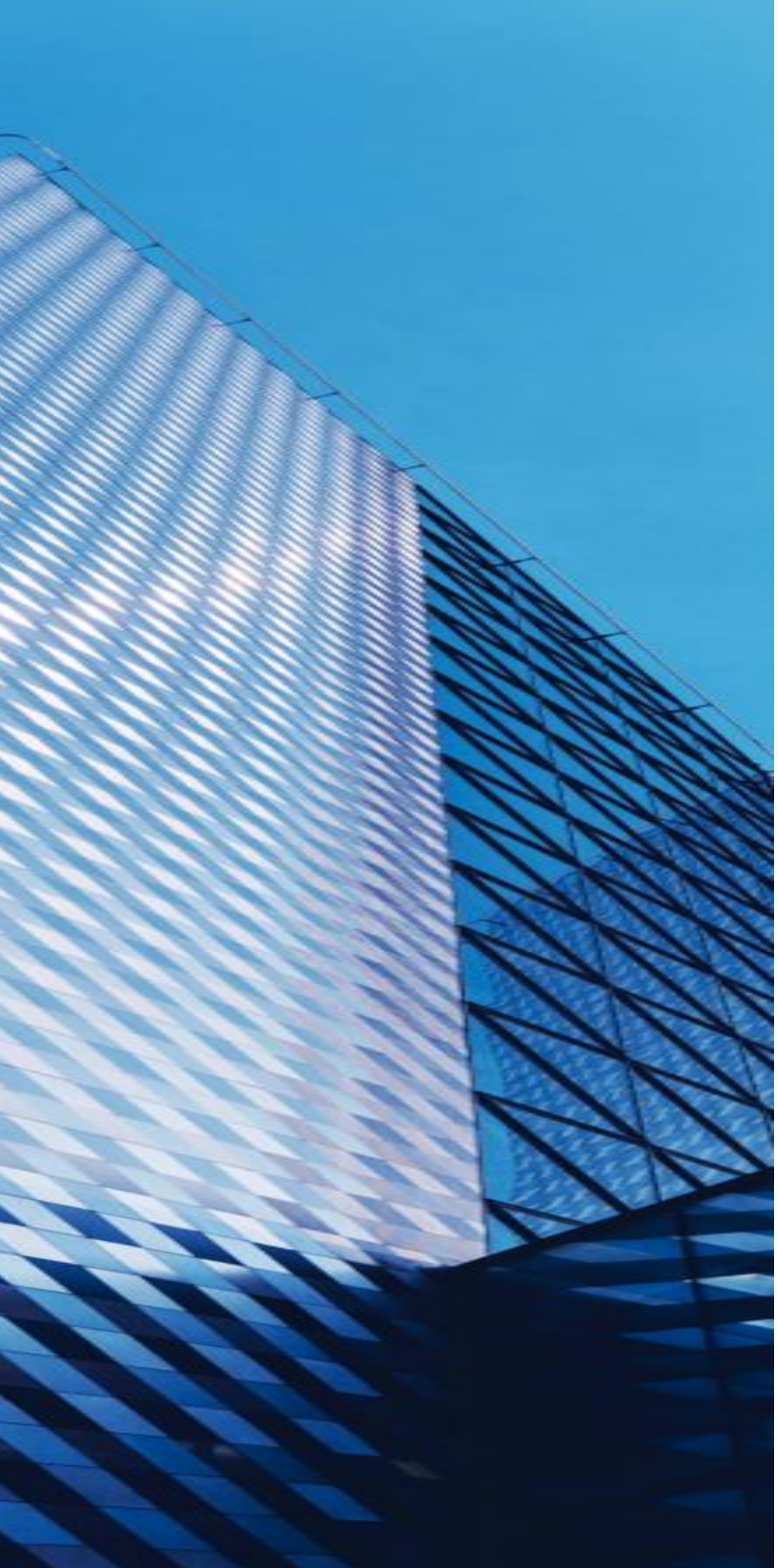
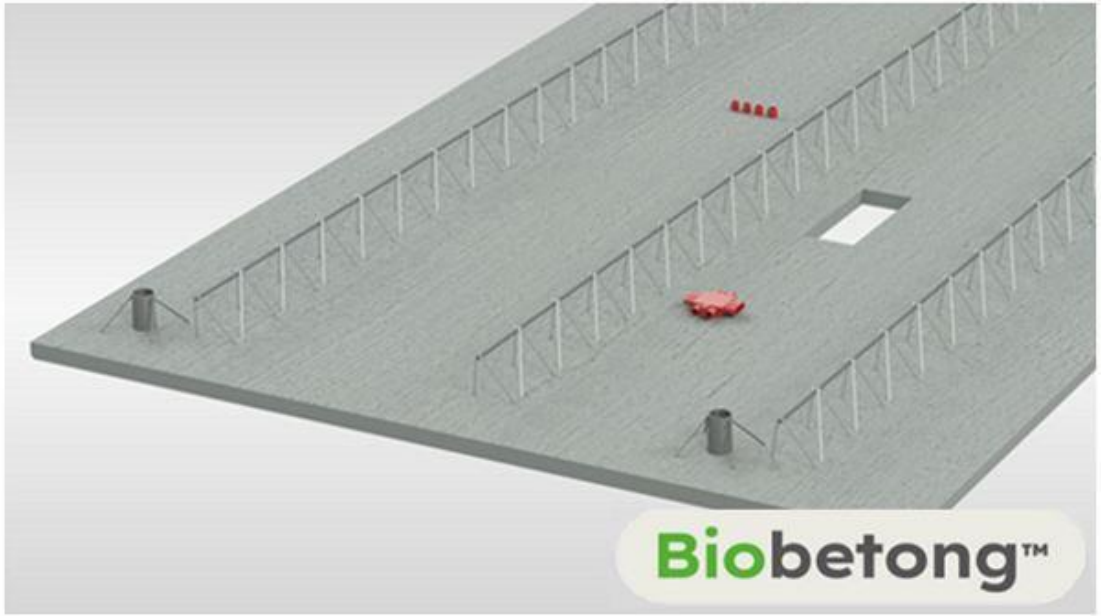


