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

SW-Ringprogramm

Registration number:	EPD-Kiwa-EE-157332-EN
Issue date:	17-05-2024
Valid until:	17-05-2029
Declaration owner:	SW Umwelttechnik
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

SW-Ringprogramm

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-157332-EN

1.3 VALIDITY

Issue date: 17-05-2024

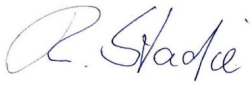
Valid until: 17-05-2029

1.4 PROGRAM 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: SW Umwelttechnik

Address: Bahnstraße 89, A 9021 Klagenfurt

E-mail: office@sw-umwelttechnik.com

Website: www.sw-umwelttechnik.com

Production location: SW Umwelttechnik Österreich GmbH, Klagenfurt

Address production location: Bahnstraße 87-89, 9021 Klagenfurt

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) – General Product Category Rules (PCR A) (Version 2.1, 2022-02-14)

EN 16757:2022-11-01: Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements

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:

1 General information

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: v3.16 (2024-02-12)

** 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 'SW-Ringprogramm' with the calculation identifier ReTHiNK-57332.

2 Product

2.1 PRODUCT DESCRIPTION

The product covered by this EPD is one ton of concrete manhole and represents the average production of concrete manhole rings, bottoms, cones and covers from the “SW-Ringprogramm”-system in 2022 at the production site in Klagenfurt. All inputs have been averaged weighted by the produced quantity of each individual product in the year 2022 at the production site in Klagenfurt. The product is manufactured with diameters from 60 to 300 cm and with a concrete compressive strength class of C30/37. The gross density of the product is 2411,691 kg/m³.

The list below provides an overview of all products covered by this EPD:

- SW-AUSGLEICHSRING 600/50MM
- SW-AUSGLEICHSRING 600/100MM
- SW-AUSGLEICHSRING 600/200MM
- SW-AUSGLEICHSRING 600/100MM OBEN FALZ
- SW-AUSGLEICHSRING 600/100MM UNTEN FALZ
- SW-RING 600/100MM
- SW-RING 600/200MM
- SW-RING 600/300MM
- SW-RING 600/300MM MAUL
- SW-RING 600/600MM
- SW-RING 600/600MM GELOCHT
- SW-RING 600/600MM BODEN
- SW-RING 600/600MM BODEN EIN/AUSLAUF
- SW-RING 800/100MM
- SW-RING 800/300MM
- SW-RING 800/300MM MAUL
- SW-RING 800/600MM
- SW-RING 800/600MM GELOCHT
- SW-RING 800/600MM BODEN
- SW-RING 800/700MM BODEN EIN/AUSLAUF
- SW-KONUS 800/600/300MM
- SW-RING 1000/300MM
- SW-RING 1000/300MM ALU-STEIGB
- SW-RING 1000/600MM
- SW-RING 1000/600MM ALU-STEIGB
- SW-RING 1000/600MM GELOCHT
- SW-RING 1000/600MM BODEN
- SW-KONUS 1000/600/600MM
- SW-KONUS 1000/600/600MM ALU-STEIGB
- SW-RING 1500/500MM
- SW-RING 1500/750MM
- SW-RING 1500/1000MM
- SW-RING 1500/500MM GELOCHT
- SW-RING 1500/1000MM GELOCHT
- SW-RING 1500/550MM BODEN
- SW-RING 1500/800MM BODEN
- SW-RING 1500/1050MM BODEN
- SW-KONUS 1500/600/600MM
- SW-RING 2000/500MM
- SW-RING 2000/750MM
- SW-RING 2000/1000MM
- SW-RING 2000/500MM GELOCHT
- SW-RING 2000/1000MM GELOCHT
- SW-RING 2000/550MM BODEN
- SW-RING 2000/800MM BODEN
- SW-RING 2000/1050MM BODEN
- SW-KONUS 2000/600/800MM
- SW-RING 2500/500MM
- SW-RING 2500/750MM
- SW-RING 2500/1000MM
- SW-RING 2500/500MM GELOCHT
- SW-RING 2500/750MM GELOCHT
- SW-RING 2500/1000MM GELOCHT
- SW-RING 2500/550MM BODEN
- SW-RING 2500/800MM BODEN
- SW-RING 2500/1050MM BODEN
- SW-KONUS 2500/600/1050MM
- SW-RING 3000/500MM
- SW-RING 3000/750MM
- SW-RING 3000/500MM GELOCHT
- SW-RING 3000/750MM GELOCHT
- SW-RING 3000/550MM BODEN
- SW-KONUS 3000/600/1300MM
- SW-RING 1500/500/150MM MUFFE DIN4034T1
- SW-RING 1500/750/150MM MUFFE DIN4034T1
- SW-RING 1500/1000/150MM MUFFE DIN4034T1
- SW-RING 1500/1000/150 BODEN MUFFE DIN403
- SW-RING 2000/500/150MM MUFFE DIN4034T1
- SW-RING 2000/750/150MM MUFFE DIN4034T1
- SW-RING 2000/1000/150MM MUFFE DIN4034T1
- SW-RING 2000/1000/150 BODEN MUFFE DIN403
- SW-DECKEL D6 680MM 15KN-K
- SW-DECKEL D6 680MM 30KN-K
- SW-DECKEL D6 680MM 15KN VENT

