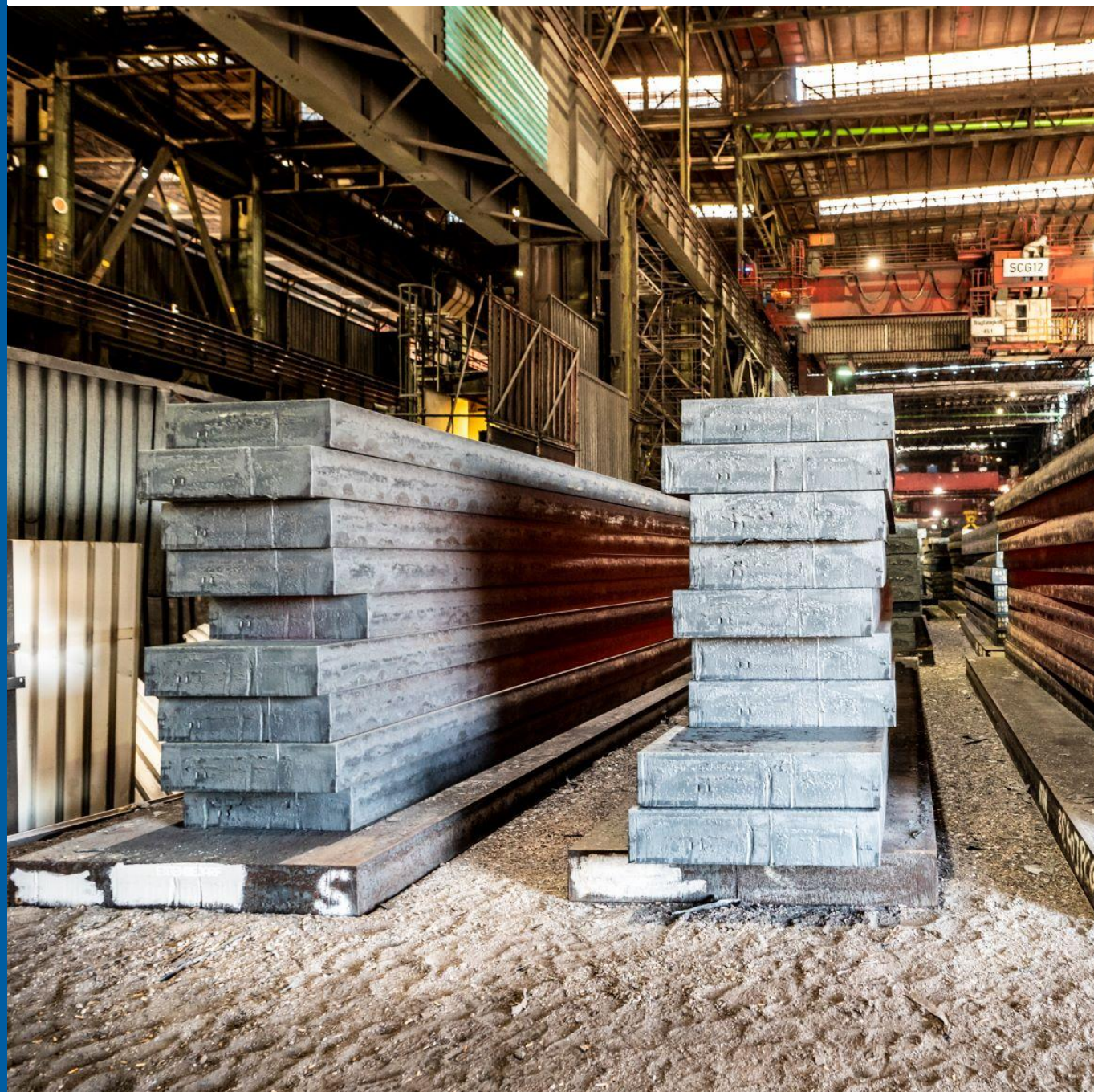
Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804+A2:2019

