EPD®
THE INTERNATIONAL EPD® SYSTEM

Southeast Asia EPD

ECO PLATFORM EPD VERIFIED

Environmental Product Declaration

In accordance with **ISO 14025:2006** and

EN 15804:2012+A2:2019/AC:2021 for:

Rebar

This EPD of multiple products, covers a range of rebar product, based on the weighted average results of the product group across various standards applicable to rebars.

Product standards covered in this EPD are TCVN 1651 – 2:2018, ASTM A615/A615M – 20, BS4449:2005+A3:2016, CS2:2012, SS560:2016, JIS G3112:2020, and AS/NZS 4671:2019.

VAS Group Nghi Son Joint Stock Company [VAS Group]

Nghi Son Iron Steel Complex,

Nghi Son Economic Zone, Hai Thuong Ward,

Nghi Son Town, Thanh Hoa, Vietnam

Programme
The International EPD® System, www.environdec.com

EPD registered through the fully aligned regional hub EPD Southeast Asia, https://www.epd-southeastasia.com/

Programme operator
EPD International AB

Regional Hub
EPD Southeast Asia

EPD registration number
S-P-13773

Publication date
2024-05-10

Valid until
2029-05-10

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Table of Contents

General information

Programme information

Programme	**The International EPD ® System** EPD registered through the fully aligned regional hub: EPD Southeast Asia
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Accountabilities for PCR, LCA and independent, third-party verification	
Product category rules (PCR): CEN standard EN 15804 serves as the Core Product Category Rules (PCR)	
Product Category Rules (PCR): Product Category Rules (PCR): PCR 2019:14 of Construction products, version 1.3.3 UN CPC: 41242	
PCR review was conducted by: The Technical Committee of the International EPD® System.	**Review chair:** No chair appointed The review panel may be contacted via the Secretariat www.environdec.com/contact.
Life Cycle Assessment (LCA) LCA accountability: PT Life Cycle Indonesia Corresponding practitioner: Jessica Hanafi, Ph.D., Gloria FJ Kartikasari, Vivian, Elbert Fernando Tjandra	
Third-party verification Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☑ EPD verification by individual verifier	
Third party verifier: Claudia A. Peña, Director of PINDA LCT SpA, pinda.lct@gmail.com **Approved by:** The International EPD® System Technical Committee, supported by the Secretariat	
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☑ No	

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD

VAS Group Nghi Son Joint Stock Company [VAS Group]

Contact

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Product certifications

+ JIS G3112:2020
+ ASTM A615/A615M-20
+ SAE J403:2014
+ BS4449:2005+A3:2016
+ QCVN 7:2019/BKHCN
+ TCVN 11384: 2016
+ TCVN 1651-1:2018
+ TCVN 1651-2:2018

Management system certification

+ TCVN ISO 9001:2015/ ISO 9001:2015
+ ISO 14001:2015/ TCVN ISO 14001:2015
+ ISO 45001:2018

Name and location of production site(s)

Nghi Son Iron Steel Complex, Nghi Son Economic Zone, Hai Thuong Ward, Nghi Son Town, Thanh Hoa, Vietnam.

Description of the organisation

VAS Group Nghi Son Thanh Hóa Site (VAS Group) is a leading steel manufacturing company in Vietnam. The company is known for producing steel products that adhere to various international standards, including the Standard Regulation QCVN:2011/BKHCN, Vietnamese Standards (TCVN), Japanese Industrial Standards (JIS), American Society for Testing and Materials (ASTM), British Standard (BS 4449:2005), and Construction Standard Hong Kong (CS2:2012). The production processes conform to global standards and have been accredited by numerous international institutes. VAS Group: VAS Steel Nghi Son Thanh Hóa Site is determined to continuously improve its products and processes to achieve excellence where the products not only concern their customers but are also responsible for society and the environment.