This EPD was created in accordance with EN 15804 and includes the production stage (A1-A3), transportation to the site (A4), construction (A5), the use stage (B1-B3), the end-of-life stage (C1-C4) and benefits and loads beyond the system boundary (D) (Cradle to gate with options, modules C1-C4 and module D). The declaration covers an average product produced at a single plant.

2 Product

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The product is intended to be used as a component of concrete entry manholes and inspection chambers. These ring-shaped precast concrete elements are stacked on top of each other to create a chamber, that can be accessed by a person. This chambers are used to inspect or maintain drainage and sewage systems.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

Following scenario 7 (parts for sewage and drainage systems) in annex F of EN 16757, the reference service life for the product covered by this EPD is assumed to be 100 years.

USED RSL (YR) IN THIS LCA CALCULATION:

100

RSL PARTS

Following scenario 7 (parts for sewage and drainage systems) in annex F of EN 16757, the reference service life for the product and its components covered by this EPD is assumed to be 100 years.

2.4 TECHNICAL DATA

Technical Data:

- Gross density: 2411,691 kg/m³ (Range: 2399,370 kg/m³-2464,768 kg/m³)
- Compressive strength: C30/37

Base materials:

- Cement: 14,6 m% (Range: 13,7 m%-16,6 m%)
- Aggregates: 78,7 m% (Range: 76,4 m%-80,0 m%)
- Water: 6,1 m% (Range: 5,6 m%-7,3 m%)
- Steel: 0,5 m% (Range: 0,0 m%-2,7 m%)
- Admixture: 0,1 m% (Range: 0,1 m%-0,2 m%)

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product contains no substances given by the REACH Candidate list of substances of very high concern.

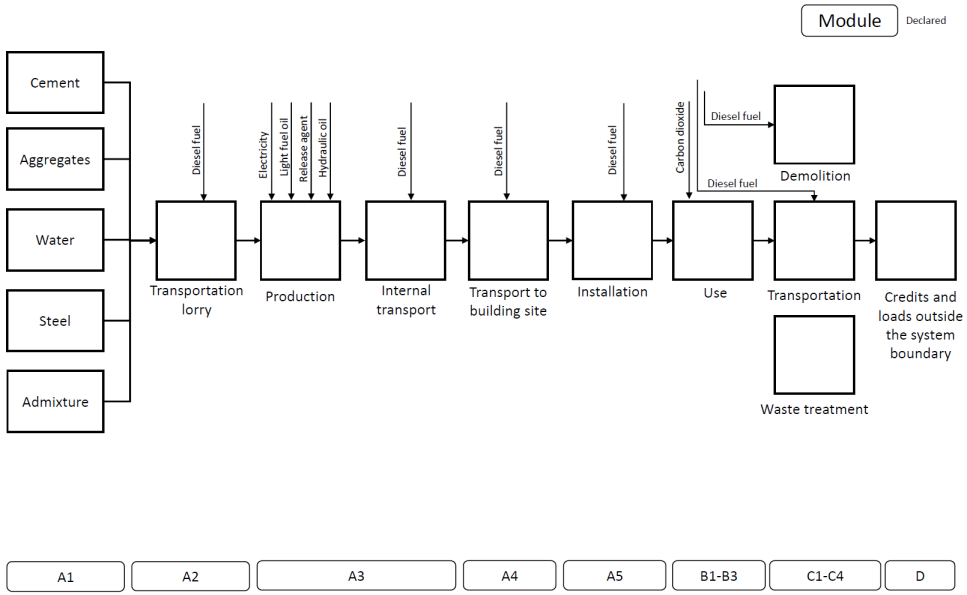
2.6 DESCRIPTION PRODUCTION PROCESS

The manufacturing includes the following processes:

