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Programme operator: EPD Southeast Asia

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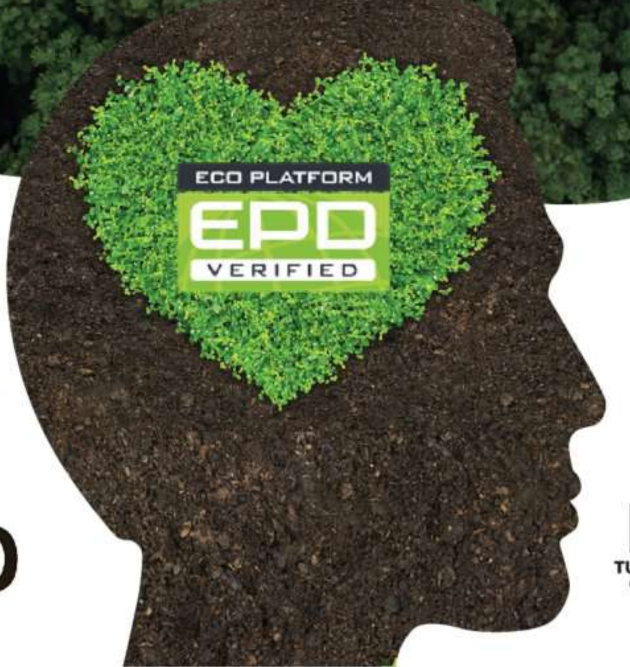
An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

ENVIRONMENTAL PRODUCT DECLARATION

From:
TUNG HO STEEL VIETNAM CORPORATION (THSVC)

- In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:
- Multiple steel products:
  - Deformed bar
  - Wire rod
  - Deformed bar in coil