Product information

Product name

Rebar

Product identification

VAS Vietnam's rebar have been granted the Vietnam and international standard, TCVN 1651-1:2008, TCVN 1651-2:2018, JIS G 3112:2010, ASTM A615 /A615M-20, and BS4449:1997.

Product description

Rebar from VAS Vietnam Company are meticulously manufactured from carefully selected materials, ensuring they are in an optimal metallurgical state for further works. Rebar is typically made from steel, providing structural support and resilience against tensile forces that concrete alone cannot withstand. It primarily used in the construction industry to reinforce concrete and building structures, including roofs, floors, walls, roads and bridges. The detailed specifications of each rebar such as dimensions, and mechanical properties vary depending on the product types and range. VAS Vietnam's rebar is produced in shape and can be divided into type of section, with length up to 12 m. The results in the EPD are based on a weighted average of all standards and grades, providing a clearer depiction of the products covered and taking into account the total production of VAS Vietnam's steel products over a one-year period within the study timeframe.

UN CPC code

UN CPC 41242 - Other bars and rods of iron or non-alloy steel, not further worked than forged, hot-rolled, hot-drawn or extruded, but including those twisted after rolling.

Geographical Scope

Manufactured in Nghi Son Iron Steel Complex, Nghi Son Economic Zone, Hai Thuong Ward, Nghi Son Town, Thanh Hoa Province, Vietnam and Supplied to Global.

Mechanical Properties

Properties	Range	Average
Diameter	D10mm – D40mm	15.78
Nominal Diameter	D10mm - D40mm	15.78
Cross Section Area	78.5 to 1 257 mm^2	225
Unit Weight	0.617 to 9.86 kg/m	1.77
Weight tolerance	±4 to ±6 %	±5%

Product Standard and Grade

This EPD covers rebar products that comply with the specified standards and grades:

Standard	Grade
TCVN 1651 – 2:2018	CB 300 – V, CB 400 – V, CB 500 – V
ASTM A615/A615M – 20	Gr 40 (280), Gr 60 (420)
BS4449:2005+A3:2016	B500A, B500B, B500C
CS2:2012	250, 500B, 500C
SS560:2016	B500A, B500B, B500C
JIS G3112:2020	SD390
AS/NZS 4671:2019	500N

LCA information

Declared unit

1 tonne of rebar

Time representativeness

Specific data for the manufacturing collected from 2022-01-01 to 2022-12-31. The 10-year requirement for generic data has been met.

Database(s) and LCA software used

Generic data for upstream and downstream processes use Ecoinvent 3.9.1 database and modelled by using SimaPro Developer software version 9.5.0.1. No datasets older than 10 years were used.

Description of system boundaries

The system boundary was chosen based on the goal and scope of the study and in accordance with EN 15804:2012+A2:2019, i.e. EPD type B which comprises a “cradle-to-gate” with modules C1–C4 (the end-of-life stages), and module D (benefits and loads beyond the system boundary), and optional modules A4. Modules A5 and B1-B7 have not been included due to the inability to predict how the material will be used in the construction process and use stage. All losses were accounted in the modules where they occurred. The study does not cover for environmental impacts from construction, production equipment, and other capital goods, as well as personnel-related impacts like transportation to and from work.

Results from modules A1-A3 should not be used alone. Module C must be considered for a comprehensive assessment. Ignoring module C may lead to incomplete conclusions and errors in decision making. The processes below are included in the product system to be studied:

1 Upstream (A1-A2)

a. Production of raw materials (Sorted scrap steel)

b. Production of electricity and fuel gas (i.e. natural gas)

c. Transportation of raw/auxiliary materials from the supplier to manufacturing plant

d. Extraction of water (i.e. lake and underground water)

e. Port Activities (Unloading)