Crude Steel



Registration number:	EPD-Kiwa-EE-211782-EN
Issue date:	08-07-2025
Valid until:	08-07-2030
Declaration owner:	Hüttenwerke Krupp Mannesmann GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Crude Steel

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-211782-EN

1.3 VALIDITY

Issue date: 08-07-2025

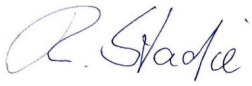
Valid until: 08-07-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: Hüttenwerke Krupp Mannesmann GmbH

Address: Ehinger Straße 200, 47259 Duisburg, Germany

E-mail: marten.sprecher@hkm.de

Website: https://www.hkm.de

Production location: Duisburg

Address production location: Ehinger Straße 299, 47259 Duisburg, Germany

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Gaurav Das

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, SOP EE 1203_R. 2.0 (27.02.2025)

Kiwa-Ecobility Experts, General Programme Instructions “Product Level” – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930, SOP EE 1203_R. 2.0 (27.02.2025)

1 General information

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2:2019. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2:2019 and ISO 14025.

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.6

Characterization method: R<THINK characterization method (see references for more details)

LCA database profiles: ecoinvent (for version see references)

Version database: v3.19 (20250306)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Crude Steel' with the calculation identifier ReTHiNK-111782.

2 Product

2.1 PRODUCT DESCRIPTION

Hüttenwerke Krupp Mannesmann GmbH (HKM), based in Duisburg, is an integrated steel company that produces pig iron and crude steel using the blast furnace–converter process. The company is part of a joint venture and primarily supplies its shareholders with high-quality semi-finished steel products in the form of slabs.

The product to be declared is unalloyed and low-alloy crude steel in slab form ("Crude Steel Slabs"), which serves as a preliminary material for further rolling and forming processes in downstream production.

The Environmental Product Declaration refers to a representative average of the crude steel produced in Duisburg and takes into account various input materials (scrap, alloying elements), which may vary slightly depending on the composition of each batch.

2.2 REFERENCE SERVICE LIFE

RSL PRODUCT

The RSL is filled in because the R<THINK system requires it. The RSL is not relevant for this study. It was added only for technical reasons and does not affect the results.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.3 TECHNICAL DATA

Product Form	Continuous cast slab
Intended Use and Steel Grades	Steel grades according to national and international standards: · **Sheet and tinplate steels:** St 2 – St 15, Dual-phase *Standards: DIN 1623, EN 10130, EN 10111, EN 10268, EN 10346* · **Steels for line pipes:** St E 210.7 – St E 480, API 5L, API 5LS, API 5LX *Standards: DIN 17172, EN 10208-2* · **General structural steels:** R St 34-1 – St 52-3 *Standards: DIN 17100, EN 10025-2* · **Microalloyed steels:** St E 210.7 – St E 480.7 *Standards: DIN 17172, DIN 17102, EN 10149-2, EN 10208-2* · **Unalloyed and alloyed boiler plate steels:** H 1 – 10CrMo910 *Standards: DIN 17155, EN 10028-2, EN 10216-2* · **Shipbuilding steels:** Grade A – E 36 *Standards: EN 10225* · **Case-hardened and quenched & tempered steels:** C 10 – D 95 *Standards: DIN 17200, EN 10084, EN ISO 683-2*
Typical Mechanical Properties (varying by customer requirements)	Density: approx. 7,8 g/cm³ Unit weight: max. 40 t
Chemical Composition (typical, in mass-%)	C: 0.06–0.15 Mn: 0.60–1.50 Si: <0.50 P, S: each <0.025 Cr, Ni, Mo, Cu: up to approx. 0.30 depending on customer requirements Total weight of alloying elements per ton of slab: 18.45 kg Scrap content: 16.8%
Slab Dimensions	Length: max. 12 m Width: 800 to 2100 mm Thickness: 260 mm

2.4 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any (or less than 1%) of the substances from the “Candidate List of Substances of Very High Concern for Authorization” (SVHC).

