber cladding.

(Transportation - A2)
Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emission in total results is small, the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that the return trip is used by the transportation company to serve the needs of other clients.

(Manufacturing - A3)
In order to calculate the energy consumption for 1 m2 of wall panel, an inventory of all activities and machines used for assembling a wall was performed. Consequently, each activity was timed and multiplied with the energy consumption of each machine (as provided by the machineries' manufacturer/checked individually). In addition to this, the energy used by the lighting system per hour was multiplied by the total assembly time for a wall, and then divided by the area of that wall to get the value per m2 of wall panel.

All the wood-based manufacturing waste is recycled by a third-party company, while the non-recyclable materials (such as the lining membrane) end up in landfill.

There is no water used directly in the manufacturing process.

There are no direct emissions arising from the production process.

No packaging materials are taken into consideration as the final product (the whole modular unit - with walls and slabs) is sold as a fully fitted modular unit that just needs to installed on site.

TRANSPORT AND INSTALLATION (A4-A5)

This EPD does not cover the transport and installation phase.

PRODUCT USE AND MAINTENANCE (B1-B7)

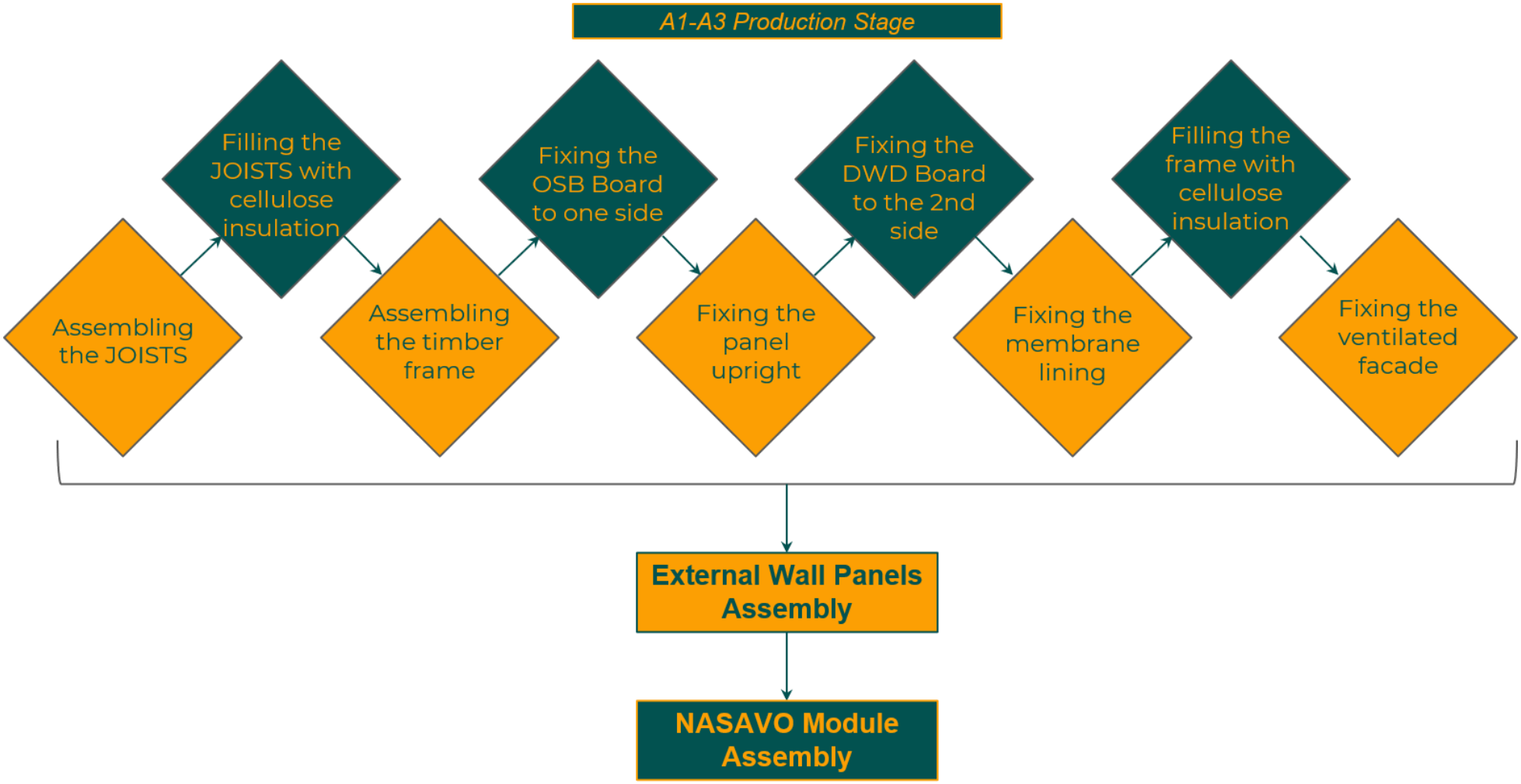
This EPD does not cover the use phase.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life, the modular units are returned to our factory through our buy-back programme (the distance will vary according to the location, therefore a generic distance of 100 km was considered in C2). Afterwards, they are dismantled and the waste is separated. The demolition process consumes energy in the form of diesel fuel used by building machines (C1). Once the panels are dismantled the materials that cannot be recycled/reclaimed are sent to landfill (C4), while the wood based materials are recycled into pellets on our factory's premises. The benefits resulting from avoiding the wood pellets production are accounted for in Module D.