2 Core (A3)

- Production of auxiliary materials (e.g., Chemicals, etc.)
- Induction Furnace
- Continuous Casting Machine
- Marking process for Billet,Wire Rod Mill for Wire Rod, and Rebar Mill for Rebar
- Packaging
- Utilities: water treatment, wastewater treatment, waste collection, electricity substation
- Direct emission to the environment
- Transport to waste processing unit
- Waste processing including waste treatment process by a registered third party for hazardous waste

3 Downstream (A4, C1-C4, D)

a. Port Activities (Product Loading)

b. Transport product to customer

c. Deconstruction & Demolition

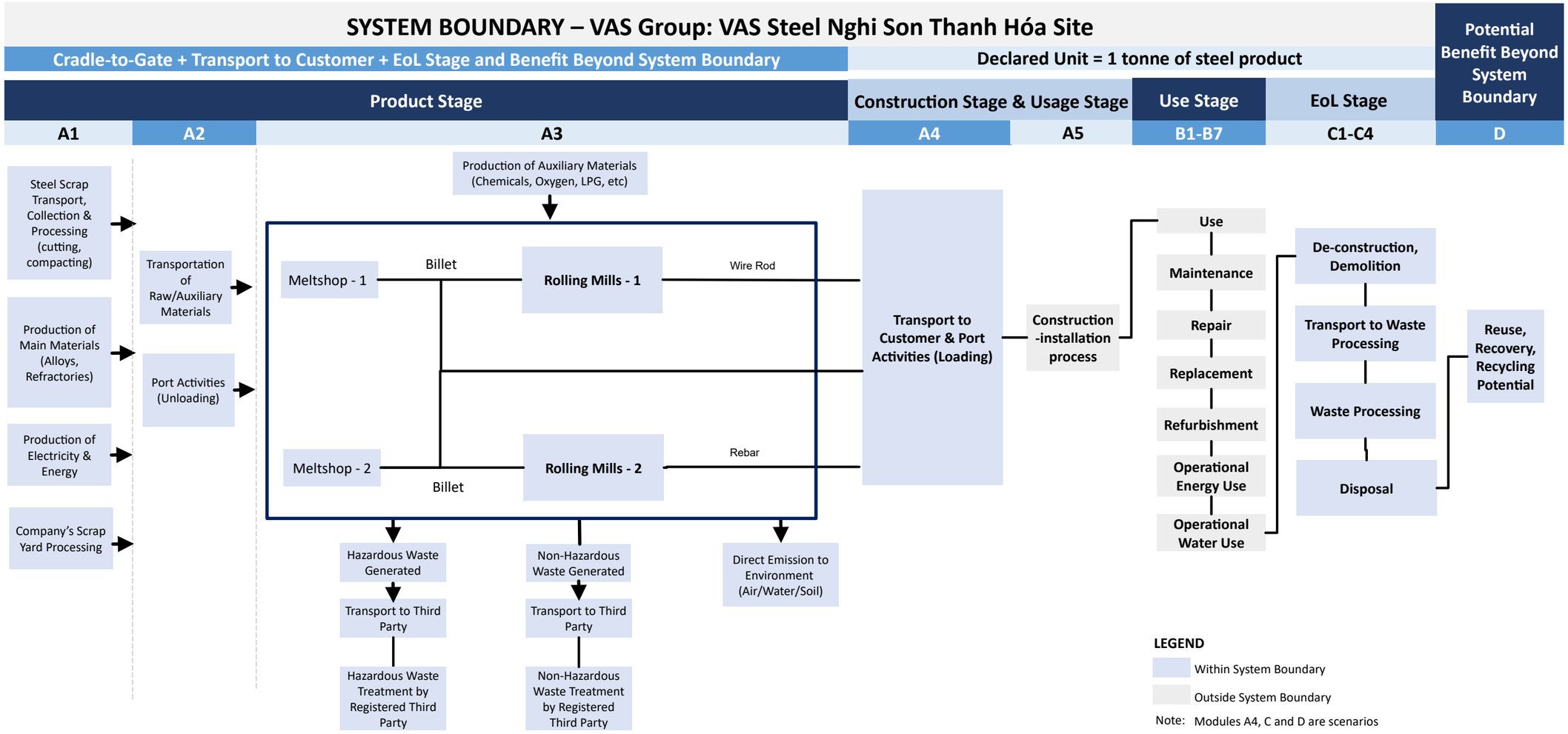
d. Disposal

e. Reuse/Recovery/Recycling of the end of life of the products

f. Scrap Yard (Sorting, Cutting, Shredding)