2 Product

2.5 DESCRIPTION PRODUCTION PROCESS

The slabs are produced at HKM via a classic integrated steelmaking route, which includes all essential process steps—from coke and sinter production to pig iron generation and steel refinement. The process steps are as follows:

Coke Plant: Production of blast furnace coke from imported coking coal. By-products such as coke oven gas, tar, sulfur, and benzene are either reused internally or utilized externally.

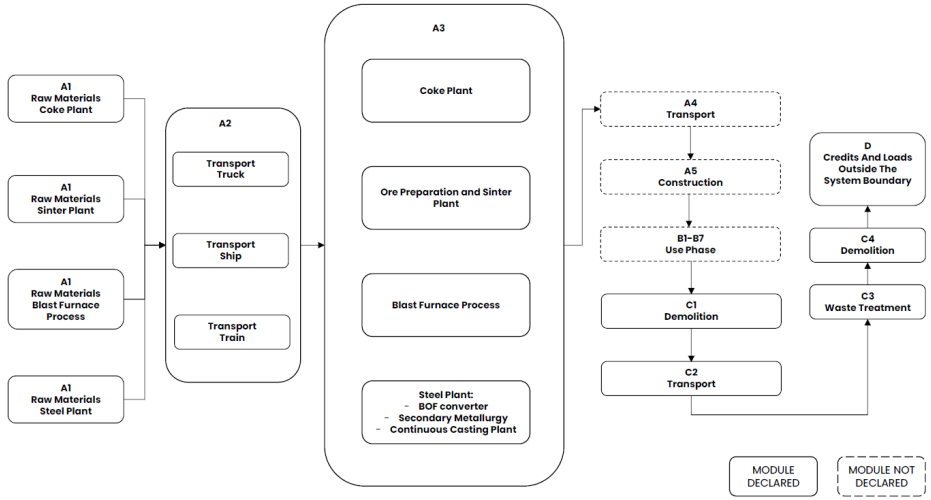
Ore Preparation and Sinter Plant: Fine ores, additives, and dusts are processed into sinter, which serves as feedstock for the blast furnace.

Blast Furnace Process: Iron ore (lump ore, sinter, pellets), coke, and additives are reduced and melted in the blast furnace to produce molten pig iron. This process also generates blast furnace slag, which is processed into granulated slag, and blast furnace gas.

Steel Plant

- **BOF Converter:** The molten pig iron is refined in the converter by adding scrap and using the oxygen blowing process.
- **Secondary Metallurgy**: In ladle furnaces and vacuum systems, the chemical composition is fine-tuned through alloying and temperature control.
- **Continuous Casting Plant**: The liquid steel is cast into slabs, cooled, stacked, and prepared for further processing.

All facilities are located at the Duisburg plant site, forming a fully integrated process chain. Additionally, process gases are utilized for energy generation in an in-house power plant. Other infrastructure units such as the PCI system (pulverized coal injection: grinding, drying, and injection) and internal transport systems are included within the system boundaries of the life cycle assessment model.



3 Calculation rules

3.1 DECLARED UNIT

1 tonne (t)

1 tonne of slab (alloyed raw steel), for a representative average of alloying elements

Reference unit: ton (ton)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	ton
Weight per reference unit	1000.000	kg
Conversion factor to 1 kg	0.001000	ton

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN 15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD is representative for Crude Steel, a product of HKM. The results of this EPD are representative for Germany.

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

3 Calculation rules

The following processes are excluded:

- Manufacturing of equipment used in production, buildings or any other capital asset
- Transportation of personnel to the plant
- The transportation of personnel within the plant
- Research and development activities
- Long-term emissions

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

3.6 ALLOCATION

In this study, economic allocation was applied in accordance with the ECO Platform regulation Version 1.1 published in June 2024. The functional unit is 1 tonne of crude steel produced via the Basic Oxygen Furnace (BOF) route. The steel production system generates various co-products in addition to crude steel, including blast furnace slag, LD slag, granulated slag, tar, benzene, and sulfur.