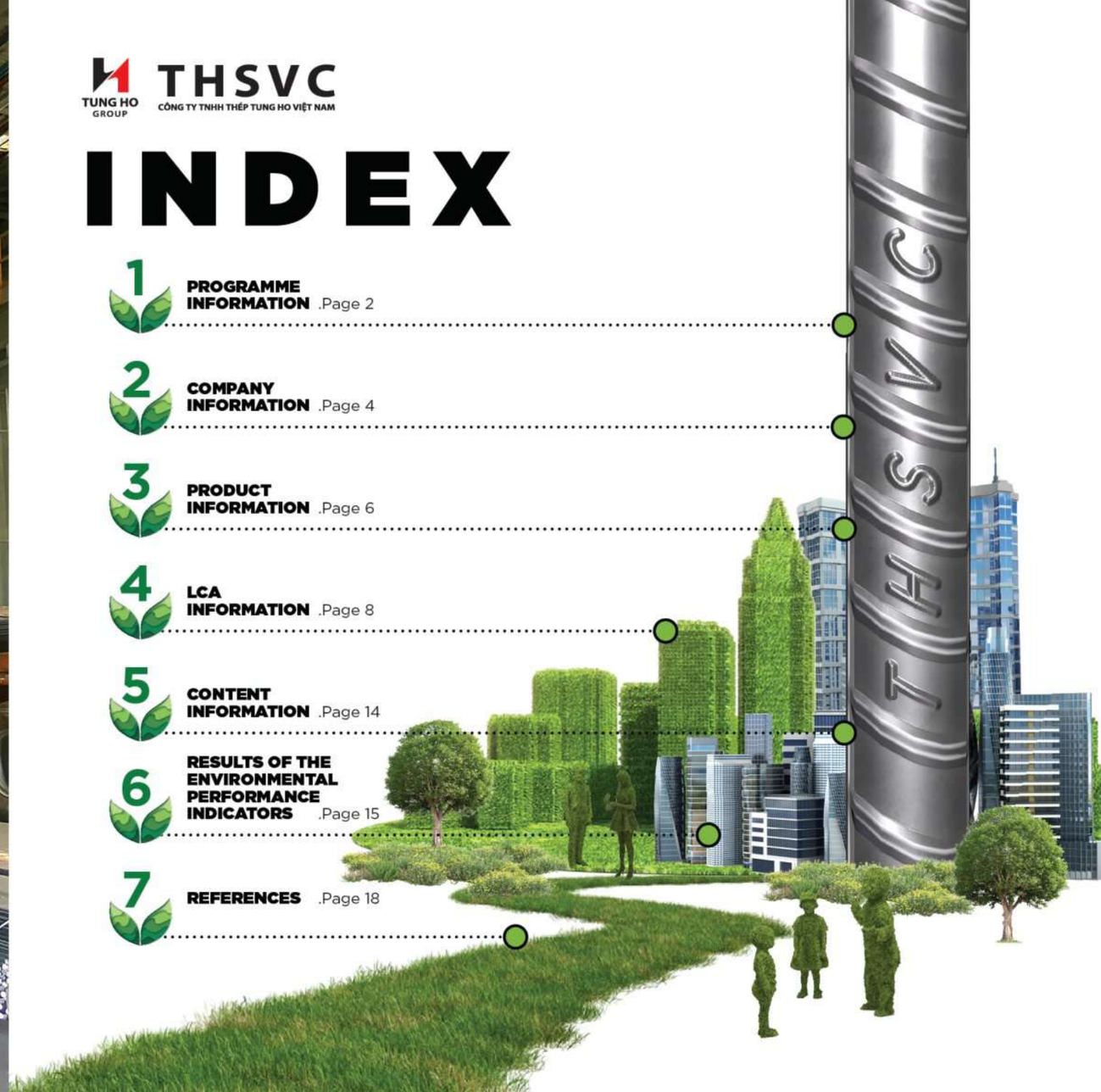
EPD® THE INTERNATIONAL EPD® SYSTEM

EPD Southeast Asia

TUNG HO GROUP THSVC CÔNG TY TNHH THÉP TUNG HO VIỆT NAM

TUNG HO GROUP THSVC
CÔNG TY TNHH THÉP TUNG HO VIỆT NAM

INDEX



1 PROGRAMME INFORMATION

Programme:	EPD Southeast Asia, hub of The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden HubEPD Southeast Asia: Kencana Tower, Level M Business Park Kebon Jeruk Jl Raya Meruya Ilir No. 88 Jakarta Barat 11620 Indonesia
Website:	https://www.epd-southeastasia.com/
Email:	info@environdec.com and admin@epd-southeastasia.com

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): PCR 2019:14 v.1.2.5, Construction products, EPD International 2022-11-01, valid until 2024-12-20
UN CPC code(s): 4121

PCR review was conducted by: The Technical Committee of the International EPD® System.
See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, ADDERE Research & Technology, Chile.
Tel: +56 9 9359 9210; E-Mail: cpena@addere.cl
The review panel may be contacted via the Secretariat www.environdec.com/contact.

Life Cycle Assessment (LCA)

LCA accountability: SGS INTRON B.V., A. Schuurmans

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, ADDERE Research & Technology
Approved by: The International EPD® System

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.

2 COMPANY INFORMATION

Owner of the EPD:
TUNG HO STEEL VIETNAM CORPORATION (THSVC)

Contact: Nguyen An Anh Vu
Email: a0582@tunghosteel.com
Phone: +84 947 282 324

Description of the organisation: Tung Ho Steel is established in 1962 in Taiwan and is still headquartered in Taiwan. In 2016, the Vietnamese company Fuco Steel was acquired and renamed Tung Ho Steel Vietnam Corporation (THSVC). THSVC's energy and resource management aims at an effective use of energy and an environmental policy focusing amongst others on reusing waste and reducing CO_2 emissions. This EPD is part of their environmental communication with stakeholders.

Product-related or management system-related certifications: ISO 9001:2015, ISO 17025:2017, ISO 14001

Name and location of production site(s):
THSVC has one production facility in Phu My: Phu My II Industrial Zone, Phu My Ward, Phu My Township, Ba Ria Vung Tau Province, Vietnam Vietnam.

TUNG HO GROUP THSVC CÔNG TY TNHH THÉP TUNG HO VIỆT NAM

3 PRODUCT INFORMATION

This EPD covers multiple products as described below. Since the production of 1 ton steel product is the same for each of the products, the declared unit of 1 ton and the environmental impacts per ton apply to all 3 products. The EPD is therefor based on average results per ton.

