ENVIRONMENTAL PRODUCT DECLARATION

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

AROLLA CLT

EPD HUB, HUB-1473
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Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Arolla
Address	Rua Garrett nº 19, 3º D, 1200-203 Lisboa, Portugal
Contact details	info@arolla.pt
Website	https://www.arolla.pt/

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 options, A4-B7, and modules C1-C4, D
EPD author	Clément Schüpbach, Arolla LDA
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	Imane Uald lamkaddam, 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	Arolla CLT
Additional labels	
Product reference	
Place of production-	Setúbal, Portugal
Period for data	2022-2023
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	%

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m3
Declared unit mass	470 kg
GWP-fossil, A1-A3 (kgCO2e)	2,48E+02
GWP-total, A1-A3 (kgCO2e)	-5,07E+02
Secondary material, inputs (%)	0.14
Secondary material, outputs (%)	98
Total energy use, A1-A3 (kWh)	3790
Total water use, A1-A3 (m3e)	10.3

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Arolla design, produce, and build eco-responsible high-quality homes in balance with nature.
The innovative construction system is based on certified solid wood CLT panels, produced using the most advanced technology.

PRODUCT DESCRIPTION

The Arolla Cross Laminated Timer (CLT) panels consist of 3-9 layers of kiln-dried softwood lumber, glued together with a formaldehyde-free and vapour permeable Polyurethane (PU) glue. Generally, the layers of the softwood boards are arranged perpendicular (angle of 90º) to each other. We ensure that we use as much of the tree as possible — to create panels that vary in thickness from a standard 120 mm (for internal walls) to 260 mm (for external walls), and up to 1,200 mm wide x 16,000 mm long. Arolla's CLT was designed to be placed without any external cladding, allowing for a single element to be used as both the interior and exterior of a home or building. A truly monolithic solution made possible by perfectly compiled and sanded Arolla CLT panels.

Further information can be found at https://www.arolla.pt/.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals		
Minerals		
Fossil materials	1	EU
Bio-based materials	99	EU

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	209.82
Biogenic carbon content in packaging, kg C	8.17

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 m^3
Mass per declared unit	470 kg
Functional unit	
Reference service life	

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	x	x	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.

The kiln-dried timber is shipped to Arolla's factory from European sawmills. There it is sorted and cut to the desired length, then glued and pressed into panels of different dimensions. The occurring sawdust and trimmings of the panels are co-products that are sold for use as biomass.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

A4:
The finished CLT panels are wrapped in polypropylene foil. To further protect the material, polypropylene corners and wood slats from the raw material delivery and production are reused.
A5:
The CLT elements are assembled on-site using cranes and manual labour. Energy consumption from crane operation to install panels is accounted for in Module A5.

