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

reinforcing stabilized three and seven-wire strands with and without dents with a nominal tensile strength of 1670÷1860 N /mm2 with a diameter of 6.5÷15.7 mm (PC-strand) .

Registration number:	EPD-Kiwa-EE-162692-EN
Issue date:	21-12-2023
Valid until:	21-12-2028
Declaration owner:	PJSC "STALKANAT"
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

reinforcing stabilized three and seven-wire strands with and without dents with a nominal tensile strength of 1670÷1860 N /mm2 with a diameter of 6.5÷15.7 mm (PC-strand) .

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-162692-EN

1.3 VALIDITY

Issue date: 21-12-2023

Valid until: 21-12-2028

1.4 PROGRAM OPERATOR

Kiwa-Ecobility Experts
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Frank Huppertz

(Head of Kiwa-Ecobility Experts)

Prof. Dr. Frank Heimbecher

(Chairman of the independent expert committee - Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: PJSC "STALKANAT"

Address: str. Vodoprovidna 16,, 65007 Odesa, UA

E-mail: gremecheva_sb@stalkanat.com.ua

Website: https://stalkanat.com.ua/

Production location: PJSC " Stalkanat"

Address production location: Vapnyana St, 52A, 65006 Odessa, UA

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

Anne Kees Jeeninga, Advieslab

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

PCR A
PCR A – General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1 (2022)

PCR B
Kiwa-Ecobility Experts, Berlin, 2020: PCR B – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)

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. 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 EPDs programs 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: v3.15 (2023-07-12)

** 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 'reinforcing stabilized three and seven-wire strands with and without dents with a nominal tensile strength of 1670÷1860 N /mm2 with a diameter of 6.5÷15.7 mm (PC-strand) .' with the calculation identifier ReTHiNK-62692.

2 Product

2.1 PRODUCT DESCRIPTION

This EPD applies to steel reinforcing stabilized three and seven-wire strands with or without dents with a nominal tensile strength of 1670÷1860 N/mm2 with the diameter of 6.5÷15.7 mm, produced by PJSC "STALKANAT".

The investigated product - PC-strand reinforcing strands is a twisted product of three or seven wires twisted together around a common axis. After laying on a cable machine, the strands are subjected to thermomechanical treatment (heating and stretching) to stabilize the mechanical properties.

Reinforcing strands are mainly used for the manufacture of precast concrete elements, hollow core slabs, beams, TT slabs or railway sleepers, as well as in post-tensioned structures such as bridges, viaducts or silos. For transportation and storage, the strands are wound into coils with in-line (precision) laying of the following sizes:

- outer diameter of the coil - no more than 1600 mm;

- inner diameter of the coil - 750 mm, 800 mm, 900 mm;

- bay width - 750 mm, 630 mm.

- weight (1 - 4) tons.

All reinforcing strands can be made from both smooth wire and dented wire. The standard tensile strength is 1860 MPa, but other strengths are available. Three-wire strands are twisted from wire of the same diameter. In seven-wire strands, the diameter of the center wire is at least 3% larger than that of the outer spiral wire. The standard geometric and mechanical properties of each bundle of strands are tested and verified in our own laboratory as well as in independent accredited laboratories in accordance with EN ISO 15630-3. They are also constantly monitored by the relevant certification bodies, ensuring full compliance with product standards.

The strands are wound into coils, which are tied with a metal tape 0.8x32 mm in 8 places evenly spaced around the skein.

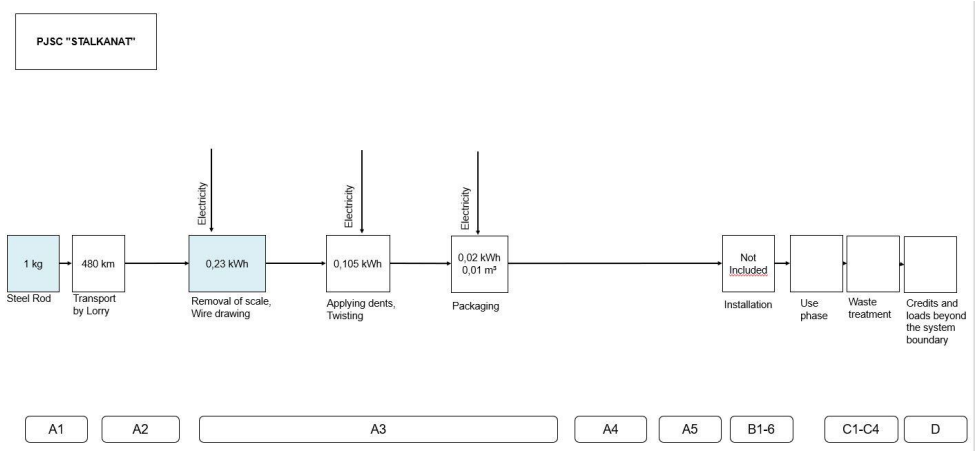
The strands are packed in polypropylene fabric. Packaging should protect the strand from mechanical damage and corrosion during transportation and storage.

