Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections

Registration number:	EPD-Kiwa-EE-177997-en
Issue date:	13-09-2024
Valid until:	13-09-2029
Declaration owner:	LLC INDUSTRIAL STEEL GROUP
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-177997-en

1.3 VALIDITY

Issue date: 13-09-2024

Valid until: 13-09-2029

1.4 PROGRAMME OPERATOR

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1.5 OWNER OF THE DECLARATION

Manufacturer: LLC INDUSTRIAL STEEL GROUP

Address: Sucharskiego 49, 97-500 Radomsko, Poland

E-mail: office@isg-poland.com

Website: https://industrialsteelgroup.com/

Production location: LCC INDUSTRIAL STEEL GROUP

Address production location: Sucharskiego 49, 97-500 Radomsko, Poland

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 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Elisabeth Amat Guasch, Greenize

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 (Kiwa-EE) – PCR A General Product Category Rules (2022-02-14)

Kiwa-Ecobility Experts (Kiwa-EE) – PCR B Product Category Rules for steel construction products (2020-03-13, draft)

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. 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

1 General information

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 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

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

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

** 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 'Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections' with the calculation identifier ReTHiNK-77997.

2 Product

2.1 PRODUCT DESCRIPTION

Spiral-welded steel pipes and structural hollow sections produced by Industrial Steel Group are crafted using state-of-the-art technologies and adhere to the highest industry standards. Spiral welded steel pipes and structural hollow sections are the same products, only their exact name differs, which is determined by their application (for pressure or construction) and the relevant production standard. Each product undergoes rigorous quality control measures to ensure durability and performance.

Spiral-welded steel pipes and structural hollow sections are characterized by a higher level of strength compared to longitudinal-welded pipes and hollow sections. They are manufactured by the cold rolling method, allowing the production of pipes / hollow sections with high uniformity of metal structure.

The production line features state-of-the-art machinery for manufacturing spiral pipes and structural hollow sections, including automated ultrasonic inspection of welded joints. It is equipped to manufacture submerged arc-welded spiral pipes and hollow sections, offering a wide range of diameters from 323.9 to 2235 mm, wall thickness from 6.3 to 25 mm, and lengths from 4 to 30 m.

The spiral seam ensures uniform distribution of stresses throughout the circumference of the pipe / structural hollow section, making it more resistant to deformation and rupture. This makes spiral-welded steel pipes and structural hollow sections an ideal solution for use in infrastructure and industrial facilities where high strength and reliability are required.

This is a single EPD (average composition has been used for the LCA model). The composition of the reference product is reported in the table below.

Raw material	Unit	Value
Steel *	%	99.0
Welding wire	%	1.0

Note: * Steel material is non-alloyed and low-alloyed steel, hot-rolled (EAF routed steel 38% and BOF routed steel 62%). This composition refers to the reference period of data collection.

UN CPC Code: 41287 Other tubes and pipes of circular cross-section, welded, of steel

Production standards:

The company manufactures SAWH steel pipes and welded steel structural hollow sections in compliance with ISO, EN and other regulations. The pipe production is certified by several internationally approved bodies.

Product certifications according to: Regulation 305/2011/EU, Directive 2014/68/EU, ISO 3183, AD 2000, API 5L, EN 10217-1, EN 10217-2, EN 10217-3, EN 10217-5, EN 10217-6, EN 10219.

Management system certifications according to: ISO 9001, ISO 14001, ISO 50001.

Quality Control/ Assurance:

Through each phase of production, starting from acceptance quality control of raw materials until the delivery of the products to the Clients, ISG Quality Department thoroughly tests, inspects and verifies the compliance of products in accordance with the standards as well as project specific technical requirements.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections are used in various industries, such as:

- Oil and gas industry (oil and gas transportation)
- Construction (water supply, drainage, heating, sewerage)
- Industry (transportation of hazardous and toxic materials, production of chemicals)

2 Product

- Shoreline reinforcement and landslide prevention (preventing soil erosion, strengthening the coastline and protecting areas from the negative effects of water bodies)
- Agriculture (irrigation, water supply)

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The generic life cycle of the products can be considered as 100 years. The RSL of the construction limits the lifetime of spiral-welded steel pipes and structural hollow sections. It should be noted that Use stage with modules B1-B5 is not declared.