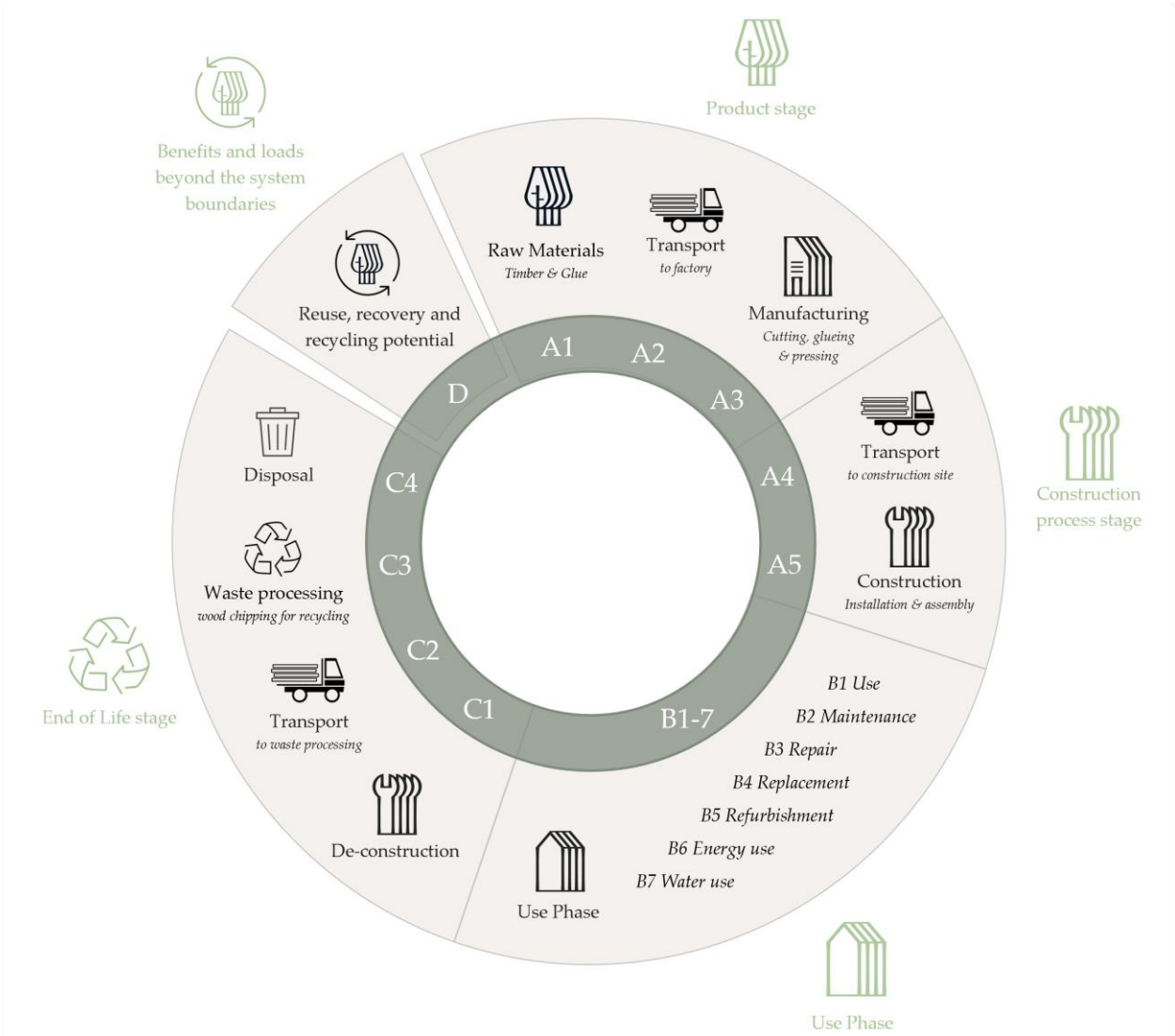
PRODUCT USE AND MAINTENANCE (B1-B7)

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)

For the end of life of the CLT, we differentiate between 4 scenarios. Wood reuse (5%), wood to incineration (59%), wood recycling (35%), and landfill (1%).

SYSTEM BOUNDARIES



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.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	Allocated by mass or volume
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	%

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. The EPD Generator uses Ecoinvent v3.8, Plastics Europe, Federal LCA Commons and One Click LCA databases as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF VP-029-C

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	-7,11E+02	8,28E+01	1,21E+02	-5,07E+02	5,28E+01	6,16E+00	MND	MND	MND	MND	MND	MND	MND	1,88E+00	2,11E+00	7,63E+02	5,07E-02	8,42E+01
GWP – fossil	kg CO_2e	7,98E+01	8,27E+01	8,52E+01	2,48E+02	5,27E+01	5,89E+00	MND	MND	MND	MND	MND	MND	MND	1,86E+00	2,11E+00	6,83E+00	5,06E-02	-2,90E+02
GWP – biogenic	kg CO_2e	-7,91E+02	3,17E-02	3,50E+01	-7,56E+02	2,13E-02	0,00E+00	MND	MND	MND	MND	MND	MND	MND	4,62E-03	0,00E+00	7,56E+02	0,00E+00	3,74E+02
GWP – LULUC	kg CO_2e	9,03E-01	3,61E-02	8,86E-01	1,82E+00	2,05E-02	2,70E-01	MND	MND	MND	MND	MND	MND	MND	2,10E-02	8,21E-04	5,79E-03	5,24E-05	-7,52E-01
Ozone depletion pot.	kg CFC_{-11}e	1,13E-05	1,90E-05	4,50E-06	3,48E-05	1,24E-05	2,58E-07	MND	MND	MND	MND	MND	MND	MND	9,96E-08	4,97E-07	3,72E-07	1,51E-08	-3,32E-05
Acidification potential	mol H^+e	5,89E-01	6,09E-01	6,35E-01	1,83E+00	1,72E-01	2,76E-02	MND	MND	MND	MND	MND	MND	MND	1,44E-02	6,88E-03	5,81E-02	4,27E-04	-1,34E+00
EP-freshwater[2)]	kg Pe	9,46E-03	6,44E-04	3,61E-03	1,37E-02	4,47E-04	1,28E-04	MND	MND	MND	MND	MND	MND	MND	8,11E-05	1,79E-05	1,78E-04	9,75E-07	-2,15E-03
EP-marine	kg Ne	2,03E-01	1,44E-01	8,79E-02	4,35E-01	3,77E-02	3,72E-03	MND	MND	MND	MND	MND	MND	MND	1,92E-03	1,51E-03	2,38E-02	2,82E-04	-3,31E-01
EP-terrestrial	mol Ne	2,02E+00	1,60E+00	9,85E-01	4,60E+00	4,19E-01	3,31E-02	MND	MND	MND	MND	MND	MND	MND	2,18E-02	1,68E-02	2,54E-01	1,59E-03	-3,65E+00
POCP ("smog")[3)]	kg NMVOCe	7,52E-01	4,86E-01	2,79E-01	1,52E+00	1,62E-01	1,06E-02	MND	MND	MND	MND	MND	MND	MND	5,94E-03	6,50E-03	6,32E-02	5,68E-04	-1,01E+00
ADP-minerals & metals[4)]	kg Sbe	7,26E-04	1,89E-04	2,17E-04	1,13E-03	1,28E-04	1,32E-05	MND	MND	MND	MND	MND	MND	MND	4,22E-06	5,15E-06	1,53E-05	1,71E-07	-1,12E-03
ADP-fossil resources	MJ	1,33E+03	1,26E+03	1,19E+03	3,78E+03	8,26E+02	4,11E+01	MND	MND	MND	MND	MND	MND	MND	2,41E+01	3,31E+01	6,72E+01	1,16E+00	-4,48E+03
Water use[5)]	m^3e depr.	4,99E+01	5,40E+00	3,37E+01	8,90E+01	3,69E+00	1,49E+00	MND	MND	MND	MND	MND	MND	MND	6,80E-01	1,48E-01	1,91E+01	6,93E-03	-1,24E+02