ENVIRONMENTAL PRODUCT DECLARATION

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

Prefabricated Form Slab Elements Biobetong IV
Heidelberg Materials Precast Abetong



EPD HUB, HUB-1350
Published on 26.04.2024, last updated on 26.04.2029.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Heidelberg Materials Precast Abetong
Address	Box 24, S-351 03 VÄXJÖ, Sweden
Contact details	info.precastabetong@heidelbergmaterials.com
Website	www.precastabetong.heidelbergmaterials.se

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	Sister EPD
Parent EPD number	HUB-1349
Scope of the EPD	Cradle to gate with options, A4, and modules C1-C4, D
EPD author	Andreas Lidö, Heidelberg Materials Precast Abetong
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☑ External verification
EPD verifier	Haiha Nguyen, 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	Prefabricated Form Slab Elements Biobetong IV
Additional labels	Biobetong IV
Product reference	-
Place of production	Hallstahammar, Sweden
Period for data	Data for the calendar year 2022 is used in this study.
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	0%

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 metric ton of concrete element
Declared unit mass	1000 kg
GWP-fossil, A1-A3 (kgCO2e)	9,98E+01
GWP-total, A1-A3 (kgCO2e)	1,02E+02
Secondary material, inputs (%)	12
Secondary material, outputs (%)	80,7
Total energy use, A1-A3 (kWh)	315
Total water use, A1-A3 (m3e)	2,71

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Heidelberg Materials Precast Abetong is one of the leading companies for the development, manufacture and sale of concrete elements and concrete-based products. The company employs more than 500 employees and has a turnover of approximately SEK 1,3 billion per year and is part of the international building materials group Heidelberg Materials. The company's production of concrete elements and products takes place in a responsible manner in one of the six factories. The finished parts are then transported out to construction sites, where Heidelberg Materials Precast Abetong or the costumer handles the assembly. Costumers are found in both the construction and agriculture sectors.

PRODUCT DESCRIPTION

The product is prefabricated form slab elements Biobetong IV consisting of aggregate, cement, blast furnace slag, reinforcement and lattice girders. The product is mainly used for floors in heated buildings. It can also be used as outdoor elements in moderately exposed conditions. The product fulfils the requirements of SS-EN 13369:2018 Common rules for precast concrete products and SS-EN 13747:2005+A2:2010 Precast concrete products - Floor plates for floor systems.

Biobetong is Heidelberg Materials Precast Abetong's trademark for products consisting of low carbon concrete. Biobetong IV will have a GWP meeting level 4 according to "Svensk Betong vägledning utgåva 2".

Technical specifications:
Concrete strength C30/37.
Exposure classes X0 and XC1.
Life length class up to L100 (100 years).
Fire classes up to REI60.

Typical dimensions are:
Length of element 7,0 m.
Width of element 2,4 m.
Thickness of element 45 mm.
Approx. 9,5 m^2/ton.

Further information can be found at www.precastabetong.heidelbergmaterials.se.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	4,5	Europe
Minerals	95,5	Sweden
Fossil materials	-	-
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

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

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 metric ton of concrete element
Mass per declared unit	1000 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	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.