Product name (multiple products): deformed bar, wire rod and deformed bar in coil

Deformed bar

Wire rod

Deformed bar in coil

Product identification: As per standards mentioned in Table below: TCVN1651-2, CNS 560 A2006, JIS G3112, ASTM A615, ASTM A706, GB1499-2, KS D3504, BS 4449, AS/NZS 4671, TCVN 1651-1, CNS 560 A2006, JIS G3112, ASTM A615, ASTM A706, GB1499-2, KS D3504, BS 4449, AS/NZS 4671

Product description: The products are predominantly used as reinforcement in concrete structures in the construction sector. The available length ranges from 6 m to 22 m. Diameter ranges for the deformed bar are D10 – D50, for the wire rod D5.5 – D20 and for the deformed steel bar in coil D6 – D20.

Applicable standards are:

Steel product	Applicable standards	Sizes
Deformed bar	TCVN1651-2 CNS 560 A2006 JIS G3112 ASTM A615 ASTM A706 GB1499-2 KS D3504 BS 4449 AS/NZS 4671	Diameter: D10-D50 D10-D50 D10-D51 #3-#14 N3-N14 D10-D50 D10-D51 10mm-40mm 6.0-40.0mm Length: 6m-22m
Wire rod	TCVN 1651-1	Diameter: D5.5-D20
Deformed Steel Bar in Coil	CNS 560 A2006 JIS G3112 ASTM A615 ASTM A706 GB1499-2 KS D3504 BS 4449 AS/NZS 4671	Diameter: D6-D20

UN CPC code: 4121 Products of iron and steel

Geographical scope: Global

The products are produced in Vietnam and sold in various countries. The geographical scope of the production (module A1-A3) is Vietnam, whereas for transport to customers (module A4) and end-of-life (module C) generic data for global use or 'rest of world' (global without Europe) are applied.

4 LCA INFORMATION

TUNG HO GROUP THSVC CÔNG TY TNHH THÉP TUNG HO VIỆT NAM

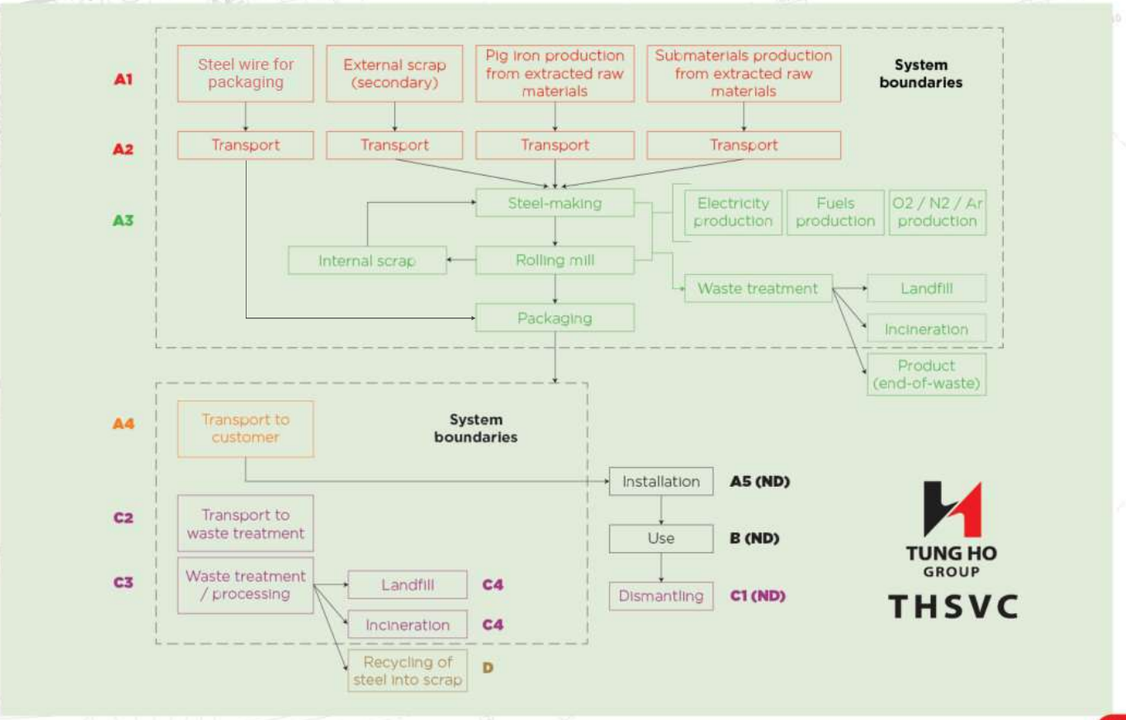
- **Declared unit**:
"1 (one) ton of Tung Ho Steel Vietnam Corporation steel product (deformed bar, wire rod and deformed bar in coil)"

- **Reference service life**: not applicable

- **Time representativeness**: Data for the production (module A3) cover the year 2021. Background data are not older than 10 years.