After packing, the skein of strands is tied to wooden bars with a steel strap for easy transportation.

In standard environmental conditions, steel strands represent a stable product, devoid of any fire or explosion risks. However, it's crucial to note that polypropylene packaging fabric and wooden blocks, employed for stowage in vehicles during transportation to consumers, are susceptible to ignition in the presence of open flames. To mitigate this risk, it is imperative to exercise precautions. Specifically, during the storage and transportation phases, ensure a considerable distance from potential sources of ignition.

Product type according to REACH No. 1907/2006 – construction product. It is not classified as a hazardous substance. Conditions for safe storage, including any incompatibilities: Avoid moisture, acids and other factors that may corrode the metal. When warehousing and storing, keep the original packaging.

Information on toxicological effects: The product has no toxicological effects.



2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Reinforcing strands are mainly used for the manufacture of precast concrete elements, hollow core slabs, beams, TT slabs or railway sleepers, as well as in post-tensioned structures such as bridges, viaducts or silos. For transportation and storage, the strands are wound into coils with in-line (precision) laying of the following sizes:

- outer diameter of the coil - no more than 1600 mm;

- inner diameter of the coil - 750 mm, 800 mm, 900 mm;

- bay width - 750 mm, 630 mm.

- weight (1 ÷ 4) tons.

2 Product

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

Since the service life of wire strands is not considered, there is no need to specify a reference service life. The generic life cycle of product can be considered as 100 years for any calculations basics.

USED RSL (YR) IN THIS LCA CALCULATION:

100

2.4 TECHNICAL DATA

In particular, the manufacturer declares the following information about the technical characteristics of the product:

Tensile modulus

195 GPa ± 10% (strand)

Elongation ≥ 3.5% at L ≥ 500 mm

Low relaxation ≤ 2.5% after 1,000 hours of stress with a load of 70% of the breaking force.

A nominal tensile strength of 1670÷1860 N/mm2 with the diameter of D=4,85÷15,7 mm.

PJSC «Stalkanat» produces strands for the European Union according to the following standards: FprEN 10138-1,3:2009, prEN 10138 –1,3:2006, prEN 10138-1,3:2011, SFS 1265-1,3:2014, SS 212551:2013, SS 212553:2013, AT 001SC-01/314-2023, GOST 13840-68, BS 5896:2012, ÖNORM B 4758:2014, NMÉ: A-16/2018, NMÉ: A-27/2019, NEN 3868:2001, SI 1735, Part 4, ITB-KOT-2018/0637, NEN 3868:2001.

2.5 DESCRIPTION PRODUCTION PROCESS

The rebar plant receives the components necessary for the production of products: wire rod (Carbon steel reinforcing bars (“rebar”) (according to the product standards listed in the references section of this EPD) that are manufactured via the blast furnace/basic oxygen furnace route (BF/BOF), followed by hot rolling.) used as raw material and auxiliary products that are used at each stage of the process.

The production process consists of the following production steps:

- **Removal of scale mechanically.** Hot rolled products have a layer of iron oxides on their surface, which must be removed before drawing. This process is carried out on a surface preparation line installed in front of the drawing bench. The wire rod passes through the steel rollers, bends on them, the scale falls off the surface of the wire rod. After removing the scale in the rollers, the surface of the wire rod is treated with rotating steel brushes to remove any remaining scale. Then the wire rod is washed with water, coated with products (phosphate + borax) that promote lubrication at the next stage of wire drawing. Before drawing, the wire rod is dried with hot air.

- **Wire drawing.** In cold drawing, the wire rod is passed through several consecutive drawing dies installed on the drawing bench, which leads to a decrease in the cross section and a change in physical characteristics. To facilitate passage through the dies, powdered soaps are used to reduce the friction of the wire in the dies. When the wire rod passes through successive dies, the cross section is reduced to a given size, the material is also strengthened and the surface of the wire is smooth.

- **Applying dents.** To improve adhesion to concrete, the wire is passed through pinch rollers mounted on the drawing bench after the last die.