In the factory the production of form slab elements takes place in a circulation where the form slabs are moved between a series of workstations. Production begins by cleaning the table and assembling the sides that make up the mould. After that the required cast-in-material for electrical and plumbing purposes are glued to the table and form oil is applied to the mould.

Welding robots are used to manufacture the required reinforcement mesh nets and girders needed for the form slab. The welding robot uses reinforcement steel from coils. Once the reinforcment is placed the elements are casted and transported to the curing chamber. After curing the form slabs are released from the moulds and placed in stacks before finally being transported out to the storage yard, ready for transport to the construction site.

Non- and hazardous waste is transported to nearby recycling centre, concrete waste is used as filling material or crushed to rock.

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.

After notification from the construction site, the elements are loaded onto lorries for transport. The transports are optimised for both efficient assembling at the construction site and reducing the number of required vehicles. Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions and environmental impacts of fuel production. Average distance of transportation from production plant to building site is assumed as 100 km and the transportation method is assumed to be lorry. Transportation does not cause losses. Optional A5 module is not declared.

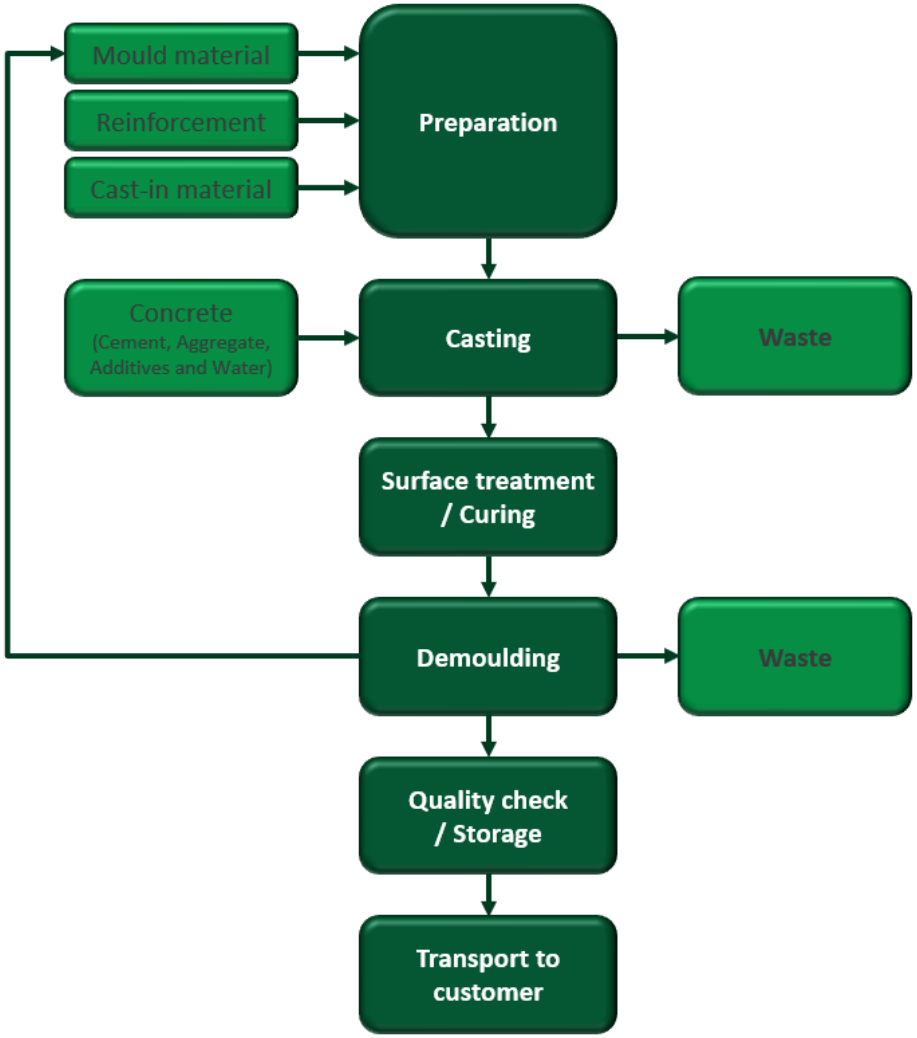
PRODUCT USE AND MAINTENANCE (B1-B7)

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, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste. The demolition process consumes energy in the form of diesel fuel used by building machines (C1). Energy consumption of a demolition process is on the average 10 kWh/m2 (Bozdağ, Ö & Seçer, M. 2007), an average mass of a reinforced concrete building is about 1 ton/m2. Therefore, energy consumption demolition is 10 kWh/metric ton. The dismantled concrete elements are delivered to the nearest construction waste treatment plant (C2), assumed distance 50 km. At the waste treatment plant, waste that can be reused, recycled or recovered for energy is separated and diverted for further use (C3). Unusable materials are disposed of in a landfill (C4). Due to the recycling potential of reinforcement steel and concrete, they can be used as secondary raw material. 95% of the steel and 80% of the concrete are recycled, this avoids the use of virgin raw materials (D).