- **Database(s) and LCA software used**: Simapro 9 and EcoInvent 3.6

- **Description of system boundaries**:
b) Cradle to gate with options: modules A1 - A3, A4, C1 – C4 and module D.
Since the installation (module A5) and use (module B) depend on the application, which can vary, these modules are not considered.



DESCRIPTION OF MODULES

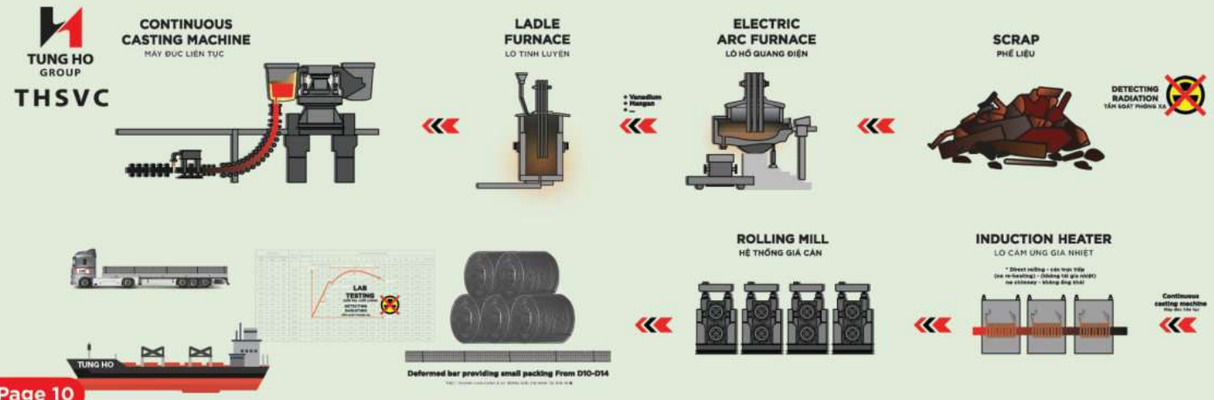
Module A1 + A2: Raw material supply and transport to factory

The main input material is steel scrap. THSVC buys scrap steel scrap from various external sources. This scrap is considered a secondary raw material free of environmental burden. Transport of all specific suppliers to Tung Ho in Vietnam are included.
Small amounts of pig iron are also used, modelled as primary production and with specific transport to Tung Ho.

Finally, a range of sub-materials is added as input of the EAF. These materials function as alloying compounds and as substances aiding the reaction processes. The total input of sub-materials over the reference year 2021 is included as well as the specific transport to factory.

Module A3: Manufacturing

The system diagram for Module A3 is shown below. THVSC's factory in Vietnam comprises a steel-making plant with capacity 1 000 000 ton per year, and a subsequent rolling mill plant with capacity 600 000 ton per year (https://www.thsvc.com.vn/Productionprocess#gsc.tab=0). THSVC buys scrap and produces steel out of this by an electric arc furnace process. The output of the melting process is the input for the rolling mill. Products of THSVC are: billets (output of steel-making plant, input for the rolling), and the products from the rolling line: deformed bar, sections, wire rod en deformed bar in coil. Steel sections can also be produced but are not considered in this study. The products are packed with wire rod before being transported to the customer.
The production process and steps are the same for each of the products. Full year input / output data are collected and allocated to the products per ton of steel produced. No by-products are produced. All inputs and outputs are allocated to the steel products. Internal scrap waste is recycled and considered to be in closed loop in module A3.