To reflect the real production process, all inputs were modeled based on actual mass and energy requirements, without scaling or excluding co-product-related inputs. Based on economic allocation calculations, 97.49% of the environmental impacts are assigned to crude steel, while 2.51% are allocated to the co-products.

3.7 DATA COLLECTION & REFERENCE PERIOD

All primary data were collected during the accounting period (01.01.2023 – 31.12.2023).

All secondary data were selected with a geographical reference to Germany whenever possible.

If datasets with a reference to Germany were not available, datasets were chosen based on the following geographical scope, in descending order: Europe, Global.

3.8 ESTIMATES AND ASSUMPTIONS

The production-relevant facilities include what is known as the "Glocke" — a system consisting of the coking plant, sinter plant, blast furnace, and steelworks — as well as a coal grinding and drying unit (KMT plant) used to prepare and inject coal into the blast furnace. The actual steel production takes place within this integrated system. Between the four main units, process gases and intermediate products are exchanged internally. As some material flows are not tracked with unit-level precision and certain exchanges are not fully quantifiable, the Glocke is treated as a single integrated system, or “black box,” in the LCA model. All input and output flows related to this system are recorded in detail by HKM and form the basis for this life cycle assessment.

Alloying inputs totaling 18.7 kg per tonne of crude steel were modeled using the generic dataset from ecoinvent 3.9.1. This represents a typical mix of alloying elements and results in approximately 89.7 kg CO_2e per tonne of steel.

For the waste scenario, the treatment of steel at the end of life was modeled based on typical industry practice. It was assumed that 95% of the steel is collected and recycled, while 5% is landfilled. The benefit of recycling is reflected in Module D, where the avoided burden of primary steel production is credited using the environmental profile of electric arc furnace (EAF) steel.

Transport processes were modeled using a weighted average approach based on annual purchasing data. Countries of origin for raw materials were analyzed, and the transport mix was calculated proportionally to the imported mass. The transport modes used in the model include barge tanker, rail freight, transoceanic freight ship, and lorry (truck), each represented by appropriate ecoinvent datasets. Pipeline transport is already included in the dataset for gas extraction.

The amount of production waste generated per functional unit (1,000 kg of crude steel) is 2.5 kg, which corresponds to 0.25% of the total output. Given the marginal quantity, this waste is considered negligible in terms of environmental impact. It was modeled using a burden-free waste scenario.

No specific data was available regarding the demolition or deconstruction phase of the final product application. Since the crude steel is a semi-finished product and its end use varies widely across sectors and structures, it is not possible to reasonably estimate processes, energy use, or emissions related to its removal at end of life.

3 Calculation rules

3.9 DATA QUALITY

The primary data represent iron and steel production in Germany.

The quality level of geographical representativity can be considered “good,” the quality level of technical representativity can be considered “good,” and the temporal representativity can also be considered “good.” Therefore, the overall data quality for this EPD can be classified as “good.”

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts, third party verifier shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

3.10 POWER MIX

The electricity used in the production process is generated on-site from process gases and natural gas. Since emissions from these fuels are directly included in the LCA model, electricity is not modeled as a separate input. As such, no standalone emission factor is assigned to electricity within the life cycle model. A calculated average emission factor of 0.35 kg CO_2e/kWh, based on internal fuel use and power generation, is documented in the background report for information purposes only.