USED RSL (YR) IN THIS LCA CALCULATION:

100

2.4 TECHNICAL DATA

Dimensions of pipes and structural hollow sections and technical data:

Characteristic, unit	Value
Diameter (outside) [mm]	323.9 – 2235.0
Wall thickness [mm]	up to 25
Length [m]	4 - 30
Strength [MPa]	up to 485 (X70)

Main steel grades of pipes and structural hollow sections production:

Steel grades
S235JRH S275J0H S275J2H S355J0H S355J2H S420ML S460NH
P235GH P265GH P275NL1 P275NL2
P355N P355NL1 P355NL2 P460N P460NH P460NL1 P460NL2 L245M (CrBM)
L290M (X42M) L320M (X46M) L360M (X52M) L415(X60) L450(X65) L485(X70)

Similar grades of steel may be used in production.

Spiral-welded steel pipes and structural hollow sections are produced in the following sizes:

Outside diameter	Wall thickness	Outside diameter	Wall thickness	Outside diameter	Wall thickness
329.9	6.3 - 12.5	711.0	6.3 - 25.0	1219.0	6.3 - 25.0
355.6	6.3 - 12.5	813.0	6.3 - 25.0	1422.0	6.3 - 25.0
406.4	6.3 - 12.5	914.0	6.3 - 25.0	1626.0	6.3 - 25.0
457.0	6.3 - 12.5	1016.0	6.3 - 25.0	1829.0	7.1 - 25.0
508.0	6.3 - 16.0	1067.0	6.3 - 25.0	2032.0	8.0 - 25.0
610.0	6.3 - 25.0	1118.0	6.3 - 25.0	2235.0	8.8 - 25.0

2.5 SUBSTANCES OF VERY HIGH CONCERN

The products do not contain “Candidate List of Substances of Very High Concern (SVHC)” compounds.

2.6 DESCRIPTION PRODUCTION PROCESS

The production of spiral-welded steel pipes and structural hollow sections comprises the following process steps:

- Raw material inspection
- Uncoiling
- Rough leveling
- End cutting and butt welding
- Precision leveling
- Delivering
- Forming by inner and outer welding
- Welding slag cleaning and overall inspection (visual, ultrasound)
- Hydrostatic testing (if required by the standard)
- Length measuring and weighing
- Final inspection and marking
- Storage

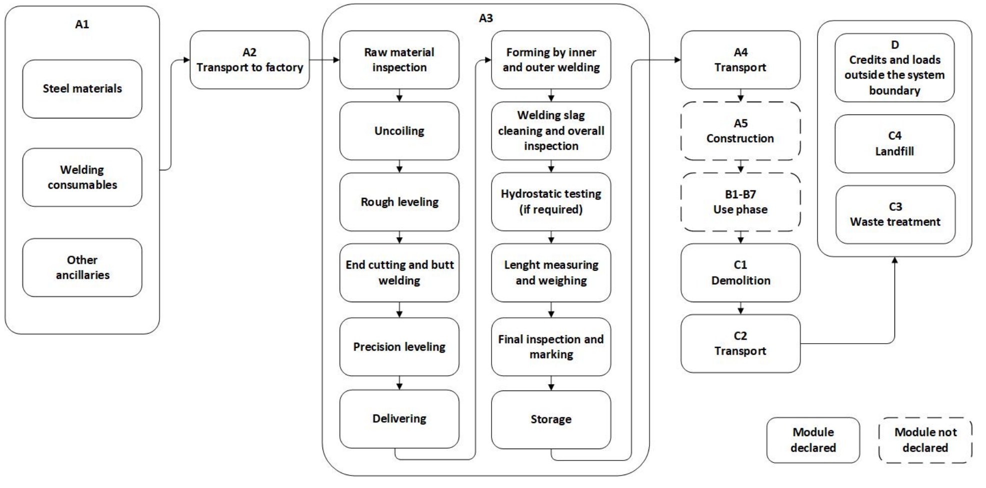
Spiral-welded steel pipes and structural hollow sections production comprises meticulous processes that ensures quality and reliability. The production process involves welding

2 Product

seams using electric arc welding, and undergoing rigorous non-destructive testing, including ultrasound (UV) and X-ray inspection (RT), if required.

The company has more than 2,000 tons of coil steel stocked for ongoing orders. The stock is of different thicknesses and grades, which allows to fulfill any pipe / structural hollow section production order in the shortest possible time.

The production process is presented in the flow diagram below.



3 Calculation rules

3.1 DECLARED UNIT

1 metric ton of spiral-welded steel pipes and steel structural hollow sections

The EPD refers to the declared unit of one metric ton of Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections produced by LCC Industrial Steel Group.