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Module C End-of-life

At the end-of-life the steel is demolished as part of a building product. A generic demolition process for stony building materials, including reinforced concrete, is used in module C1. Since construction steel is recycled all over the world, an end-of-life scenario is chosen in which 95% of the steel is recycled as scrap. Transport to a sorting site over 100 km (module C2) and sorting and pressing to prepare for recycling (module C3) are included. The remaining 5% losses and inefficiencies are assumed to be landfilled (C4).

Module D Recycling

In Module D, the net flow to recycling is taken into account for loads and benefits of the steel scrap recycling into new steel.

→ Whereas Modules A1-A3 represent the actual processes, the Modules A4, C and D represent **scenarios. The scenarios included are currently in use and are representative for one of the most probable alternatives.**

Module A4 Transport to customer

In A4, transport to site, bulk transport applies. The default EcoInvent process Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U, is used.
Since transport differs to various customers, a fictive transport distance of 100 km is applied. The results can be linearly scaled for specific transport distances (e.g. 200 km is twice the values for 100 km).

MORE INFORMATION

• More information on THSVC can be obtained at: https://www.thsvc.com.vn/Profile#gsc.tab=0

.• For more information about the LCA the LCA practitioner can be contacted via nl.intron@sgs.com .

CUT-OFFS

No specific assumptions were made in this LCA, nor are cut-offs applied. The material and energy data are based on full year figures and complete. No data gaps were identified.

A1 - **A3** Production cradle-to-gate

The purchased electricity used in the manufacturing process accounts for 43.7% of the GWP-GHG results of modules A1 - A3. The energy source of this electricity is the Vietnamese grid mix as included in the EcoInvent database (GWP-GHG 0.133 CO2-eq/MJ = 0.278 CO2-eq/kWh). The climate impact GWP-GHG indicator in A1-A3 is 1.01E03.

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**	**D5**
Modules declared	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x		x
Geography	global	global	global	global									global	global	global	global	global
Specific data used	Manufacturing data (A3) and transport distance to production (A2) are specific. Other data generic.			generic									generic	generic	generic	generic	generic
Variation – products	< 10%																
Variation – sites	Not applicable																

5 CONTENT INFORMATION

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Steel	1 ton	90,2	0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Steel wire rod	1,26 per ton	0,01	0

The products are made of usual construction steel and do not contain Substances of Very High Concern in amounts greater than 1%.

6 RESULTS OF THE ENVIRONMENTAL PERFORMANCE INDICATORS

Results per declared unit 1 t steel product

Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	1,01E+03	1,35E+01	3,52E+00	9,60E01	5,50E+01	5,68E-01	-1,36E+02
GWP-fossil	kg CO_2 eq.	1,01E+03	1,35E+01	3,50E+00	9,59E01	5,84E+01	5,67E-01	-1,38E+02
GWP-biogenic	kg CO_2 eq.	-1,14E+00	6,23E-03	2,03E-02	4,43E04	-3,46E+00	1,12E -03	1,44E+00
GWP-luluc	kg CO_2 eq.	4,84E01	4,95E03	6,66E-04	3,51E-04	6,46E02	1,58E-04	1,02E-01
ODP	kg CFC 11 eq.	4,67E05	2,98E06	4,54E-07	2,12E-07	7,11E -06	2,33E-07	-3,37E-06
AP	molH$^+$ eq.	7,72E+00	7,83E-02	2,20E-02	5,56E-03	6,46E01	5,38E-03	-5,32E-01
EP-freshwater	kg P eq.	3,78E-02	1,36E-04	1,09E-04	9,68E06	3,34E03	6,35E-06	-4,87E-03
EP-marine	kg N eq.	1,44E+00	2,76E-02	8,75E-03	1,96E-03	1,43E-01	1,85E-03	-9,88E-02
EP-terrestrial	mol N eq.	1,60E+01	3,04E-01	9,71E-02	2,16E-02	1,65E+00	2,04E-02	-1,15E+00
POCP	kg NMVOC eq.	4,66E+00	8,68E-02	2,64E02	6,17E-03	4,52E01	5,93E-03	-7,84E-01
ADP-minerals & metals*	kg Sb eq.	2,87E-03	3,42E-04	9,88E06	2,43E05	2,87E03	5,19E-06	-9,32E-05
ADP-fossil*	MJ	1,11E+04	2,04E+02	4,70E+01	1,45E+01	7,17E+02	1,58E+01	-9,64E+02
WDP*	m^3	1,43E+02	7,28E-01	2,13E-01	5,18E-02	7,64E+00	7,10E-01	-2,63E+01
Acronyms	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							