- Delivery of raw and auxiliary materials
- Storage of raw and auxiliary materials
- Preparation of the production machine (attaching the mold and inserting the reinforcement)
- Preparation of the materials for mixing
- Preparation of the concrete mixer
- Concrete mixing
- Delivering the concrete to the production machine
- Filling the concrete into the machine
- Manufacturing and subsequent direct removal of each product from the mold
- Transport to the curing hall
- Curing
- Quality check and transport to storage
- Transport to the finishing area
- Finishing
- Transport to storage

The data on generated production waste is recorded as accurately as possible. The production waste consists of waste concrete. There is no production waste for scrap metal, because the reinforcement rings and brackets are delivered of the size used for the production. No packaging materials are used for this product.

2 Product



2.7 CONSTRUCTION DESCRIPTION

At the construction site the product is usually lifted and brought into position by a crane. No further material or equipment is needed to install the product on the construction site. Besides the diesel consumption for the crane no additional energy is consumed during construction. No waste is generated during the construction of the product since the product is delivered as ready-made product. The transportation to the construction site does not cause any losses as products are secured properly.

3 Calculation rules

3.1 FUNCTIONAL UNIT

Ton of concrete manhole parts

The EPD refers to the declared unit of one ton of concrete manhole chamber rings, bottoms, cones and covers produced by SW Umwelttechnik in Klagenfurt.

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 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	X	X	X	X	X	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 SW-Ringprogramm, a product of SW Umwelttechnik. The results of this EPD are representative for European Union.

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) that contribute to more than 1% of the total mass, energy or environmental impact of the system are considered in this LCA. The total neglected input flows do not exceed the limit of 5% of energy use and mass.

3 Calculation rules

The product stage includes materials, energy and waste flows only related to production processes. Energy, water and material use related to company management and sales activities are excluded where technically possible. Production and construction of manufacturing capital goods and infrastructure as well as other processes which are not directly related to the production are also excluded.

Construction process stage (A4-A5)

All input flows (e.g. transportation to the construction site, additional raw material use for construction, installation energy (use)of energy use for assembly , etc.) and output flows (e.g. construction waste, packaging waste, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass

Use stage (B1-B3)

All (known) input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. emissions to soil, air and water, construction waste, packaging waste, end-of-life waste, etc.) related to the building fabric are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

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

There are no allocations between co-products since there are no co-products created during the manufacturing.

3.7 DATA COLLECTION & REFERENCE TIME PERIOD

All process-specific data were collected for the operating year 2022. The quantities of raw and auxiliary materials as well as energy consumption have been recorded and averaged over the entire operating year 2022.

3.8 ESTIMATES AND ASSUMPTIONS

The energy consumption, ancillary materials and production waste is allocated according to the annual production of the declared unit to the total annual production at the factory.

No environmental impacts are associated with the use stage of the product. However, carbonation of concrete will occur during the lifetime of the product and is included in module B1. Carbonation is calculated using the approach suggested by EN 16757. Since the product is embedded in the ground during use stage, the carbonation of the outer surface is not being considered.

3.9 DATA QUALITY

The background data is taken from Ecoinvent database version 3.6 (2019). The life cycle assessment was modeled with the R<THiNK tool. Geographical reference space of the background data is Austria.

All relevant process-specific data have been collected. The data relating to the manufacturing phase of the SW-Ringprogramm are determined by SW Umwelttechnik and refers to the production site in Klagenfurt, Bahnstraße 87-93. The data relating to the construction phase are determined as well by SW Umwelttechnik and refers to an average construction process.

Secondary data were taken from the Ecoinvent 3.6 (2019) database. 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 operation.

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 can not influence or choose, were backed up with generic data. According to the criteria of the "UN Environmental Global Guidance on LCA database development" mentioned in EN 15804+A2, the data quality for all three representativeness categories (geographical, technical and time) can be described as good.

3 Calculation rules

Suitable EPDs for cement, plasticizers and air entrainers were integrated. The EPDs for plasticizers and air entrainers, referred to in this EPD, each decribe the results of an LCA for the product out of all covered products with the highest environmental impact (worst-case-scenario). Besides that it should be noted, that the additional environmental impact indicators, suggested by EN 15804, are not fully declared in the EPDs for plasticizers or air entrainers. Therefore, the additional environmental impact indicators, declared in this EPD, do not consider the complete impact of the plasticizers and air entrainers for some additional environmental impact categories.