- **Twisting.** In this step, the wires are helically twisted into a strand in a rebar strand production line to form different types of strands.

- **Stabilization.** To eliminate the stresses in the wire that occur during the drawing process, the strands are thermomechanically treated under specified temperature conditions and tension, subsequently the strand is cooled with water at a controlled temperature, and finally air dried to prevent wetting and rusting of the strand.

- **Winding.** Reinforcing strands are wound into coils for shipment to the consumer.

- **Package.** Coils of strands are packed in polypropylene fabric.

3 Calculation rules

3.1 DECLARED UNIT

Kg

The declared functional unit is 1 kg. Other declared units are permissible if conversion to 1 kg is depicted in a transparent manner.

reference_unit: kilogram (kg)

3.2 CONVERSION FACTORS

Description	Value	Unit
reference_unit	1	kg
Conversion factor to 1 kg	1.000000	kg

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with modules C1-C4 and module D LCA. 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 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 reinforcing stabilized three and seven-wire strands with and without dents with a nominal tensile strength of 1670÷1860 N /mm2 with a diameter of 6.5÷15.7 mm (PC-strand) ., a product of PJSC "STALKANAT". The results of this EPD are representative for European Union.

3.5 CUT-OFF CRITERIA

Product Stage (A1-A3)

The production stage encompasses the transportation of raw materials, the conversion of these raw materials(steel Purchased from the steel supplier) into the end product. This phase accounts for the energy necessary for production, supplementary materials, packaging materials, and the associated emissions. It's important to note that certain processes, such as wire drawing, and emissions generated therein, are excluded from consideration, as their impact is minimal, constituting less than 1% of the overall steel impact. Therefore, the analysis primarily focuses on electricity consumption and input materials.

Construction process stage (A4-A5)

This stage consists the transport of the product from production plant to the construction site.

It also includes the loss of material during construction. The additional needed production, transport and end-of-life of the lost material during construction is included.

The end-of-life of packaging material up to the end-of-waste state or disposal of final residues is also included.

Use stage (B1-B3)

3 Calculation rules

This stage consists of the impacts arising from components of the building and construction works during their use.

The stage also covers the combination of all planned technical and associated administrative maintenance actions during the service life to maintain the product installed in a building, in a construction works or its parts in a state in which it can perform its required functional and technical performance, as well as preserve the aesthetic qualities of the product. This will include preventative and regular maintenance activities.

Product replacement (B4) and renovation (B5) only apply when the product is considered in a lifespan (of a building, work , etc.).

Operational water and energy use are not considered.

End of life stage (C1-C4)

When the end of the life stage of the building is reached, the de-construction/demolition begins. This EPD includes de-construction/demolition (C1), the necessary transport (C2) from the demolition site to the sorting location and distance to final disposal. The end of life stage includes the final disposal to landfill (C4), incineration (C3) and needed recycling processes up to the end-of-waste point (C3). Loads and benefits of recycling, re-use and exported energy are part of module D.

The prescribed waste scenarios from the NMD Determination method v1.1 have been used for the various materials in the product.

Benefits and Loads beyond the system boundary (Module D)

This stage contains the potential loads and benefits of recycling and re-use of raw materials/products. The loads contain the needed recycling processes from end-of-waste-point up to the point-of-equivalence of the substituted primary raw material and a load for secondary material that will be lost at the end-of-life stage.

The loads and benefits of recycling and reuse are included in this module. The benefits are calculated based on the primary content and the primary equivalent.

In addition, the benefits of energy recovery are granted at this stage. The amount of avoid energy is based on the Lower Heating Values of the materials and the efficiencies of the incinerators as mentioned in the NMD Determination method v1.0 or EcoInvent 3.6 (2019)

In accordance with the criteria of the reference standard, the system has been extended as far as possible to avoid attributing environmental impacts to by-products of multi-unit processes within the manufacturing process.

If necessary, distribution was applied to the inputs and outputs of the system based on physical properties (mass or volume).

There was no need to apply economic criteria.

3.6 ALLOCATION

Allocation were avoided

3.7 DATA COLLECTION & REFERENCE TIME PERIOD

01.01.2022-31.01.2023

3.8 ESTIMATES AND ASSUMPTIONS

The Purschase of Steel is generalized to 100% from Arcelor as mostly the steel is from Arcelor and sometimes (only in special cases of non-availability) it is purchased from other supplier and there is no fixed quantity for same hence, that can be neglected.