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.

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	Not applicable
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	0%

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

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	9,02E+01	8,79E+00	3,41E+00	1,02E+02	8,70E+00	MND	MND	MND	MND	MND	MND	MND	MND	3,31E+00	4,42E+00	4,06E+00	1,02E+00	-6,15E+00
GWP – fossil	kg CO_2e	8,88E+01	8,78E+00	2,21E+00	9,98E+01	8,70E+00	MND	MND	MND	MND	MND	MND	MND	MND	3,31E+00	4,41E+00	4,05E+00	1,02E+00	-6,12E+00
GWP – biogenic	kg CO_2e	1,29E+00	3,63E-03	1,15E+00	2,45E+00	3,61E-03	MND	MND	MND	MND	MND	MND	MND	MND	6,06E-04	1,81E-03	4,95E-03	6,62E-04	-1,83E-02
GWP – LULUC	kg CO_2e	1,48E-01	3,34E-03	5,35E-02	2,05E-01	3,26E-03	MND	MND	MND	MND	MND	MND	MND	MND	3,30E-04	1,65E-03	1,60E-03	9,59E-04	-8,42E-03
Ozone depletion pot.	kg CFC_{-11}e	1,20E-06	2,16E-06	4,01E-07	3,76E-06	2,17E-06	MND	MND	MND	MND	MND	MND	MND	MND	7,07E-07	1,08E-06	7,77E-07	4,11E-07	-4,99E-07
Acidification potential	mol H^+e	1,92E-01	2,74E-02	2,37E-02	2,43E-01	2,77E-02	MND	MND	MND	MND	MND	MND	MND	MND	3,44E-02	1,50E-02	4,44E-02	9,55E-03	-3,97E-02
EP-freshwater[2)]	kg Pe	4,09E-03	6,27E-05	7,29E-05	4,22E-03	6,21E-05	MND	MND	MND	MND	MND	MND	MND	MND	1,10E-05	3,25E-05	6,32E-05	1,06E-05	-3,48E-04
EP-marine	kg Ne	5,52E-02	5,94E-03	7,81E-03	6,90E-02	6,12E-03	MND	MND	MND	MND	MND	MND	MND	MND	1,52E-02	3,60E-03	1,67E-02	3,31E-03	-8,59E-03
EP-terrestrial	mol Ne	8,39E-01	6,59E-02	9,76E-02	1,00E+00	6,78E-02	MND	MND	MND	MND	MND	MND	MND	MND	1,67E-01	3,99E-02	1,85E-01	3,64E-02	-1,12E-01
POCP ("smog")[3)]	kg NMVOCe	1,91E-01	2,58E-02	2,04E-02	2,37E-01	2,67E-02	MND	MND	MND	MND	MND	MND	MND	MND	4,59E-02	1,48E-02	5,09E-02	1,06E-02	-2,87E-02
ADP-minerals & metals[4)]	kg Sbe	1,90E-05	2,35E-05	4,93E-06	4,74E-05	2,13E-05	MND	MND	MND	MND	MND	MND	MND	MND	1,68E-06	1,07E-05	1,35E-04	2,33E-06	-5,96E-05
ADP-fossil resources	MJ	4,71E+02	1,38E+02	1,22E+02	7,32E+02	1,39E+02	MND	MND	MND	MND	MND	MND	MND	MND	4,45E+01	6,97E+01	5,46E+01	2,78E+01	-8,85E+01
Water use[5)]	m^3e depr.	9,42E+00	6,41E-01	3,15E+00	1,32E+01	6,41E-01	MND	MND	MND	MND	MND	MND	MND	MND	1,20E-01	3,20E-01	3,71E-01	8,84E-02	-1,17E+01