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4.2 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
(ei3.9.1) waste not applicable or evaporated (empty scenario) (NMD ID 26)	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)	0	0	0	0	0
Waste Scenario HKM	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Waste Scenario HKM (without benefits)	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	(ei3.9.1) Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.3 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables.
First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
(ei3.9.1) waste not applicable or evaporated (empty scenario) (NMD ID 26)	NL	0	0	0	0	0

4 Scenarios and additional technical information

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
Waste Scenario HKM	DE	0	5	0	95	0
Waste Scenario HKM (without benefits)	DE	0	0	0	0	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Waste Scenario HKM	0.000	50.000	0.000	950.000	0.000
Total	**0.000**	**50.000**	**0.000**	**950.000**	**0.000**

4.4 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
(ei3.9.1) waste not applicable or evaporated (empty scenario) (NMD ID 26)	-164.640	0.000
Waste Scenario HKM	950.000	0.000
Waste Scenario HKM (without benefits)	0.000	0.000
Total	**785.360**	**0.000**

5 Results

For the impact assessment long-term emissions (>100 years) are not considered. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER TON

CORE ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	4.65E+2	2.47E+2	8.33E+2	1.55E+3	0.00E+0	7.82E+0	2.47E+1	3.04E-1	-2.90E+2
GWP-f	kg CO_2 eq.	4.65E+2	2.46E+2	8.33E+2	1.54E+3	0.00E+0	7.79E+0	2.46E+1	3.04E-1	-2.87E+2
GWP-b	kg CO_2 eq.	2.22E-1	7.44E-2	5.82E-1	8.78E-1	0.00E+0	2.54E-3	7.39E-2	1.33E-4	-1.94E+0
GWP-luluc	kg CO_2 eq.	2.09E-1	3.00E-1	2.52E-1	7.61E-1	0.00E+0	2.78E-2	3.61E-2	1.83E-4	-8.38E-1
ODP	kg CFC 11 eq.	5.51E-6	3.77E-6	3.90E-6	1.32E-5	0.00E+0	1.39E-7	3.91E-7	8.79E-9	-1.28E-6
AP	mol H+ eq.	2.37E+0	5.79E+0	5.63E-1	8.72E+0	0.00E+0	3.73E-2	2.76E-1	2.29E-3	-1.45E+0
EP-fw	kg P eq.	2.70E-2	1.60E-3	9.88E-3	3.85E-2	0.00E+0	7.75E-5	1.12E-3	2.96E-6	-1.85E-2
EP-m	kg N eq.	6.16E-1	1.38E+0	8.41E-2	2.08E+0	0.00E+0	1.42E-2	6.28E-2	8.74E-4	-2.94E-1
EP-T	mol N eq.	7.12E+0	1.53E+1	9.74E-1	2.34E+1	0.00E+0	1.51E-1	7.18E-1	9.42E-3	-3.33E+0
POCP	kg NMVOC eq.	2.30E+0	4.26E+0	3.59E-1	6.93E+0	0.00E+0	5.16E-2	2.15E-1	3.28E-3	-3.81E-1
ADP-mm	kg Sb-eq.	1.86E-3	3.29E-4	3.21E-4	2.51E-3	0.00E+0	2.44E-5	1.52E-3	4.22E-7	-2.71E-3
ADP-f	MJ	1.83E+4	3.05E+3	3.06E+3	2.44E+4	0.00E+0	1.12E+2	3.34E+2	7.57E+0	-5.84E+3
WDP	m3 world eq.	1.33E+1	9.72E+0	2.02E+2	2.25E+2	0.00E+0	6.09E-1	4.05E+0	3.34E-1	-2.22E+2

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PM	disease incidence	2.10E-5	8.29E-6	2.06E-6	3.14E-5	0.00E+0	7.69E-7	3.78E-6	5.01E-8	-3.87E-5
IR	kBq U235 eq.	4.18E+0	1.29E+0	2.05E+1	2.59E+1	0.00E+0	4.35E-2	8.88E-1	2.00E-3	-4.88E+1
ETP-fw	CTUe	5.23E+3	1.54E+3	4.19E+2	7.18E+3	0.00E+0	8.24E+1	2.62E+2	3.55E+0	2.50E+3
HTP-c	CTUh	3.72E-6	1.27E-7	2.24E-7	4.08E-6	0.00E+0	4.13E-9	3.76E-8	1.29E-10	-2.57E-5
HTP-nc	CTUh	2.32E-6	1.07E-6	9.15E-7	4.30E-6	0.00E+0	8.97E-8	1.69E-6	1.62E-9	-5.82E-5
SQP	Pt	2.42E+3	5.77E+2	3.88E+2	3.38E+3	0.00E+0	8.81E+1	5.93E+2	1.50E+1	-2.21E+3