3.10 GUARANTEES OF ORIGIN

The electricity mix was chosen according to the average renewable mix delivered to SW Umwelttechnik Österreich GmbH in the reference year 2022. The calculation of this electricity mix followed the market based approach. No CO2 certificates were counted.

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), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Distance	200 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 ASSEMBLY (A5)

The following information describes the scenarios for flows entering the system and flows leaving the system at module A5.

FLOWS ENTERING THE SYSTEM

For flows entering the system at A5 the following scenario is assumed for module A5.

	Value	Unit
Energy consumption for installation/assembly		
Diesel, burned in machine (incl. emissions)	0.8333	l

4.3 USE STAGE (B1)

Emissions to air/soil/water are applicable, the scenario accounted in module B1 is as follows in the table below.:

Description	Cycle (yr)	Number of cycles	Amount per cycle	Total Amount	Unit
Carbonation during use stage	100	1	-5125815.882	-5125815.882	mg

4.4 MAINTENANCE (B2)

For maintenance no input or output flows are modelled.

4 Scenarios and additional technical information

4.5 REPAIR (B3)

Repairs are not applicable within the functional unit and to achieve the reference service life.

4.6 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)	2.017	l

4.7 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]
Abfallszenario Beton Österreich (3% Deponierung; 97% Recycling)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
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 Scenarios and additional technical information

4.8 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 [%]
Abfallszenario Beton Österreich (3% Deponierung; 97% Recycling)	EU	0	3	0	97	0
Steel, reinforcement (NMD ID 74)	NL	0	5	0	95	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Abfallszenario Beton Österreich (3% Deponierung; 97% Recycling)	0.000	29.859	0.000	965.447	0.000
Steel, reinforcement (NMD ID 74)	0.000	0.235	0.000	4.460	0.000
Total	**0.000**	**30.094**	**0.000**	**969.906**	**0.000**

4.9 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]
Abfallszenario Beton Österreich (3% Deponierung; 97% Recycling)	965.427	0.000
Steel, reinforcement (NMD ID 74)	3.072	0.000
Total	**968.500**	**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	A5	B1	B2	B3	C1	C2	C3	C4	D
AP	mol H+ eqv.	1.87E-1	1.17E-2	4.15E-2	2.40E-1	1.57E-1	2.86E-2	0.00E+0	0.00E+0	0.00E+0	6.92E-2	4.03E-2	9.85E-3	1.50E-3	-1.01E-1
GWP-total	kg CO2 eqv.	8.50E+1	3.18E+0	1.03E+1	9.85E+1	2.70E+1	2.73E+0	-5.13E+0	0.00E+0	0.00E+0	6.62E+0	6.96E+0	1.58E+0	1.59E-1	-1.56E+1
GWP-b	kg CO2 eqv.	5.84E-2	2.24E-3	3.50E-1	4.11E-1	1.25E-2	7.60E-4	0.00E+0	0.00E+0	0.00E+0	1.84E-3	3.21E-3	9.09E-3	3.13E-4	2.20E-2
GWP-f	kg CO2 eqv.	8.50E+1	3.17E+0	9.93E+0	9.81E+1	2.70E+1	2.73E+0	-5.13E+0	0.00E+0	0.00E+0	6.61E+0	6.95E+0	1.57E+0	1.58E-1	-1.56E+1
GWP-luluc	kg CO2 eqv.	3.06E-2	1.00E-3	3.74E-3	3.53E-2	9.89E-3	2.15E-4	0.00E+0	0.00E+0	0.00E+0	5.21E-4	2.55E-3	2.99E-4	4.42E-5	-5.17E-3
EP-m	kg N eqv.	5.56E-2	2.99E-3	1.18E-2	7.04E-2	5.52E-2	1.26E-2	0.00E+0	0.00E+0	0.00E+0	3.05E-2	1.42E-2	3.92E-3	5.18E-4	-2.85E-2
EP-fw	kg P eqv.	1.66E-2	2.64E-5	8.31E-4	1.75E-2	2.72E-4	9.94E-6	0.00E+0	0.00E+0	0.00E+0	2.41E-5	7.01E-5	4.89E-5	1.78E-6	-4.00E-4
EP-T	mol N eqv.	6.75E-1	3.32E-2	1.47E-1	8.55E-1	6.08E-1	1.38E-1	0.00E+0	0.00E+0	0.00E+0	3.35E-1	1.57E-1	4.35E-2	5.72E-3	-3.22E-1
ODP	kg CFC 11 eqv.	1.77E-6	7.65E-7	1.42E-6	3.96E-6	5.96E-6	5.90E-7	0.00E+0	0.00E+0	0.00E+0	1.43E-6	1.53E-6	2.04E-7	6.53E-8	-1.98E-6
POCP		1.82E-1	1.17E-2	4.11E-2	2.35E-1	1.74E-1	3.81E-2	0.00E+0	0.00E+0	0.00E+0	9.21E-2	4.47E-2	1.19E-2	1.66E-3	-1.06E-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