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 options 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	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN15804 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 Submerged Arc Helical Welded (SAWH) Steel Pipes and Welded Steel Structural Hollow Sections, products of LCC Industrial Steel Group. The results of this EPD are representative for Poland.

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

Construction process stage (A4)

Transportation to the construction site is considered in this LCA.

Construction process stage (A5)

The installation process excluded as ISG is not responsible for this process.

Use stage (B1-B3)

The Use stage was excluded from the assessment, as it does not contribute to the environmental impacts and overall performance evaluation of the product throughout its life cycle.

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.

Based on EN 15804+A4, the end-of-life system boundary of the product system is set, where outputs of the system under study, have reached the end-of-waste state. Thus, waste processing of the materials flows during any module of the product system (e.g. the production stage, end-of-life stage) are included up to the system boundary of the respective module. A product reaches its end-of-waste state when there is a market for the recovered product and when the recovered product fulfils the technical requirements for the specific purposes and meets the legislation and standards applicable to the product. Therefore producers of waste bear the burden of the waste treatment, based on the “polluter pays” principle. Consumers of recycled products receive them burden-free.

In the Module D the net impacts and substitution effects were calculated as stated in Annex D of EN 15804+A2.

Due to the recycling potential of metals, the end-of-life product is mainly converted into recycled raw materials (Module D). Loads and benefits of recycling, re-use and exported energy are part of module D. The benefits are calculated based on the primary content and the primary equivalent.

3.6 ALLOCATION

There are no co-products in the raw material supply and manufacturing phase, so no allocation methods were used at this stage (for co-products). Appropriation or attribution of inputs and outputs, e.g. auxiliary materials, energy (utilities), waste have been done on the basis of production volumes. The Life Cycle Assessment was modelled with the R<THiNK software from NIBE. The background data is taken from Ecoinvent version 3.6 (2019) Allocation, cut-off library. Almost all consistent datasets contained in the Ecoinvent database is documented and can be viewed in the online Ecoinvent documentation. Allocation principles in the background are in compliance with the foreground. Specific information on allocations within the background data can be found in the Ecoinvent database version 3.6 (2019) document.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data collection was conducted according to the EN ISO 14044:2006, Chapter 4.3.2. According to the goal definition, all significant input and output flows that belong to the examined product are identified and quantified. The input and output flows are attributed to the process stages where they occur, raw material supply (Module A1), transport to manufacturer (Module A2) and manufacturing (Module A3), the input and output flows could be clearly assigned.

Data on average product composition, production waste and energy consumption reflect the 12-month reference period (07.2023-06.2024).

3.8 ESTIMATES AND ASSUMPTIONS

All installed raw materials of the products are analysed, and the masses are determined following the allocation and cut-off requirements. Production-specific energy consumption were measured and provided by Industrial Steel Group. Supplier information regarding transport distances also are provided by Industrial Steel Group.

The production data is recorded to a high standard of accuracy and precision. Since the production process is similar for all of the products produced at the manufacturing site, the energy consumption, ancillary materials and production waste is attributed according to the 12-month period use of the declared unit based on the total 12-month period production at the factory.

No packaging materials are used for these products. For delivery of finished products only straps are used, which are reusable many times.

Modules A1 to A3: The production stage includes materials, energy and waste flows only related to the production processes (e.g. energy and water use related to company

3 Calculation rules

management and sales activities are excluded where technically possible; production, manufacture, and construction of manufacturing capital goods and infrastructure, other processes which are not directly related to the production of steel structures). Water for hydrostatic testing is reused.

Suppliers and origin manufacturers of steel materials (non-alloy and low-alloy steel, hot-rolled) declare that 18% to 54.9% of scrap metal is used in steelmaking processes. This information was considered in the calculations. For welding wire there is no precise information on secondary content, thus secondary content come from the documentation of the background processes.

A4: Transport scenario is provided by Industrial Steel Group - transportation to a construction site located in Riga, Latvia. No product losses are assumed as it is secured properly.

Module A5: excluded.

Modules B2 to B7: excluded.

Modules C1 to C4, D: As the products are marketed internationally, no country-specific waste scenario was considered. Therefore, the waste scenarios of NMD (2022) were adopted.