The energy consumption of a demolition process is assumed to be 0.01 kWh/kg (Bozdağ, Ö & Seçer, M. 2007). The source of energy is diesel fuel used by work machines.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

For easier modelling and because of lack of accuracy in available modelling resources many constituents under 0,1% of product mass are excluded. These include nails and screws which represent a very small quantity out of the whole product and have no serious impact on the emissions of the product.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. In this study, as per the reference standard, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g., mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

Allocation was solely used for the energy consumption of the lighting system. The energy used by the lighting system per hour was multiplied by the total assembly time for an external wall panel, and then divided by the area of that wall to get the value per m2 of wall panel.

Allocation used in environmental data sources is aligned with the above.

AVERAGES AND VARIABILITY

This EPD is product and factory specific and does not contain average calculations.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent and One Click LCA databases were used as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total	kg CO_2e	-1,12E2	7,53E0	2,91E0	-1,01E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,47E-1	6,81E-1	1,28E2	2,02E-3	-2,89E1
GWP – fossil	kg CO_2e	2,44E1	7,53E0	2,93E0	3,48E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,47E-1	6,81E-1	6,53E-1	2E-3	-1,06E1
GWP – biogenic	kg CO_2e	-1,36E2	5,47E-3	-1,69E-2	-1,36E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	6,88E-5	4,94E-4	1,27E2	1,62E-5	-1,83E1
GWP – LULUC	kg CO_2e	9,07E-2	2,27E-3	5,52E-4	9,35E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,09E-5	2,05E-4	1,47E-3	9,61E-7	-4,15E-2
Ozone depletion pot.	kg $CFC_{-11}e$	2,92E-6	1,77E-6	9,64E-8	4,78E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,34E-8	1,6E-7	5,47E-8	6,21E-10	-9,7E-7
Acidification potential	mol H^+e	1,81E-1	3,16E-2	2,05E-2	2,33E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,59E-3	2,86E-3	3,61E-3	1,71E-5	-8,91E-2
EP-freshwater[3)]	kg Pe	1,99E-3	6,12E-5	5,72E-4	2,62E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	1E-6	5,54E-6	6,82E-5	3,5E-8	-1,35E-3
EP-marine	kg Ne	4,3E-2	9,53E-3	2,02E-3	5,45E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,14E-3	8,61E-4	4,85E-4	5,79E-6	-2,55E-2
EP-terrestrial	mol Ne	4,46E-1	1,05E-1	2,21E-2	5,73E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,25E-2	9,51E-3	5,92E-3	6,38E-5	-2,94E-1
POCP (“smog”)	kg NMVOCe	1,56E-1	3,38E-2	6,46E-3	1,96E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,44E-3	3,06E-3	1,54E-3	1,84E-5	-7,39E-2
ADP-minerals & metals	kg Sbe	4,85E-3	1,28E-4	1,28E-5	4,99E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,78E-7	1,16E-5	2,53E-6	2,15E-8	-1,7E-4
ADP-fossil resources	MJ	3,84E2	1,17E2	5,48E1	5,56E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,4E0	1,06E1	1,32E1	4,71E-2	-1,77E2
Water use[2)]	m^3e depr.	1,05E1	4,36E-1	8,31E-1	1,18E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	6,35E-3	3,94E-2	1,65E-1	2,11E-3	-2,53E0