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2

5 Results

ILCD classification	Indicator	Disclaimer
	Potential Soil quality index (SQP)	2

Disclaimer 1 – 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 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.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	3.41E+2	4.05E+1	4.40E+2	8.22E+2	0.00E+0	1.58E+0	5.18E+1	6.41E-2	-1.12E+3
PERM	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	3.41E+2	4.05E+1	4.40E+2	8.22E+2	0.00E+0	1.58E+0	5.18E+1	6.41E-2	-1.12E+3
PENRE	MJ	1.83E+4	3.05E+3	3.06E+3	2.44E+4	0.00E+0	1.12E+2	3.34E+2	7.57E+0	-5.78E+3
PENRM	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	1.83E+4	3.05E+3	3.06E+3	2.44E+4	0.00E+0	1.12E+2	3.34E+2	7.57E+0	-5.78E+3
SM	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-9.50E+2
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	9.99E-1	3.68E-1	5.93E+0	7.29E+0	0.00E+0	2.70E-2	1.66E-1	8.04E-3	-8.06E+0

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 resources | **SM**=Use of secondary material | **RSF**=Use of renewable secondary fuels | **NRSF**=Use of non-renewable secondary fuels | **FW**=Net use of fresh water

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	-1.36E+3	1.57E-2	-3.38E+0	-1.36E+3	0.00E+0	7.12E-4	1.85E-3	4.01E-5	1.14E-2
NHWD	Kg	1.99E+2	2.10E+1	1.16E+1	2.31E+2	0.00E+0	7.38E+0	1.01E+1	5.00E+1	-3.91E+2
RWD	Kg	2.87E-3	8.35E-4	1.64E-2	2.01E-2	0.00E+0	2.55E-5	6.76E-4	1.12E-6	-3.71E-2

HWD=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.50E+2	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy, Thermic | **EEE**=Exported Energy, Electric

5 Results

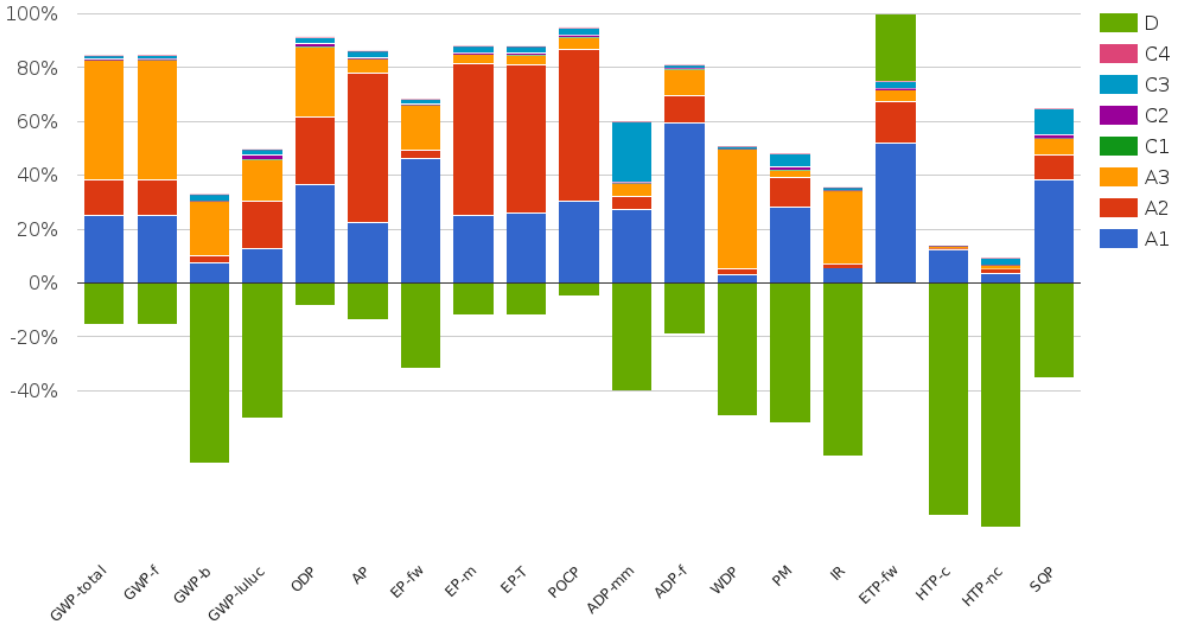
5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER TON

