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

Cement-bound spacers for reinforced concrete structures

Registration number:	EPD-Kiwa-EE-187184-EN
Issue date:	15-01-2025
Valid until:	15-01-2030
Declaration owner:	BAG® Bauartikel GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Cement-bound spacers for reinforced concrete structures

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-187184-EN

1.3 VALIDITY

Issue date: 15-01-2025

Valid until: 15-01-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
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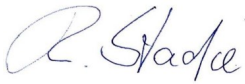
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: BAG® Bauartikel GmbH

Address: Zotzenheimer Straße 64a , 55576 Sprendlingen, Germany

E-mail: zentrale@bagbauartikel.com

Website: https://www.bagbauartikel.info/

Production location: PPUH BETONEX

Address production location: Kopernika 29, 42-134 Truskolasy, 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

Lucas Pedro Berman, Senda

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 (2022-02-14)

DIN EN 16757 - Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements (2023-03)

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 'Cement-bound spacers for reinforced concrete structures' with the calculation identifier ReTHiNK-87184.

2 Product

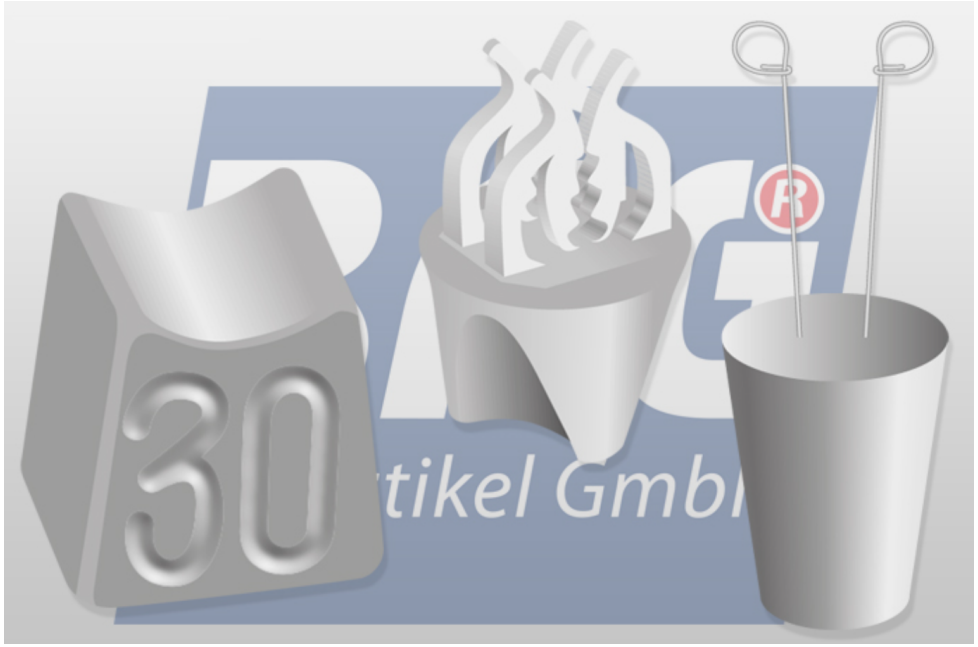
2.1 PRODUCT DESCRIPTION

The cement-bound spacers is produced by BAG® Bauartikel GmbH. Cement-bound single and area spacers made of a high-strength mortar with a minimum strength class of C50/60.

The raw and auxiliary materials are listed in Table 1. These refer to the raw materials used at the Truskolasy site. The quantities are based on the regional specifications of the raw materials.

Table 1: Raw and auxiliary materials

Name	Unit	Value
Sand	Vol.-%	58%
Cement	Vol.-%	23%
Water	Vol.-%	10%
Fly Ash	Vol.-%	7%
Additives	Vol.-%	2%



2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Cement-bound spacers are a widely used building material in the construction industry. They are essential components in reinforced concrete construction, used to maintain the required concrete cover around the reinforcement. This concrete cover is determined by the specified structural design and the defined exposure classes, which are based on the environmental conditions the structure will face, such as exposure to moisture, chemicals, or temperature fluctuations. The minimum concrete cover is crucial for protecting the rebar from corrosion, as it acts as a barrier against harmful elements that could weaken the reinforcement over time. By ensuring that the reinforcement is adequately shielded, spacers help maintain the structural integrity of the concrete. Adhering to the required concrete cover not only ensures the durability of the reinforcement but also guarantees the minimum service life of the reinforced concrete structure. This protection against corrosion ultimately prevents premature deterioration, reducing maintenance needs and ensuring the long-term functionality and safety of the building or infrastructure.