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy	MJ	4,58E2	1,47E0	1,17E1	4,72E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,84E-2	1,33E-1	2,22E0	7,77E-4	-3,15E1
Renew. PER as material	MJ	1,25E3	0E0	-2,08E-4	1,25E3	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-1,25E3	0E0	-4,94E2
Total use of renew. PER	MJ	1,7E3	1,47E0	1,17E1	1,72E3	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,84E-2	1,33E-1	-1,24E3	7,77E-4	-5,25E2
Non-re. PER as energy	MJ	3,19E2	1,17E2	5,48E1	4,91E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,4E0	1,06E1	1,32E1	4,71E-2	-1,77E2
Non-re. PER as material	MJ	6,45E1	0E0	0E0	6,45E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-6,45E1	0E0	0E0
Total use of non-re. PER	MJ	3,84E2	1,17E2	5,48E1	5,56E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,4E0	1,06E1	-5,12E1	4,71E-2	-1,77E2
Secondary materials	kg	1,25E1	0E0	6,89E-6	1,25E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	-3,47E-1
Renew. secondary fuels	MJ	6,57E0	0E0	0E0	6,57E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	5,8E-1	2,44E-2	3,92E-2	6,43E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,01E-4	2,2E-3	4,14E-3	5,32E-5	-5,76E-2

6) PER = Primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	7E-1	1,14E-1	6,74E-2	8,81E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,66E-3	1,03E-2	0E0	8,25E-5	-7,01E-1
Non-hazardous waste	kg	1,93E1	1,26E1	2,67E1	5,87E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,91E-2	1,14E0	0E0	1,9E-1	-3,17E1
Radioactive waste	kg	9,89E-4	8,04E-4	4,45E-4	2,24E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,38E-5	7,27E-5	0E0	2,83E-7	-9,03E-4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	1,5E0	0E0	5,14E0	6,64E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	7,47E1	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	4,24E-2	0E0	0E0	4,24E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	2,03E1	7,46E0	2,89E0	3,07E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,45E-1	6,75E-1	6,43E-1	1,96E-3	-1,04E1
Ozone depletion Pot.	kg $CFC_{-11}e$	1,31E-6	1,41E-6	8,88E-8	2,8E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,23E-8	1,27E-7	6,43E-8	4,95E-10	-9,43E-7
Acidification	kg SO_2e	1,13E-1	1,53E-2	1,81E-2	1,46E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,65E-4	1,38E-3	3,09E-3	1,36E-4	-6,54E-2
Eutrophication	kg PO_4^3e	2,73E-2	3,09E-3	1,78E-2	4,82E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	6,43E-5	2,8E-4	2,15E-3	2,77E-6	-3,14E-2
POCP (“smog”)	kg C_2H_4e	6,53E-3	9,7E-4	6,77E-4	8,18E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,76E-5	8,77E-5	1,27E-4	5,12E-7	-3,3E-3
ADP-elements	kg Sbe	4,85E-3	1,28E-4	1,28E-5	4,99E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,78E-7	1,16E-5	2,53E-6	2,15E-8	-1,7E-4
ADP-fossil	MJ	3,84E2	1,17E2	5,48E1	5,56E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,4E0	1,06E1	1,32E1	4,71E-2	-1,77E2

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Elma Avdyli, as an authorized verifier acting for EPD Hub Limited
01.06.2022

VERIFIED ISO 14025