Module C1: This module concerns the deconstruction of steel pipes / structural hollow sections. It is assumed that the demolition process consumes energy in the form of diesel fuel used by building machines. The energy use for demolition is based on a general value provided in the IVL report NR U 5176 (Erlandsson & Petersson 2015). In this study, a general value of 10kWh/ton is given for the demolition of a steel structure.

It is assumed that 100% of the steel pipes / structural hollow sections at the end of the service life, during the demolition phase, are collected as separate construction waste.

Modules C2 to C4 and D: It is assumed that steel pipes/ structural hollow sections are separated after demolition. A waste scenario according to the Dutch National Environmental Database (NMD) is applied:

- Steel, construction profiles: 94% of steel material is recycled, 5% reused and 1% landfilled.

All of end-of-life product is assumed to be sent to the closest facilities (C2).

The data on generated production waste is also recorded separately for each waste flow as accurately as possible. Thus, the generated production waste is stated per declared unit.

In general, the inputs and outputs were attributed to the process in which they occur. That means:

- Environmental impacts caused by manufacturing or production waste (transport, incineration, waste processing, landfill and benefits through material and energy recovery) are assigned to module A3.
- Environmental impacts caused in the end-of-life stage are assigned to module C2 (transport), C3 (waste processing), C4 (disposal) and D (benefits through material and energy recovery).

3.9 DATA QUALITY

All relevant process data was collected in the operational data survey. The data relating to the production stage of the product was determined by Industrial Steel Group and refers to the production site in Radomsko, Poland. Data for processes beyond the manufacturer's control were assigned generic data (since suppliers' EPDs were not available or not developed according to EN 15804:A2).

To ensure the comparability of the results, only consistent background data from the Ecoinvent database V3.6, released in 2019, was used in the LCA (e.g. data records on energy, transport, auxiliary and operating materials).

The database is regularly checked and thus complies with the requirements of ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804. The quantities of raw materials, consumables and supplies used as well as the energy consumption have been recorded and averaged over the entire year of manufacturing operation.

The cut-off on the background is according to the background processes documentation (information on cut-off within the background data can be found in the Ecoinvent database version 3.6 (2019) document).

The general rule has been that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

Overall, the data quality can be described as good for all three representativeness categories (geographical, technical and time). Data quality was calculated using the Data Quality level and criteria according to the PEF approach (Annex E.2 of EN 15804+A2). The DQRs range from 1,67 to 2,67 for the most abundant inputs in terms of mass.

3 Calculation rules

3.10 POWER MIX

No Guarantees of Origin are included, residual national electricity grid mix (Poland) is used.

The residual mix of the country is calculated based on the domestic residual mix. The domestic residual mix represents the sum of all domestic electricity production considering imports and export outside the calculation area and issued and expired attributes. The shares have been calculated based on statistics from AIB (2022) following the methodology of grexel (2020).

Source: Ecoinvent v.3.9.1 database.

4 Scenarios and additional technical information

4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD.

	Value and unit
Vehicle type used for transport	Lorry (Truck) >32t, EURO6 | market for (EU)
Fuel type and consumption of vehicle	not available
Distance	850 km
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.2 DE-CONSTRUCTION, DEMOLITION (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
Diesel, burned in machine (incl. emissions)	1.009	l

4.3 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]
Steel, construction profiles (NMD: ID 70)	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	Lorry (Truck), unspecified (default) | market group for (GLO)

4 Scenarios and additional technical information

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

4.4 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 [%]
Steel, construction profiles (NMD: ID 70)	EU	0	1	0	94	5

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Steel, construction profiles (NMD: ID 70)	0.000	10.000	0.000	940.000	50.000
Total	**0.000**	**10.000**	**0.000**	**940.000**	**50.000**