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	1,06E-06	9,58E-07	4,49E-07	2,47E-06	1,01E-06	MND	MND	MND	MND	MND	MND	MND	MND	9,22E-07	5,12E-07	6,68E-06	1,92E-07	-5,11E-07
Ionizing radiation[6)]	kBq U235e	3,77E+03	7,16E-01	7,46E+00	3,77E+03	7,16E-01	MND	MND	MND	MND	MND	MND	MND	MND	2,05E-01	3,54E-01	3,39E-01	1,26E-01	-1,32E+00
Ecotoxicity (freshwater)	CTUe	4,45E+00	1,15E+02	7,00E+01	1,90E+02	1,16E+02	MND	MND	MND	MND	MND	MND	MND	MND	2,68E+01	5,88E+01	8,55E+01	1,82E+01	-1,11E+02
Human toxicity, cancer	CTUh	7,51E-08	3,10E-09	1,43E-09	7,96E-08	3,00E-09	MND	MND	MND	MND	MND	MND	MND	MND	1,03E-09	1,51E-09	2,81E-09	4,54E-10	-6,16E-09
Human tox. non-cancer	CTUh	1,41E-06	1,16E-07	3,19E-08	1,56E-06	1,18E-07	MND	MND	MND	MND	MND	MND	MND	MND	1,94E-08	5,96E-08	1,01E-07	1,19E-08	-1,14E-07
SQP[7)]	-	1,27E+02	1,50E+02	4,10E+01	3,18E+02	1,62E+02	MND	MND	MND	MND	MND	MND	MND	MND	5,79E+00	8,10E+01	3,23E+01	5,96E+01	-8,50E+01

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	2,53E+02	1,83E+00	3,78E+01	2,93E+02	1,80E+00	MND	MND	MND	MND	MND	MND	MND	MND	2,54E-01	8,80E-01	2,61E+00	2,42E-01	-7,95E+00
Renew. PER as material	MJ	6,92E-01	0,00E+00	0,00E+00	6,92E-01	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	-6,92E-01	0,00E+00
Total use of renew. PER	MJ	2,54E+02	1,83E+00	3,78E+01	2,93E+02	1,80E+00	MND	MND	MND	MND	MND	MND	MND	MND	2,54E-01	8,80E-01	2,61E+00	-4,50E-01	-7,95E+00
Non-re. PER as energy	MJ	4,64E+02	1,38E+02	1,25E+02	7,28E+02	1,39E+02	MND	MND	MND	MND	MND	MND	MND	MND	4,45E+01	6,97E+01	5,46E+01	2,78E+01	-8,86E+01
Non-re. PER as material	MJ	6,49E+00	0,00E+00	0,00E+00	6,49E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	-6,49E+00	0,00E+00
Total use of non-re. PER	MJ	4,71E+02	1,38E+02	1,25E+02	7,34E+02	1,39E+02	MND	MND	MND	MND	MND	MND	MND	MND	4,45E+01	6,97E+01	5,46E+01	2,14E+01	-8,86E+01
Secondary materials	kg	1,20E+02	4,05E-02	1,38E-02	1,20E+02	3,92E-02	MND	MND	MND	MND	MND	MND	MND	MND	1,74E-02	1,96E-02	3,10E-02	5,85E-03	-9,73E-02
Renew. secondary fuels	MJ	2,61E+01	3,77E-04	8,82E-05	2,61E+01	3,45E-04	MND	MND	MND	MND	MND	MND	MND	MND	5,70E-05	1,77E-04	8,29E-04	1,53E-04	-6,97E-04
Non-ren. secondary fuels	MJ	8,86E+01	0,00E+00	0,00E+00	8,86E+01	0,00E+00	MND	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	2,66E+00	1,82E-02	3,28E-02	2,71E+00	1,84E-02	MND	MND	MND	MND	MND	MND	MND	MND	2,70E-03	9,20E-03	1,04E-02	3,05E-02	-2,82E-01

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	2,54E-02	1,50E-01	1,23E-01	2,98E-01	1,49E-01	MND	MND	MND	MND	MND	MND	MND	MND	5,96E-02	7,81E-02	1,46E-01	0,00E+00	-5,18E-01
Non-hazardous waste	kg	1,13E+01	2,62E+00	5,51E+01	6,90E+01	2,59E+00	MND	MND	MND	MND	MND	MND	MND	MND	4,19E-01	1,34E+00	3,30E+00	1,93E+02	-1,53E+01
Radioactive waste	kg	1,70E-02	9,54E-04	1,68E-03	1,97E-02	9,58E-04	MND	MND	MND	MND	MND	MND	MND	MND	3,13E-04	4,78E-04	3,69E-04	0,00E+00	-4,42E-04

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	2,90E-03	0,00E+00	0,00E+00	2,90E-03	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	8,68E+00	0,00E+00	0,00E+00	8,68E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	8,07E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	6,34E-02	0,00E+00	0,00E+00	6,34E-02	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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.

HaiHa Nguyen, as an authorized verifier acting for EPD Hub Limited
26.04.2024

VERIFIED ISO 14025