Port activities for the unloading of steel scrap and loading of products, are included as they fall under the operational control of the company.

System diagram



More information

Relevant websites for more information regarding the process in manufacturing:

https://vasgroup.vn/

Key Assumptions and Limitations

1. Production process of all materials (e.g SiO_2, lubricating oil, etc.) and electricity are modelled using data available in commercial databases. Dataset of electricity mix in Vietnam used is estimated using database from Ecoinvent 3.
2. Air Emissions produced by burned diesel, LPG, and coal are estimated using database from Ecoinvent 3. For LPG, the emissions of CO_2, CH_4, and NO_2 is modified to 2 980 kg/tonne 0.237 kg/tonne and 0.00473 kg/tonne (GHG Protocol, 2017).
3. Several wastes produced such as slag, refractories, scale, paper bag, and plastic bag is used again internally. The other such as dust, dried sludge, sorted materials, and used oil is send to third party. The treatment in third party for dust is pressing reused block bricks, for used oil is Physical chemistry which are burning then solidification, and the rest is incineration and solidification.
4. In this study, the direct emission in form of CO_2 emitted from induction furnace is not measured and assumed to be negligible according to the IPCC 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Industrial Processes and Product Use.
5. Energy consumption and emissions from the transportation process of scrap steel, raw materials, and waste are modelled using available data in the Ecoinvent database by considering the type of transportation used and the transport distance.
6. Data for land use is aggregate for Production Area of Wire Rod (IF-1, CCM-1, and Wire Rod Mill) and Rebar (IF-2, CCM-2, Rebar Mill).
7. The data collected for electricity consumption is aggregation of each processing area which also cover the electricity required for the utilities of the related area (IF-1 & CCM-1, IF-2 & CCM-2, Wire Rod Mill, and Rebar Mill).

Cut-off rules

In accordance with EN 15804:2012+A2:2019/AC:2021, all available data shall be included. In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process. The total of neglected input flows per module, e.g. per module A1-A3, C1-C4 and module D shall be a maximum of 5 % of energy usage and mass. If there is missing specific data, proxy data or extrapolation or generic data from the database or literature will be used

Data Quality

- Time related coverage: specific data were collected from 2022-01-01 to 2022-12-31, and generic data are representative of the year 2021.
- Geographic coverage: specific data were collected from area under study, i.e., VAS Steel Nghi Son Thanh Hóa Site, Vietnam Generic data were collected from global average data.
- Technological coverage: specific data were collected from current steel making process under study. Generic data from global average with technology aspects were similar with what described in the process under study, but merits improvement as processes were not modelled with specific data.

Data quality for both specific and generic data were sufficient to conduct life cycle assessment in accordance with the defined goal and scope.

Allocation

In this study, the process of Induction Furnace and continuous casting machine requires allocation as the Billet product would be either directly sold or further processed into Wire Rod or Rebar. There are no other co-products in this study and mass allocation is applied mainly to Induction Furnace, and Continuous Casting Machine.

For steel scrap used in Induction Furnace, the impact counted in steel scrap is the transportation process of the waste, covering the Port Unloading process and scrap yard (waste sorting, if applicable) as both processes is still within the company control.