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per ton:

Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0	kg C

6 Interpretation of results



The environmental impacts associated with crude steel production are mainly caused by the life cycle stages A1 to A3. Among these, the manufacturing stage (A3) is the most impactful. It contributes 64.7% of the total global warming potential (GWP).

The raw material supply stage (A1) is the second most significant. It accounts for 36.1% of GWP. This includes processes such as the extraction and processing of iron ore, pellets, coke, alloying elements, and the use of scrap.

The transport stage (A2) also plays a notable role. It contributes 19.1% of GWP.

Other life cycle stages, including C1 (deconstruction), C2 (transport), C3 (waste processing), and C4 (disposal), have smaller contributions, together accounting for about 2.6% of GWP.

6 Interpretation of results

The end-of-life benefits and loads (stage D) result in a significant credit of -22.5%, reducing the overall environmental impact.

7 References

ISO 14040:2006-10 Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14044:2006

ISO 14025:2011-10 Environmental labels and declarations — Type III environmental declarations — Principles and procedures

DIN 1623-1:1985-02 Cold rolled strip and sheet for general engineering purposes — Technical delivery conditions

EN 10130:2006-03 Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions

EN 10111:2008-07 Hot rolled low carbon steel sheet for cold forming — Technical delivery conditions

EN 10268:2006-10 Cold rolled steel flat products with high yield strength for cold forming — Technical delivery conditions

EN 10346:2015-10 Continuously hot-dip coated steel flat products — Technical delivery conditions

DIN 17172:1986-12 Welded steel pipes for pipelines — Technical delivery conditions

EN 10208-2:2009-04 Steel pipes for pipelines for combustible fluids — Technical delivery conditions — Part 2: Pipes of requirement class B

DIN 17100:1980-07 Structural steels — Technical delivery conditions

EN 10025-2:2019-11 Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels

DIN 17102:1986-12 Weldable fine grain structural steels — Technical delivery conditions

EN 10149-2:2013-12 Hot rolled flat products made of high yield strength steels for cold forming — Part 2: Delivery conditions for thermomechanically rolled steels

DIN 17155:1983-10 Steels for pressure vessels — Technical delivery conditions

EN 10028-2:2017-10 Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties

EN 10216-2:2021-06 Seamless steel tubes for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties

7 References

EN 10225:2019-10 Weldable structural steels for fixed offshore structures — Technical delivery conditions

DIN 17200:1984-11 Steels for quenching and tempering — Technical delivery conditions

EN 10084:2008-08 Case hardening steels — Technical delivery conditions

EN ISO 683-2:2018-02 Heat-treatable steels, alloy steels and free-cutting steels — Part 2: Technical delivery conditions for unalloyed and alloyed steels for quenching and tempering

EN 15804+A2
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Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

Kiwa-EE GPI R.2.0
Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, SOP EE 1203_R. 2.0 (27.02.2025)

Kiwa-EE GPI R.2.0 Annex B1
Kiwa-Ecobility Experts, General Programme Instructions “Product Level” – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930, SOP EE 1203_R. 2.0 (27.02.2025)

ecoinvent
ecoinvent Version 3.9.1 (December 2022)

R<THINK characterization method
ecoinvent 3.9.1: EN 15804+A1 indicators (CML-IA Baseline v3.09), EN 15804+A2 indicators (EF 3.1)

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