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
	kg NMVOC eqv.														
ADP-f	MJ	3.96E+2	5.09E+1	1.04E+2	5.51E+2	4.07E+2	3.76E+1	0.00E+0	0.00E+0	0.00E+0	9.10E+1	1.05E+2	2.11E+1	4.43E+0	-1.85E+2
ADP-mm	kg Sb-eqv.	4.31E-4	6.07E-5	5.65E-5	5.48E-4	6.84E-4	4.19E-6	0.00E+0	0.00E+0	0.00E+0	1.01E-5	1.76E-4	4.43E-6	1.45E-6	-3.60E-4
WDP	m3 world eqv.	1.32E+1	1.68E-1	-1.85E+0	1.16E+1	1.46E+0	5.04E-2	0.00E+0	0.00E+0	0.00E+0	1.22E-1	3.75E-1	9.56E-2	1.99E-1	-5.94E+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)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15084+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ETP-fw	CTUe	3.70E+2	4.13E+1	1.06E+2	5.18E+2	3.63E+2	2.27E+1	0.00E+0	0.00E+0	0.00E+0	5.49E+1	9.35E+1	1.71E+1	2.87E+0	-3.32E+2
PM	disease incidence	2.30E-6	2.80E-7	6.24E-7	3.20E-6	2.43E-6	7.57E-7	0.00E+0	0.00E+0	0.00E+0	1.83E-6	6.25E-7	2.17E-7	2.93E-8	-1.38E-6
HTP-c	CTUh	6.22E-8	1.06E-9	2.06E-9	6.54E-8	1.18E-8	7.92E-10	0.00E+0	0.00E+0	0.00E+0	1.92E-9	3.03E-9	4.05E-10	6.65E-11	-9.02E-9
HTP-nc	CTUh	5.97E-7	4.53E-8	6.42E-8	7.06E-7	3.97E-7	1.95E-8	0.00E+0	0.00E+0	0.00E+0	4.71E-8	1.02E-7	1.15E-8	2.04E-9	6.63E-7
IR	kBq U235 eqv.	2.21E+0	2.21E-1	4.91E-1	2.92E+0	1.71E+0	1.61E-1	0.00E+0	0.00E+0	0.00E+0	3.90E-1	4.39E-1	6.69E-2	1.82E-2	-5.65E-1
SQP	Pt	9.22E+1	5.59E+1	1.79E+2	3.27E+2	3.53E+2	4.80E+0	0.00E+0	0.00E+0	0.00E+0	1.16E+1	9.09E+1	3.52E+0	9.29E+0	-1.46E+2

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)

5 Results

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
	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 Results

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	A5	B1	B2	B3	C1	C2	C3	C4	D
PERE	MJ	6.57E+1	6.40E-1	5.07E+1	1.17E+2	5.10E+0	2.03E-1	0.00E+0	0.00E+0	0.00E+0	4.92E-1	1.31E+0	1.20E+0	3.58E-2	-4.47E+0
PERM	MJ	1.14E-1	0.00E+0	4.93E-3	1.19E-1	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	6.58E+1	6.40E-1	5.07E+1	1.17E+2	5.10E+0	2.03E-1	0.00E+0	0.00E+0	0.00E+0	4.92E-1	1.31E+0	1.20E+0	3.58E-2	-4.47E+0
PENRE	MJ	4.01E+2	5.40E+1	1.02E+2	5.58E+2	4.32E+2	3.99E+1	0.00E+0	0.00E+0	0.00E+0	9.67E+1	1.11E+2	2.25E+1	4.71E+0	-1.96E+2
PENRM	MJ	3.15E+0	0.00E+0	7.27E+0	1.04E+1	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
PENRT	MJ	4.05E+2	5.40E+1	1.10E+2	5.68E+2	4.32E+2	3.99E+1	0.00E+0	0.00E+0	0.00E+0	9.67E+1	1.11E+2	2.25E+1	4.71E+0	-1.96E+2
SM	Kg	1.91E+1	0.00E+0	7.66E-1	1.99E+1	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
RSF	MJ	8.45E+1	0.00E+0	3.66E+0	8.81E+1	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	2.34E+2	0.00E+0	1.01E+1	2.44E+2	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	1.02E+0	5.86E-3	1.08E-3	1.03E+0	4.96E-2	1.94E-3	0.00E+0	0.00E+0	0.00E+0	4.69E-3	1.28E-2	7.05E-3	4.72E-3	-1.39E+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