In this steel product system, a closed loop process is applied. Recovered steel scrap for recycling is allocated a credit (or benefit) associated with the avoided impacts of the virgin material. When the scrap is used in the manufacture of a new product, there is an allocation (or debit) associated with the scrap input. If the amount of recovered steel scrap for recycling is less than what the product system requires/ steel scrap needed in the manufacture, then the environmental burdens associated with meeting the raw material demand are included in this closed-loop model. On the other hand, if the amount of recovered steel scrap for recycling is larger than what the product system requires/ steel scrap needed in the manufacture, then the product system receives a net credit, equivalent to the net amount of virgin material avoided.

The end-of-waste state of the steel scrap is reached when the steel scrap is processed in the waste processing (Module C3). The steel scrap is sorted and pressed into blocks and ready to be used for other specific purposes. After the point of end-of-waste, the downstream emissions related to transportation process from recycler to manufacture is attributed to the processing unit that uses the secondary material.

The assessed products are distributed to around Vietnam and exported to Cambodia that spread out all over the world. In this study, applying the Pareto rules on the products distribution, only countries that are within 80% market share were taken into account, as presented in Vietnam. The recovery rate for recycling is obtained from weighted average and differentiated based on customers' countries. The remaining unrecovered steel scrap is considered as material losses that will go to other disposal scenarios to landfill. Mass allocation may be used if there are several disposal scenarios.

For the end-of-life of waste generated in the manufacturing process (e.g. Slag and Refractories, dust, etc.), polluter pays principle are applied for each type of waste. Materials sent to landfill or incineration are subject to a multi-input allocation process, where emissions are determined based on the physical/chemical properties of the material. Overhead processes associated with landfill or incineration are allocated based on the mass of the waste flows. This applies to steel scrap and waste generated in manufacturing process.

LCA Scenarios and Additional Technical Information

1 Chemical data for which there is no specific MSDS available use general data composition or generic data.

2 The projected lifetime of land is assumed last for 50 years.

3 The electricity grid in module A3 was based on the Ecoinvent database for Vietnam which is highly reliant on coal (48%), hydropower (30%), and gas-fired (18%). The climate impact (GWP-GHG) of the electricity is 0.676 kg CO_2 eq./kWh.

4 Energy consumption and emissions from the transportation process of auxiliary material and waste (suppliers to manufacturing plant and transport to waste processing) are estimated using available data in the Ecoinvent database (market database).

5 The type of truck used for transportation within the country is in the range 7.5 to 16 tonnes with EURO4 emission is used, owing to the need to transport heavier loads across longer distances. On the other hand, the transportation used between the country are truck in the range 7.5 to 16 tonnes with EURO4 emission and container ship is used.

6 Transportation in Vietnam were estimated based on World Bank for average rigid truck travelled 250 kilometres a day (2008).

7 Amount of diesel used for demolition process was modelled using Ecoinvent database for global data, i.e.,0.626 MJ diesel/kg steel.

8 Amount of diesel and electricity consumption for waste processing was modelled using Ecoinvent database for global data on sorting and pressing iron scrap, i.e., 0.1MJ diesel/kg steel and 0.01 kWh/kg steel.

9 Waste processing and disposal of scrap steel are modelled using available generic data from Ecoinvent database by considering what kind of waste treatment and disposal of scrap steel that occurred the most

10 The average steel recycling rate in Vietnam is 90% (ERIA, 2022).

11 Around 98% steel scrap is recycled locally in Vietnam while 2% is exported to other countries which are India, South Korea, and Thailand. (The Observatory of Economic Complexity, 2020).

12 VAS uses external scrap in its steel production. Net scrap was calculated by excluding the amount of internal scrap (home scrap). The potential environmental benefit calculated for the end-of-life stage (Module D) was based on the net amount of scrap left in the system.