2 Product

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

According to the service lives of building components for life cycle analyses in accordance with the BBSR Table 2017 from the Assessment System for Sustainable Building, the reference service life of concrete products is over 50 years. Adding to this, the reference service live has not been taken into account in this caluclation since the use stage (modules B1-B7) is not declared.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

With reference to Test certificate 220011095-15-01-01 “Quality Grade 1 (Q1). The Quality Grade 12 (Q12) has tested according to DS/CEN/TS 12390-9 2006, DS/EN 12390-3:2019, DS 423.36:1995, DS 423:41-45:2002, EN 480- 11:2005 and Method NT Build 492:1999. Table 2 is the technical data for the concrete spacers from BAG® Bauartikel GmbH.

Properties	Unit	Quality level 1 (Q1)	Quality level 12 (Q12)
Maximum Deformation	mm	± 1(<75mm) ±2(>75mm)	± 1(<75mm) ±2(>75mm)
Breaking load	N	L2 (>2000N)	L2 (>2000N)
Compressive Strength (Cube)	N/mm²	>50	>55
Water absorption	% after 30 min	< 8.0	< 5.0
Building Material Group	-	A1 not flammable	A1 not flammable

2.5 SUBSTANCES OF VERY HIGH CONCERN

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

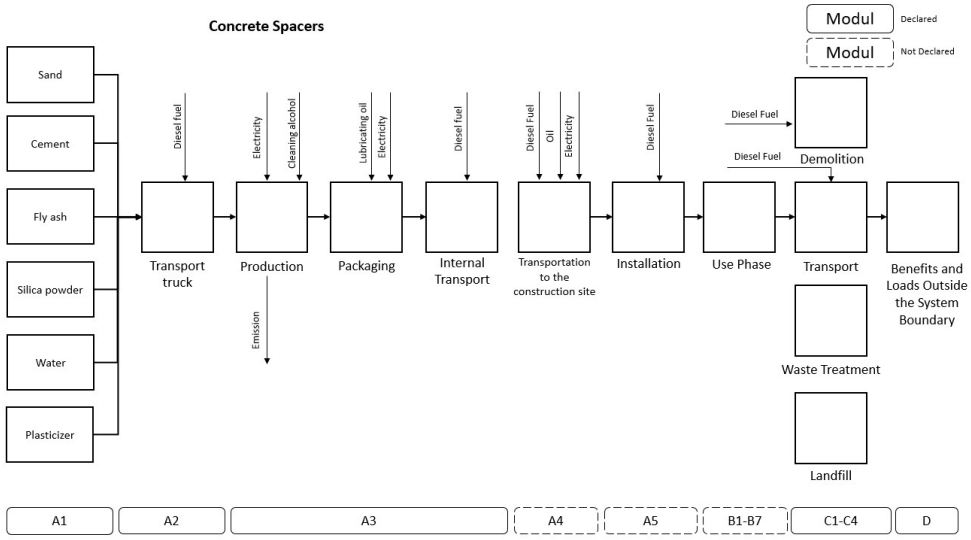
2.6 DESCRIPTION PRODUCTION PROCESS

BAG® Bauartikel GmbH manufactures cement-bound spacers made out of the raw materials listed in Table 1.

The raw materials are transported to the mixing plant in Truskolasy. The next step involves blending these materials in precise proportions to create a homogeneous raw mix, ensuring consistency and quality in the final product. As soon as the raw materials are in the mixer, the concrete is mixed. The mixer is powered by electricity. When the concrete is ready, it is prepared for moulding.

To shape the spacers, specific molds are used. These molds are designed based on the desired size, shape, and spacing requirements. Common mold shapes include cylindrical, square, or custom designs that ensure the spacer will fit the rebar and provide proper spacing. Formwork oil is applied to the molds to facilitate the easy removal of the spacers. Once the concrete is mixed, it is poured into the prepared molds. After the molds are filled, the concrete spacers are left to cure. This is a critical step, as proper curing ensures that the concrete achieves its maximum strength and durability.

The product flow diagram shows a simplified overview of this process.