Additional mandatory and voluntary impact category indicators

Results per declared unit 1 t steel product								
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG[1]	kg CO_2 eq.	1,01E+03	1,35E+01	3,50E+00	9,59E-01	5,84E+01	5,67E-01	-1,38E+02
PM	disease inc.	1,63E-04	1,21E -06	4,84E07	8,61E-08	8,31E-06	1,04E-07	-7,98E-06
IRP*	kBq U235 eq	1,83E+01	8,53E-01	1,49E-01	6,06E-02	2,62E+00	6,50E02	2,36E+00
ETP-fw**	CTUe	1,51E+04	1,81E+02	3,81E+01	1,29E+01	3,22E+03	1,03E+01	-4,63E+03
HTP-c**	CTUh	1,05E-06	5,89E09	9,05E10	4,19E-10	7,80E08	2,38E-10	-1,77E -08
HTP-nc**	CTUh	1,10E -05	1,98E-07	2,56E-08	1,41E -08	3,55E-06	7,31E -09	2,67E-05
SQP**	Pt	2,06E+03	1,77E+02	7,85E+00	1,25E+01	1,40E+03	3,32E+01	-2,13E+02
Acronyms	PM = Particulate matter, IRP = Ionising radiation, ETP-fw = Ecotoxicity, freshwater, HTP-c = Human toxicity, cancer, HTP-nc = Human toxicity, non-cancer, SQP = Land use							

** Disclaimer: 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*

*** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator Disclaimers shall be added, if required by EN 15804*

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 CO_2 is set to zero.

Resource use indicators

Results per declared unit 1 t steel product								
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	1,95E+03	2,55E+00	2,68E+00	1,81E -01	9,90E+01	1,28E-01	2,80E+01
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	1,95E+03	2,55E+00	2,68E+00	1,81E -01	9,90E+01	1,28E-01	2,80E+01
PENRE	MJ	1,19E+04	2,16E+02	5,02E+01	1,54E+01	7,63E+02	1,68E+01	-1,00E+03
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	1,19E+04	2,16E+02	5,02E+01	1,54E+01	7,63E+02	1,68E+01	-1,00E+03
SM	kg	2,17E+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	4,20E+00	2,48E- 02	1,57E-02	1,76E-03	2,72E-01	1,69E-02	-4,99E-01
Acronyms	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							

Waste indicators

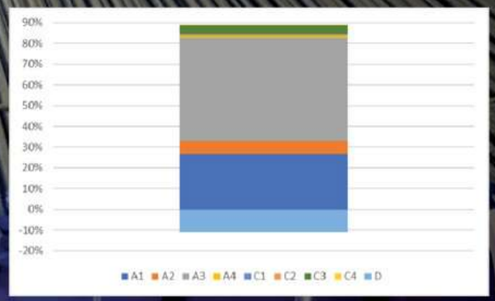
Results per declared unit 1 t steel product								
Indicator	Unit	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,42E-02	5,16E-04	8,19E-05	3,67E-05	2,12E-03	2,37E-05	-1,65E-02
Non-hazardous waste disposed	kg	9,27E+01	1,29E+01	6,56E+00	9,18E-01	2,21E+01	1,08E+02	-1,35E+01
Radioactive waste disposed	kg	1,96E-02	1,34E-03	2,11E -04	9,50E05	3,35E-03	1,04E-04	8,16E-04

Output flow indicators

Results per declared unit 1 t steel product								
Indicator	Unit	A1-A3	A4	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	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,05E+03	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

Interpretation and contribution analysis

The Figure below shows the contribution of the various Modules to the GWP-total:



Modules A1 and A3 contribute most.

7 REFERENCES

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PCR 2019:14. Construction products. V1.2.5 EPD International 2022-11-01, valid until 2024-12-20

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EPD owner:

THSVC
CÔNG TY TNHH THÉP TUNG HO VIỆT NAM

www.thsvc.com.vn/Profile#gsc.tab=0

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THE INTERNATIONAL EPD® SYSTEM

The International EPD®
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supported by the Secretariat