13 The LCA calculation methodology is EN 15804+A2 (EF Package 3.1).

14 The infrastructure data covered in this study is part of the used database.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	VN, GLO	VN, GLO	VN	VN, GLO	-	-	-	-	--	-	-	-	VN, GLO	VN, GLO	VN, GLO	VN, GLO	VN, GLO
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Content declaration

Product content	Weight, %									
Virgin Sources (Iron)	0%									
Recycled Material (pre- and post-consumer, i.e., Scrap Steel)	100%									
Standard	**% Carbon (C)**	**% Manganese (Mn)**	**% Silica (Si)**	**% Phosphorus (P)**	**% Sulphur (S)**	**% Chromium (Cr)**	**% Nickel (Ni)**	**% Copper (Cu)**	**% Nitrogen (N)**	**Cev**
Range of values covering all standard and grades	0.06-0.37	max 1.8	max 0.55	max 0.05	max 0.05	-	-	max 0.85	max 0.014	0.42-0.65
Average of values covering all standard and grades	0.24	1.8	0.55	0.05	0.05	-	-	0.82	0.0127	0.52
Packaging materials										
No packaging used for the products										
Dangerous substances from the candidate list of SVHC for Authorisation										
No dangerous substances										

Results of the environmental performance indicators

The estimated impact results provided in this EPD report are solely relative statements and do not serve as indicators of the end points of the impact categories, surpassing threshold values, safety margins, or risks. The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, non-cancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

Mandatory impact category indicators according to EN 15804:2012+A2:2019/AC:2021

Results per 1 tonne of Rebar								
Impact Indicator	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	7.38E+02	4.88E+01	6.21E+01	4.70E+01	2.93E+01	4.97E+00	1.17E+02
GWP-biogenic[A]	kg CO_2 eq.	5.50E-01	1.35E-02	8.61E-03	1.33E-02	8.59E-02	1.36E-03	-1.13E-01
GWP-luluc[A]	kg CO_2 eq.	1.69E-01	2.62E-02	7.01E-03	2.46E-02	2.98E-02	2.47E-03	6.66E-02
GWP-total	kg CO_2 eq.	7.39E+02	4.88E+01	6.21E+01	4.70E+01	2.94E+01	4.97E+00	1.17E+02
ODP	kg CFC 11 eq.	4.78E-06	7.31E-07	9.86E-07	7.12E-07	3.87E-07	7.53E-08	3.86E-06
AP	mol H^+ eq.	7.77E+00	2.97E-01	5.56E-01	2.06E-01	3.36E-01	2.31E-02	2.66E-01
EP-freshwater	kg P eq.	2.83E-02	3.88E-04	2.24E-04	3.85E-04	1.14E-03	3.95E-05	-1.38E-02
EP-marine	kg N eq.	1.29E+00	9.77E-02	2.67E-01	7.55E-02	7.19E-02	8.69E-03	4.36E-02
EP-terrestrial	mol N eq.	1.43E+01	1.06E+00	2.90E+00	8.14E-01	8.19E-01	9.38E-02	1.05E+00
POCP	kg NMVOC eq.	4.07E+00	3.45E-01	8.50E-01	2.80E-01	2.44E-01	3.18E-02	6.95E-01
ADP-minerals & metals[2 A]	kg Sb eq.	9.16E-04	1.50E-04	2.17E-05	1.52E-04	1.60E-03	1.52E-05	2.07E-03
ADP-fossil[2]	MJ	7.73E+03	6.88E+02	8.14E+02	6.70E+02	3.44E+02	7.05E+01	1.07E+03
WDP[2 A]	m^3	6.10E+01	2.28E+00	1.72E+00	2.27E+00	3.30E+00	2.32E-01	1.02E+02

[1] The 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. Potentioal ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator

[2] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

[3] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero.