3 Calculation rules

3.1 DECLARED UNIT

1 m³

1 cubic meter of the cement-bound spacers

Reference unit: cubic meter (m3)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m3
Weight per reference unit	2183.500	kg
Conversion factor to 1 kg	0.000458	m3

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

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

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

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

The modules of the 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 Cement-bound spacers for reinforced concrete structures, a product of BAG® Bauartikel GmbH. The results of this EPD are representative for European Union.

3.5 CUT-OFF CRITERIA

Product stage (Modules 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

3 Calculation rules

therefore not exceed the limit of 5% of energy use and mass. Wood pallets were used during transport, contributing biogenic content.

Excluded processes are:

- Long-term emissions
- The manufacture of equipment used in production, buildings or any other capital goods;
- The transport of personnel to the plant;
- The transportation of personnel within the plant;
- Research and development activities

End of life stage (Modules 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

Allocations were avoided as far as possible. No by-products or co-products are produced during the manufacture of the analysed product. The energy requirements of production were allocated to the individual products on the basis of energy consumption measurements. Specific information on the allocations within the background data can be found in the documentation of the Ecoinvent datasets.

Fly ash and silica powder are used in this product, which are originally co-products.

3.7 DATA COLLECTION & REFERENCE PERIOD

All process-specific data was collected for the 2023 operating year. The quantities of raw materials, consumables and supplies used and the energy consumption were recorded and averaged over the entire 2023 operating year. The reference area is Poland.

3.8 ESTIMATES AND ASSUMPTIONS

For the deconstruction of the product (module C1), a scenario was developed that reflects the average deconstruction process. Weight of the raw material taken into relation of hourly demolition potential. The same approach was used in regard to the debris removal. The value was, thus, taken from an Nationale Milieudatabase (NMD) dataset, that has been entered in R<THiNK. To sum up, two inputs have been made in C1, one for demolishing and one for debris.

The NMD is the Netherlands' national environmental database, providing standardized data for assessing the environmental impact of building materials. The NMD waste scenario for "concrete (i.a. elements,brickwork, reinforced concrete) (NMD ID 9)" is considered representative for the life cycle of the mortar and used in the calculation. 1% of the waste is deposited in a landfill, while 99% is recycled. The process "Waste concrete {Europe without Switzerland}| treatment of waste concrete, inert material landfill" is used for landfilling, whereby the dataset "Crushing, per kg stoney material [NMD, NL]" is used for recycling. The recycled waste is reused as benifits in the process "Gravel, round | gravel and sand quarry operation (RoW)".

In winter, the heating is required for the production and this has been included in the electricity mix.

3.9 DATA QUALITY

Overall, the data quality can be classified as good. The data is comprised of primary data directly collected by BAG® Bauartikel GmbH. All relevant process-specific data could be recorded during the operational data collection.

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. In addition, secondary data from the Ecoinvent database (2019, version 3.6) was used. The database is checked regularly and therefore meets the requirements of DIN EN ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804+A2. The general rule that specific data from certain production processes or average data derived from certain processes must take precedence when calculating an EPD or LCA was upheld. Data for processes over which the manufacturer has no influence were assigned to generic data.

The scenarios included are current and representative of one of the most likely scenario variants.

3 Calculation rules

3.10 POWER MIX

In this EPD, the "market based approach" was applied and the specific electricity mix, which must be labelled by the electricity supplier in accordance with local legislation, was used to carry out the LCA.

The GWP-total of the applied electricity mix is 0.83679 kg CO2-eq per kWh. The environmental profile from Ecoinvent used in the calculation is “Electricity, high voltage (PL) | production mix | Cut-off, U.” This environmental profile is subsequently transformed to medium voltage and then to low voltage.

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

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

Description	Amount	Unit
Hydraulic excavator (average) [NMD generic]	0.223	hr
Hydraulic excavator (average) [NMD generic]	0.263	hr

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]
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	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 [%]
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	NL	0	1	0	99	0

4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	0.000	21.835	0.000	2161.665	0.000
Total	**0.000**	**21.835**	**0.000**	**2161.665**	**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]
concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	2161.665	0.000
Total	**2161.665**	**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 CUBIC METER