Electricity Mix is used according to the general low voltage electricty mix of Ukraine (local based approach).

3.9 DATA QUALITY

Data quality is as per the data shared by the client with the measured values.

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]
Steel, reinforcement (NMD ID 74)	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)
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 [%]
Steel, reinforcement (NMD ID 74)	NL	0	5	0	95	0

4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Steel, reinforcement (NMD ID 74)	0.000	0.050	0.000	0.950	0.000
Total	**0.000**	**0.050**	**0.000**	**0.950**	**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]
Steel, reinforcement (NMD ID 74)	0.950	0.000
Total	**0.950**	**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 KILOGRAM

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbreviation	Unit	A1	A2	A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	2.92E-3	1.92E-4	1.01E-3	0.00E+0	4.11E-5	0.00E+0	2.50E-6	-5.22E-3
GWP-total	kg CO2 eqv.	2.54E+0	2.27E-2	2.71E-1	0.00E+0	7.09E-3	0.00E+0	2.64E-4	-1.34E+0
GWP-b	kg CO2 eqv.	-3.12E-3	1.29E-4	2.83E-3	0.00E+0	3.27E-6	0.00E+0	5.22E-7	1.41E-2
GWP-f	kg CO2 eqv.	2.54E+0	2.25E-2	2.60E-1	0.00E+0	7.09E-3	0.00E+0	2.63E-4	-1.35E+0
GWP-luluc	kg CO2 eqv.	3.35E-4	2.67E-5	8.14E-3	0.00E+0	2.60E-6	0.00E+0	7.34E-8	9.99E-4
EP-m	kg N eqv.	6.15E-3	6.74E-5	3.53E-4	0.00E+0	1.45E-5	0.00E+0	8.60E-7	-9.68E-4
EP-fw	kg P eqv.	3.49E+0	9.51E-7	9.36E-2	0.00E+0	7.15E-8	0.00E+0	2.95E-9	-4.78E-5
EP-T	mol N eqv.	1.65E-3	7.47E-4	1.62E-3	0.00E+0	1.60E-4	0.00E+0	9.48E-6	-1.13E-2
ODP	kg CFC 11 eqv.	2.00E-15	3.08E-9	8.18E-9	0.00E+0	1.56E-9	0.00E+0	1.08E-10	-3.30E-8
POCP	kg NMVOC eqv.	1.28E-7	2.03E-4	3.35E-4	0.00E+0	4.56E-5	0.00E+0	2.75E-6	-7.69E-3
ADP-f	MJ	5.06E+0	3.31E-1	1.86E+0	0.00E+0	1.07E-1	0.00E+0	7.36E-3	-9.45E+0
ADP-mm	kg Sb-eqv.	2.60E+1	1.81E-7	6.97E-1	0.00E+0	1.80E-7	0.00E+0	2.41E-9	-9.14E-7
WDP	m3 world eqv.	2.78E-8	2.92E-3	6.38E-1	0.00E+0	3.82E-4	0.00E+0	3.30E-4	-2.58E-1

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 EN15084+A2

Abbreviation	Unit	A1	A2	A3	C1	C2	C3	C4	D
ETP-fw	CTUe	3.49E+0	3.54E-1	3.23E+0	0.00E+0	9.53E-2	0.00E+0	4.77E-3	-4.54E+1
PM	disease incidence	6.15E-3	1.68E-9	1.65E-4	0.00E+0	6.37E-10	0.00E+0	4.86E-11	-7.83E-8
HTP-c	CTUh	1.23E-10	2.16E-11	1.03E-9	0.00E+0	3.09E-12	0.00E+0	1.10E-13	-1.75E-10
HTP-nc	CTUh	1.12E-8	3.96E-10	1.28E-8	0.00E+0	1.04E-10	0.00E+0	3.39E-12	2.62E-7
IR	kBq U235 eqv.	5.22E-2	1.85E-3	1.62E-2	0.00E+0	4.48E-4	0.00E+0	3.02E-5	2.31E-2
SQP	Pt	1.64E+0	2.28E-1	8.33E-1	0.00E+0	9.27E-2	0.00E+0	1.54E-2	-2.09E+0

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	AAcidification 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

5 Results

ILCD classification	Indicator	Disclaimer
	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