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
HWD	Kg	8.78E-4	1.24E-4	2.37E-4	1.24E-3	1.03E-3	1.02E-4	0.00E+0	0.00E+0	0.00E+0	2.48E-4	2.66E-4	3.68E-5	6.62E-6	-1.31E-3
NHWD	Kg	2.89E+0	4.22E+0	1.93E+0	9.05E+0	2.58E+1	4.45E-2	0.00E+0	0.00E+0	0.00E+0	1.08E-1	6.65E+0	2.94E+0	3.01E+1	-5.93E+0
RWD	Kg	9.39E-4	3.45E-4	6.63E-4	1.95E-3	2.67E-3	2.61E-4	0.00E+0	0.00E+0	0.00E+0	6.32E-4	6.88E-4	9.47E-5	2.91E-5	-8.61E-4

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

5 Results

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	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	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	4.18E+1	4.18E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.70E+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	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	2.21E+0	2.21E+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	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	1.28E+0	1.28E+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	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

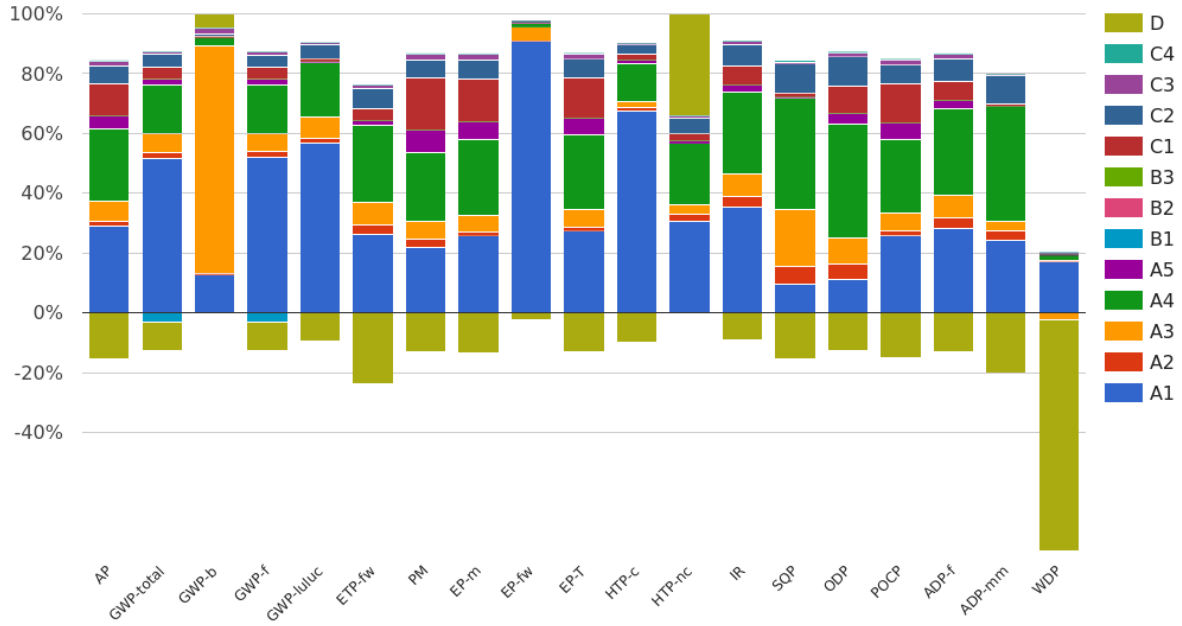
5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER TON

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 diagram shows the influence of the different life stages on the core environmental impact indicators for SW-Ringprogramm. It can be seen, that the majority of the Global Warming Potential (GWP-total) is attributed to raw material processing phase (A1), followed by the transport of the product to the construction site (A4) and manufacturing (A3). The data obtained from the EPDs for admixture considers a worst-case-scenario. Therefore the contribution to the core environmental impact indicators can be assumed to be slightly lower at every life stage.

Deviations within the product group “SW-Ringprogramm” from the average Global Warming Potential calculated in this EPD are less than 10%.

7 References

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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

EN 16757
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General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (PCR A) (Version 2.1, 2022-02-14)

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