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	7.48E-1	1.46E-1	6.50E-1	1.54E+0	2.66E-1	8.63E-2	2.20E-2	1.09E-3	-6.56E-2
GWP-total	kg CO2 eqv.	4.75E+2	2.52E+1	8.51E+1	5.86E+2	2.55E+1	1.49E+1	3.54E+0	1.15E-1	-9.12E+0
GWP-b	kg CO2 eqv.	3.52E+0	1.16E-2	-4.18E+1	-3.83E+1	7.08E-3	6.87E-3	2.04E-2	2.27E-4	-4.18E-2
GWP-f	kg CO2 eqv.	4.71E+2	2.51E+1	1.27E+2	6.23E+2	2.55E+1	1.49E+1	3.52E+0	1.15E-1	-9.07E+0
GWP-luluc	kg CO2 eqv.	2.36E-1	9.21E-3	6.15E-2	3.06E-1	2.01E-3	5.45E-3	6.70E-4	3.21E-5	-9.75E-3
EP-m	kg N eqv.	2.87E-1	5.14E-2	8.72E-2	4.26E-1	1.18E-1	3.04E-2	8.78E-3	3.76E-4	-1.88E-2
EP-fw	kg P eq	9.92E-2	2.54E-4	9.53E-3	1.09E-1	9.27E-5	1.50E-4	1.10E-4	1.29E-6	-3.35E-4
EP-T	mol N eqv.	2.05E+0	5.67E-1	9.77E-1	3.60E+0	1.29E+0	3.35E-1	9.75E-2	4.15E-3	-2.18E-1
ODP	kg CFC 11 eqv.	1.16E-6	5.55E-6	1.61E-5	2.28E-5	5.50E-6	3.28E-6	4.56E-7	4.74E-8	-9.05E-7
POCP	kg NMVOC eqv.	7.39E-1	1.62E-1	3.43E-1	1.24E+0	3.55E-1	9.57E-2	2.66E-2	1.20E-3	-6.01E-2
ADP-f	MJ	1.52E+3	3.79E+2	2.09E+3	3.99E+3	3.50E+2	2.24E+2	4.72E+1	3.21E+0	-1.13E+2
ADP-mm	kg Sb-eqv.	4.14E-4	6.37E-4	4.65E-4	1.52E-3	3.91E-5	3.77E-4	9.92E-6	1.05E-6	-4.52E-4
WDP	m3 world eqv.	1.34E+1	1.36E+0	2.61E+1	4.09E+1	4.70E-1	8.03E-1	2.14E-1	1.44E-1	-1.30E+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	C1	C2	C3	C4	D
ETP-fw	CTUe	1.84E+2	3.38E+2	1.49E+3	2.01E+3	2.11E+2	2.00E+2	3.83E+1	2.09E+0	-1.82E+2
PM	disease incidence	5.33E-6	2.26E-6	3.72E-6	1.13E-5	7.06E-6	1.34E-6	4.86E-7	2.12E-8	-1.13E-6
HTP-c	CTUh	1.20E-7	1.10E-8	5.81E-8	1.89E-7	7.38E-9	6.49E-9	9.08E-10	4.83E-11	-6.75E-9
HTP-nc	CTUh	3.43E-6	3.70E-7	1.29E-6	5.09E-6	1.81E-7	2.19E-7	2.57E-8	1.48E-9	-1.90E-7
IR	kBq U235 eqv.	1.56E+0	1.59E+0	5.52E+0	8.66E+0	1.50E+0	9.40E-1	1.50E-1	1.32E-2	-4.57E-1
SQP	Pt	3.06E+2	3.29E+2	5.47E+3	6.11E+3	4.47E+1	1.95E+2	7.88E+0	6.74E+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)

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

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

5 Results

ILCD classification	Indicator	Disclaimer
	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	C1	C2	C3	C4	D
PERE	MJ	9.18E+1	4.75E+0	4.74E+2	5.70E+2	1.90E+0	2.81E+0	2.69E+0	2.60E-2	-7.84E+0
PERM	MJ	2.02E+1	0.00E+0	3.50E+2	3.70E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	1.12E+2	4.75E+0	8.24E+2	9.40E+2	1.90E+0	2.81E+0	2.69E+0	2.60E-2	-7.84E+0
PENRE	MJ	2.11E+3	4.03E+2	1.97E+3	4.49E+3	3.72E+2	2.38E+2	5.04E+1	3.41E+0	-1.20E+2
PENRM	MJ	4.43E+1	0.00E+0	2.60E+2	3.05E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	2.16E+3	4.03E+2	2.23E+3	4.80E+3	3.72E+2	2.38E+2	5.04E+1	3.41E+0	-1.20E+2
SM	Kg	8.23E-2	0.00E+0	8.23E-4	8.31E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	3.11E+2	0.00E+0	3.11E+0	3.14E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	3.65E+2	0.00E+0	3.65E+0	3.68E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	M3	3.69E+0	4.62E-2	1.98E+0	5.72E+0	1.80E-2	2.73E-2	1.58E-2	3.43E-3	-3.05E+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