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) 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
Particulate matter	Incidence	2,75E-05	8,44E-06	1,83E-06	3,78E-05	5,99E-06	1,29E-07	MND	MND	MND	MND	MND	MND	MND	3,57E-08	2,40E-07	5,94E-07	8,54E-09	-2,15E-05
Ionizing radiation[6)]	kBq U235e	1,37E+01	6,00E+00	6,31E+00	2,60E+01	3,95E+00	2,12E-01	MND	MND	MND	MND	MND	MND	MND	1,37E-01	1,59E-01	3,31E-01	5,58E-03	-1,21E+01
Ecotoxicity (freshwater)	CTUe	3,81E+03	1,08E+03	1,25E+03	6,15E+03	7,34E+02	5,47E+01	MND	MND	MND	MND	MND	MND	MND	2,75E+01	2,94E+01	1,19E+02	1,17E+00	-5,61E+03
Human toxicity, cancer	CTUh	3,30E-07	3,12E-08	3,00E-08	3,92E-07	1,80E-08	1,70E-09	MND	MND	MND	MND	MND	MND	MND	5,10E-10	7,20E-10	1,30E-08	3,76E-11	-5,92E-07
Human tox. non-cancer	CTUh	4,58E-06	1,01E-06	9,06E-07	6,50E-06	7,07E-07	4,68E-08	MND	MND	MND	MND	MND	MND	MND	1,89E-08	2,83E-08	6,06E-07	1,19E-09	-2,93E-06
SQP[7)]	-	8,32E+04	1,30E+03	2,56E+02	8,48E+04	9,50E+02	2,89E+01	MND	MND	MND	MND	MND	MND	MND	5,32E+00	3,81E+01	1,68E+01	2,79E+00	-2,41E+04

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health 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; 7) SQP = Land use related impacts/soil quality.