Abbreviation	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	MJ	4.94E-1	2.85E-2	1.63E-1	0.00E+0	1.34E-3	0.00E+0	5.95E-5	2.75E-1
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
PERT	MJ	4.94E-1	2.85E-2	1.63E-1	0.00E+0	1.34E-3	0.00E+0	5.95E-5	2.75E-1
PENRE	MJ	2.60E+1	3.50E-1	2.44E+0	0.00E+0	1.13E-1	0.00E+0	7.82E-3	-9.81E+0
PENRM	MJ	0.00E+0	0.00E+0	5.66E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	2.60E+1	3.50E-1	2.50E+0	0.00E+0	1.13E-1	0.00E+0	7.82E-3	-9.81E+0
SM	Kg	1.67E-1	0.00E+0	5.16E-3	0.00E+0	0.00E+0	0.00E+0	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
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
FW	M3	1.19E-1	1.55E-4	1.84E-2	0.00E+0	1.30E-5	0.00E+0	7.86E-6	-4.89E-3

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

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbreviation	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	Kg	1.92E-9	6.42E-7	4.27E-6	0.00E+0	2.71E-7	0.00E+0	1.10E-8	-1.62E-4
NHWD	Kg	2.36E-1	4.46E-3	1.01E-1	0.00E+0	6.78E-3	0.00E+0	5.00E-2	-1.32E-1
RWD	Kg	6.56E-4	2.03E-6	3.01E-5	0.00E+0	7.02E-7	0.00E+0	4.83E-8	8.01E-6

HWD=hazardous waste disposed | **NHWD**=non hazardous waste disposed | **RWD**=radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbreviation	Unit	A1	A2	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
MFR	Kg	4.52E-4	0.00E+0	2.55E-2	0.00E+0	0.00E+0	9.50E-1	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
EET	MJ	0.00E+0	0.00E+0	1.40E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	8.12E-3	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

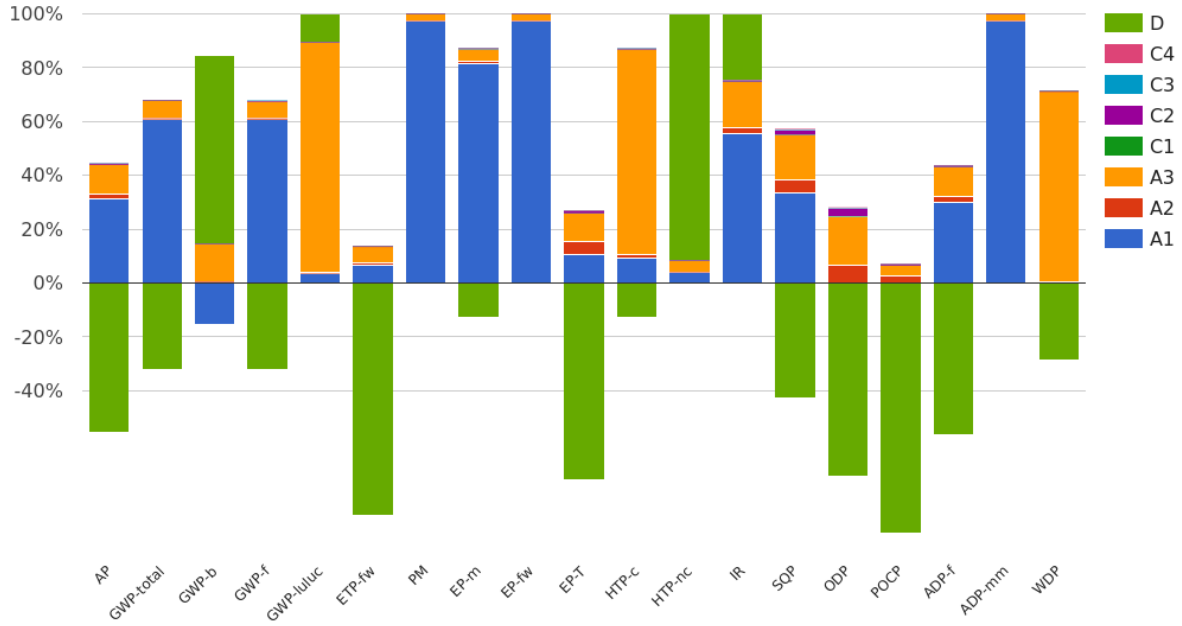
5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER KILOGRAM

BIOGENIC CARBON CONTENT

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

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 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. With A1 having the most impact and D having the most balancing impact. The main impact is from A1 as the main input is Raw material and there are some small processes happening which has not so much impact.

7 References

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

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

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

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

PCR A
PCR A – General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1 (2022)

PCR B
Kiwa-Ecobility Experts, Berlin, 2020: PCR B – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)

8 Contact information

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