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	2.14E-4	9.61E-4	1.62E-3	2.79E-3	9.55E-4	5.69E-4	8.24E-5	4.80E-6	-2.29E-4
NHWD	Kg	1.28E+0	2.41E+1	8.88E+0	3.42E+1	4.15E-1	1.42E+1	6.58E+0	2.18E+1	-1.23E+0
RWD	Kg	2.69E-3	2.49E-3	7.69E-3	1.29E-2	2.43E-3	1.47E-3	2.12E-4	2.11E-5	-4.95E-4

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

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	3.01E+1	3.01E+1	0.00E+0	0.00E+0	2.16E+3	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER CUBIC METER

BIOGENIC CARBON CONTENT

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

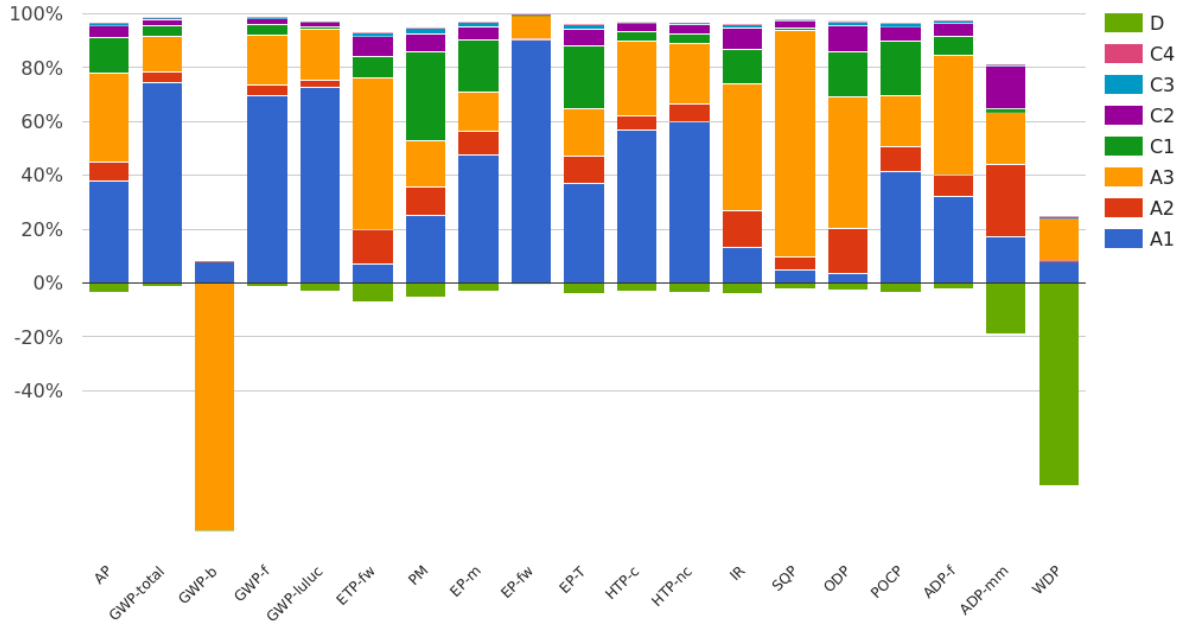
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	11.36	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	41.67	kg CO2 (biogenic)

6 Interpretation of results



The most significant contribution to the Global Warming potential (GWP-total) is the manufacturing stage (A1-A3) with a contribution of 92%. Most of this impact stems from raw material supply (A1) with a contribution of 76% from the total GWP-total.

In all of the other impact categories, (A1),(A3), (C1) and (D) prove to be impactful. Apart from GWP-total, (A1) is showing especially high impacts in Eutrophication, freshwater (EP-fw) with 91%. (A3) is showing high impacts in Land use (SQP) with 90% contibution, Human toxicity, cancer (HTP-c) with 61% and Resource use, fossils (ADP-f) with 43% overall contribution. On the other hand, (C1) is showing strong impacts in Particulate Matter (PM) with 32%. (D) is showing strong negative impacts in Water use (WDP) with -76%

7 References

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