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[8)]	MJ	9,60E+03	1,35E+01	4,52E+02	1,01E+04	9,29E+00	1,22E+01	MND	MND	MND	MND	MND	MND	MND	1,06E+01	3,73E-01	4,19E+00	2,14E-02	-2,11E+03
Renew. PER as material	MJ	5,90E+03	0,00E+00	-2,61E+02	5,64E+03	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	-5,64E+03	0,00E+00	-2,40E+03
Total use of renew. PER	MJ	1,55E+04	1,35E+01	1,91E+02	1,57E+04	9,29E+00	1,22E+01	MND	MND	MND	MND	MND	MND	MND	1,06E+01	3,73E-01	-5,64E+03	2,14E-02	-4,50E+03
Non-re. PER as energy	MJ	1,20E+03	1,26E+03	1,11E+03	3,56E+03	8,26E+02	3,89E+01	MND	MND	MND	MND	MND	MND	MND	2,41E+01	3,31E+01	6,72E+01	1,16E+00	-4,25E+03
Non-re. PER as material	MJ	1,57E+02	0,00E+00	6,84E+01	2,25E+02	0,00E+00	-7,53E+01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	-1,50E+02	0,00E+00	-2,32E+02
Total use of non-re. PER	MJ	1,35E+03	1,26E+03	1,17E+03	3,79E+03	8,26E+02	-3,64E+01	MND	MND	MND	MND	MND	MND	MND	2,41E+01	3,31E+01	-8,25E+01	1,16E+00	-4,48E+03
Secondary materials	kg	6,54E-01	3,75E-01	1,89E-01	1,22E+00	2,29E-01	1,93E-02	MND	MND	MND	MND	MND	MND	MND	3,72E-03	9,18E-03	9,79E-02	4,14E-04	-6,15E-01
Renew. secondary fuels	MJ	1,52E-02	3,29E-03	6,37E-02	8,21E-02	2,31E-03	2,16E-04	MND	MND	MND	MND	MND	MND	MND	1,44E-05	9,26E-05	2,25E-04	1,59E-05	-1,45E-02
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	9,28E+00	1,53E-01	8,19E-01	1,03E+01	1,07E-01	3,59E-02	MND	MND	MND	MND	MND	MND	MND	1,67E-02	4,27E-03	-4,37E-02	1,24E-03	-2,80E+00

8) 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	4,56E+00	1,67E+00	8,00E+00	1,42E+01	1,09E+00	3,40E-01	MND	MND	MND	MND	MND	MND	MND	1,82E-01	4,36E-02	2,37E-01	0,00E+00	-1,28E+01
Non-hazardous waste	kg	1,25E+02	2,57E+01	1,63E+02	3,14E+02	1,79E+01	9,13E+00	MND	MND	MND	MND	MND	MND	MND	3,15E+00	7,16E-01	2,82E+02	4,70E+00	-2,42E+02
Radioactive waste	kg	6,47E-03	8,53E-03	2,22E-03	1,72E-02	5,56E-03	1,21E-04	MND	MND	MND	MND	MND	MND	MND	4,78E-05	2,23E-04	7,26E-05	0,00E+00	-6,39E-03

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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	2,35E+01	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	1,65E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	2,77E+02	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,07E+01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	2,83E+03	0,00E+00	0,00E+00

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	7,80E+01	8,19E+01	8,54E+01	2,45E+02	5,22E+01	5,99E+00	MND	MND	MND	MND	MND	MND	MND	1,84E+00	2,09E+00	6,57E+00	3,54E-01	-2,83E+02
Ozone depletion Pot.	kg CFC_{-11}e	9,58E-06	1,51E-05	3,85E-06	2,85E-05	9,82E-06	2,86E-07	MND	MND	MND	MND	MND	MND	MND	8,52E-08	3,94E-07	3,19E-07	1,20E-08	-2,89E-05
Acidification	kg SO_2e	4,50E-01	4,90E-01	5,39E-01	1,48E+00	1,39E-01	2,39E-02	MND	MND	MND	MND	MND	MND	MND	1,22E-02	5,59E-03	4,24E-02	3,24E-04	-1,06E+00
Eutrophication	kg PO_4^3e	2,43E-01	7,47E-02	1,75E-01	4,92E-01	3,05E-02	1,90E-02	MND	MND	MND	MND	MND	MND	MND	2,78E-03	1,22E-03	4,09E-02	1,35E-02	-3,62E-01
POCP (“smog”)	kg C_2H_4e	6,94E-02	1,64E-02	2,31E-02	1,09E-01	6,42E-03	1,32E-03	MND	MND	MND	MND	MND	MND	MND	4,57E-04	2,57E-04	1,48E-03	7,85E-05	-6,59E-02
ADP-elements	kg Sbe	6,17E-04	1,84E-04	2,15E-04	1,02E-03	1,25E-04	1,62E-05	MND	MND	MND	MND	MND	MND	MND	4,19E-06	5,00E-06	1,39E-05	1,65E-07	-1,10E-03
ADP-fossil	MJ	1,35E+03	1,26E+03	1,19E+03	3,81E+03	8,26E+02	4,48E+01	MND	MND	MND	MND	MND	MND	MND	2,41E+01	3,31E+01	6,72E+01	1,16E+00	-4,48E+03

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.

Imane Uald lamkaddam, as an authorized verifier acting for EPD Hub Limited

30.05.2024