4.5 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]
Steel, construction profiles (NMD: ID 70)	501.114	0.000
Total	**501.114**	**0.000**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. 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 EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
AP	mol H+ eqv.	7.16E+0	2.78E-1	1.23E+0	8.67E+0	2.38E-1	3.46E-2	3.76E-2	5.73E-1	5.00E-4	-2.83E+0
GWP-total	kg CO2 eqv.	1.65E+3	6.02E+1	1.80E+2	1.89E+3	7.41E+1	3.31E+0	6.48E+0	5.55E+1	5.28E-2	-7.15E+2
GWP-b	kg CO2 eqv.	1.17E+0	1.25E-1	1.95E+0	3.24E+0	5.61E-2	9.20E-4	2.99E-3	5.98E-2	1.04E-4	7.33E+0
GWP-f	kg CO2 eqv.	1.65E+3	6.01E+1	1.78E+2	1.89E+3	7.40E+1	3.31E+0	6.48E+0	5.55E+1	5.27E-2	-7.23E+2
GWP-luluc	kg CO2 eqv.	7.95E-1	3.65E-2	5.85E-2	8.90E-1	2.26E-2	2.61E-4	2.37E-3	7.73E-3	1.47E-5	4.92E-1
EP-m	kg N eqv.	1.40E+0	7.91E-2	1.63E-1	1.64E+0	5.22E-2	1.53E-2	1.32E-2	2.50E-1	1.72E-4	-5.22E-1
EP-fw	kg P eqv.	7.99E-2	1.10E-3	1.08E-2	9.18E-2	5.89E-4	1.20E-5	6.53E-5	3.57E-4	5.90E-7	-2.60E-2
EP-T	mol N eqv.	1.55E+1	8.80E-1	1.85E+0	1.82E+1	5.82E-1	1.68E-1	1.46E-1	2.75E+0	1.90E-3	-6.10E+0
ODP	kg CFC 11 eqv.	1.07E-4	1.20E-5	3.77E-6	1.23E-4	1.82E-5	7.14E-7	1.43E-6	1.18E-5	2.17E-8	-1.86E-5
POCP	kg NMVOC eqv.	7.87E+0	2.70E-1	5.55E-1	8.70E+0	2.29E-1	4.61E-2	4.17E-2	7.55E-1	5.51E-4	-4.09E+0
ADP-f	MJ	1.94E+4	8.99E+2	2.14E+3	2.24E+4	1.20E+3	4.55E+1	9.77E+1	7.74E+2	1.47E+0	-5.18E+3
ADP-mm	kg Sb-eqv.	1.00E-2	1.30E-3	8.29E-4	1.22E-2	1.32E-3	5.07E-6	1.64E-4	9.41E-5	4.82E-7	-4.70E-4
WDP	m3 world eqv.	7.56E+2	4.15E+0	4.04E+1	8.01E+2	3.90E+0	6.10E-2	3.50E-1	1.34E+0	6.60E-2	-1.33E+2

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
ETP-fw	CTUe	4.40E+4	8.04E+2	7.86E+2	4.56E+4	9.57E+2	2.74E+1	8.71E+1	4.70E+2	9.55E-1	-2.41E+4
PM	disease incidence	1.38E-4	4.09E-6	4.48E-6	1.47E-4	6.50E-6	9.17E-7	5.83E-7	1.50E-5	9.72E-9	-4.31E-5
HTP-c	CTUh	1.07E-5	3.39E-8	3.15E-7	1.10E-5	2.32E-8	9.59E-10	2.83E-9	1.64E-8	2.21E-11	-3.28E-7
HTP-nc	CTUh	1.65E-4	8.70E-7	9.99E-6	1.75E-4	1.05E-6	2.36E-8	9.53E-8	4.04E-7	6.79E-10	1.32E-4
IR	kBq U235 eqv.	5.50E+1	4.24E+0	2.86E+0	6.21E+1	5.26E+0	1.95E-1	4.09E-1	3.45E+0	6.04E-3	1.11E+1
SQP	Pt	5.03E+3	6.18E+2	4.82E+2	6.13E+3	1.38E+3	5.81E+0	8.47E+1	1.16E+2	3.09E+0	-1.14E+3

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (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

5 Results

ILCD classification	Indicator	Disclaimer
	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
	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	A4	C1	C2	C3	C4	D
PERE	MJ	1.15E+3	3.17E+1	1.25E+2	1.31E+3	1.51E+1	2.46E-1	1.22E+0	9.86E+0	1.19E-2	1.29E+2
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	0.00E+0
PERT	MJ	1.15E+3	3.17E+1	1.25E+2	1.31E+3	1.51E+1	2.46E-1	1.22E+0	9.86E+0	1.19E-2	1.29E+2
PENRE	MJ	2.06E+4	9.53E+2	2.26E+3	2.38E+4	1.28E+3	4.83E+1	1.04E+2	8.21E+2	1.56E+0	-5.39E+3
PENRM	MJ	0.00E+0	0.00E+0	1.41E+0	1.41E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	2.06E+4	9.53E+2	2.26E+3	2.38E+4	1.28E+3	4.83E+1	1.04E+2	8.21E+2	1.56E+0	-5.39E+3
SM	Kg	4.89E+2	0.00E+0	1.22E+1	5.01E+2	0.00E+0	0.00E+0	0.00E+0	9.40E+2	0.00E+0	0.00E+0
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	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	0.00E+0
FW	M3	2.09E+1	1.92E-1	6.50E+0	2.76E+1	1.37E-1	2.34E-3	1.19E-2	6.41E-2	1.57E-3	-2.54E+0