[A] The environmental performance results are grouped (annual average) that is representative for all grades of the product because the average overall variation is no more than 10%. However, there are difference in variation for GWP biogenic (52%), GWP Luluc (18%), ADP minerals & metals (13%), WDP (20%), PM (25%), IRP (34%), ETP-fw (32%), HTP-c (184%), and SQP (20%). This is due to the variation of silica and manganese composition

Potential environmental impact – additional environmental information according to EN 15804:2012+A2:2019/AC:2021

Results per 1 tonne of Rebar								
Impact Indicator	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PM[A]	Disease incidence	1.62E-05	3.89E-06	1.59E-05	3.89E-06	4.08E-06	4.59E-07	7.29E-06
IRP[1 A]	kBq U235 eq.	2.39E+00	2.38E-01	1.65E-01	2.38E-01	2.08E-01	2.42E-02	1.29E+00
ETP-fw[2 A]	CTUe	2.92E+03	3.78E+02	3.89E+02	3.70E+02	2.81E+02	3.86E+01	-1.33E+03
HTP-c[2 A]	CTUh	2.24E-06	2.22E-08	1.90E-08	2.15E-08	4.15E-08	2.17E-09	-1.38E-06
HTP-nc[2 A]	CTUh	6.11E-06	4.72E-07	1.32E-07	4.76E-07	1.81E-06	4.81E-08	-1.20E-05
SQP[2 A]	dimension-less	1.48E+03	3.90E+02	5.48E+01	4.01E+02	6.37E+02	4.42E+01	4.59E+02

Additional mandatory and voluntary impact category indicators

Results per 1 tonne of Rebar								
Indicator	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG[3]	kg CO_2 eq.	7.39E+02	4.89E+01	6.22E+01	4.71E+01	2.95E+01	4.98E+00	1.18E+02

- **GWP-fossil** : Global Warming Potential fossil fuels
- **GWP-biogenic** : Global Warming Potential biogenic
- **GWP-luluc** : Global Warming Potential land use and land use change
- **ODP** : Depletion potential of the stratospheric ozone layer
- **AP** : Acidification potential, Accumulated Exceedance
- **EP-freshwater** : Eutrophication potential, fraction of nutrients reaching freshwater end compartment
- **EP-marine** : Eutrophication potential, fraction of nutrients reaching marine end compartment
- **EP-terrestrial** : Eutrophication potential, Accumulated Exceedance
- **POCP** : Formation potential of tropospheric ozone
- **ADP-minerals&metals** : Abiotic depletion potential for non-fossil resources
- **ADP-fossil** : Abiotic depletion for fossil resources potential
- **WDP** : Water (user) deprivation potential, deprivation-weighted water consumption
- **PM** : Particulate Matter emissions
- **IRP** : Ionizing radiation - human healt
- **ETP-fw** : Eco-toxicity – freshwater
- **HTP-c** : Human toxicity - cancer effects
- **HTP-nc** : Human toxicity - non-cancer effects
- **SQP** : Land use related impacts / soil quality

Waste production and output flows

Resource use indicators

Results per 1 tonne of Rebar								
Indicator	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	1.24E+03	8.64E+00	4.62E+00	8.51E+00	5.20E+01	8.66E-01	0.00E+00
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRE	MJ	8.22E+03	7.32E+02	8.65E+02	7.12E+02	3.67E+02	7.49E+01	0.00E+00
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	kg	1.07E+03	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
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	3.47E+01	5.93E-01	4.23E-01	5.90E-01	8.61E-01	6.01E-02	-6.77E+00

Waste indicators

Results per 1 tonne of Rebar								
Indicator	Unit	Total A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste disposed	kg	6.60E+03	3.20E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.55E+01
Non-hazardous waste disposed	kg	4.96E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.48E+00
Radioactive waste disposed	kg	2.36E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flow indicators

Results per 1 tonne of Rebar								
Parameter	Unit	Total A1 -A3	A4	C1	C2	C3	C4	D
Components for re-use	kg	8.00E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	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 re-sources
- **SM** : Use of secondary material
- **RSF** : Use of renewable secondary fuels
- **NRSF** : Use of non-renewable secondary fuels
- **FW** : Use of net fresh water

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Environmental Product Declaration

VAS Group

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