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **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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OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	Kg	1.17E-1	2.70E-3	2.62E-3	1.23E-1	2.92E-3	1.24E-4	2.48E-4	2.04E-3	2.20E-6	-8.59E-2
NHWD	Kg	3.42E+2	3.40E+1	2.00E+1	3.96E+2	1.05E+2	5.39E-2	6.20E+0	9.90E-1	1.00E+1	-6.82E+1
RWD	Kg	5.37E-2	5.93E-3	2.37E-3	6.20E-2	8.21E-3	3.16E-4	6.42E-4	5.37E-3	9.67E-6	3.43E-3

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	A4	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	5.00E+1	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	2.46E+1	2.46E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	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	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	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	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

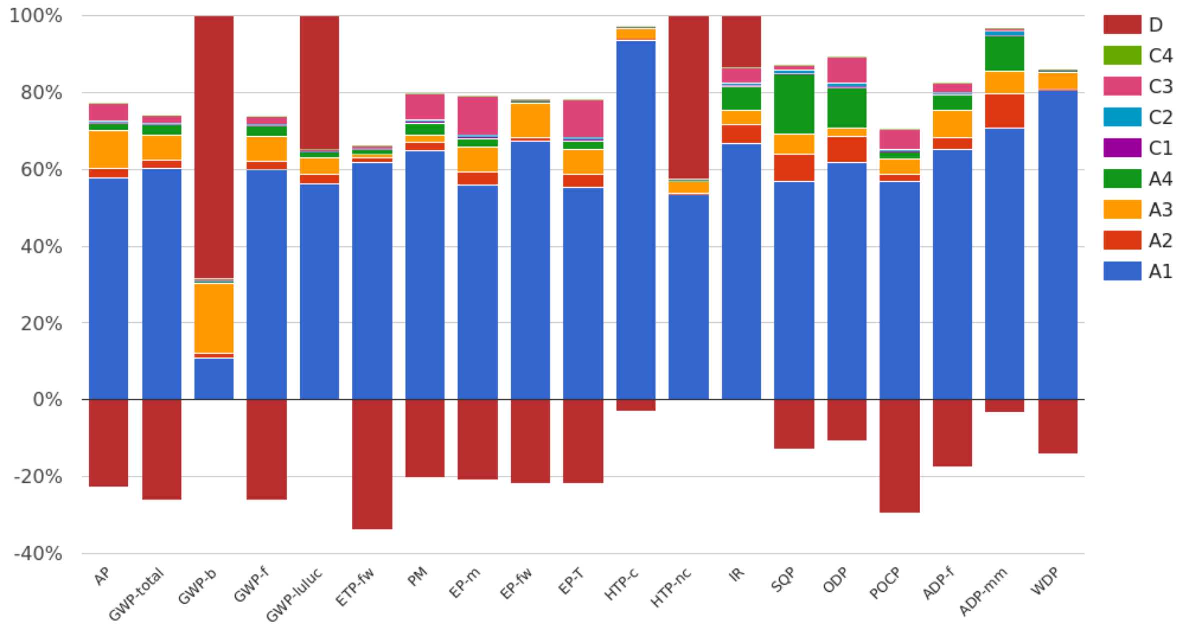
5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER TON

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



Indicators of impact assessment by impact category

The graph illustrates the impact of various factors on the x-axis, representing different indicator factors, while the legends denote the modules on the y-axis. Module A, specifically A1 (Raw Materials) and A3 (Production Phase), stands out as the primary contributor, highlighting the substantial influence of raw materials and energy use / other ancillaries in the calculations. Module D, focusing on product recycling and reuse, also holds significant impact. Potential credits come mainly from the material recovery of steel materials.

Energy-intensive steel production A1 (Raw Materials) is a major contributor to environmental impacts, over which the manufacturer has limited influence. This data serves as a roadmap for manufacturing process enhancement and building of sustainable

6 Interpretation of results

product life cycle emphasizing the importance of optimizing raw material use, efficient energy and other ancillary material utilization.

7 References

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ISO 14044
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ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A2
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7 References

ISO 21930
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