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

Polyethylene piping systems for supply and disposal, industrial applications and cable protection applications

Registration number:	EPD-Kiwa-EE-179667-en
Issue date:	14-10-2024
Valid until:	14-10-2029
Declaration owner:	Gerodur MPM Kunststoffverarbeitung GmbH & Co. KG
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Polyethylene piping systems for supply and disposal, industrial applications and cable protection applications

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-179667-en

1.3 VALIDITY

Issue date: 14-10-2024

Valid until: 14-10-2029

1.4 PROGRAMME OPERATOR

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Raoul Mancke

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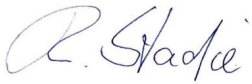


Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: Gerodur MPM Kunststoffverarbeitung GmbH & Co. KG

Address: Andreas-Schubert-Straße 6, 01844 Neustadt, Germany

E-mail: info@gerodur.de

Website: https://www.gerodur.de/en/

Production location: Gerodur MPM Kunststoffverarbeitung GmbH & Co. KG

Address production location: Andreas-Schubert-Straße 6, 01844 Neustadt, Germany

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+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 16903 - Product Category Rules complementary to EN 15804, for buried plastics piping systems prEN 16903:2021 (2022-10-22)

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 'Polyethylene piping systems for supply and disposal, industrial applications and cable protection applications' with the calculation identifier ReTHiNK-79667.

2 Product

2.1 PRODUCT DESCRIPTION

The EPD is declared as average environmental performance for PE pipes that are being used for different types of supply and disposal, industrial and environmental technology as well as industrial cable conduits. The pipes are produced from polyethylen in different thicknesses, lengths and colors and are marked with colored stripes depending on the used material.

Material	Composition
PE Resins	99.8%
Additives	0.20%

Multiple product families with no significant distinction in production, raw materials, transports and packaging are included in this EPD.

RCprotect®: Pipes made of PE100-RC with colored stripes (PAS 1075 type 1) or coextruded solid wall pressure pipes with a dimensionally integrated, colored outer layer (PAS 1075 type 2) for marking the medium in accordance with the DIN EN 12201 or DIN EN 1555 standard. RCprotect® is particularly resistant to the consequences of scratches caused by the absence of sand bedding and the point loads that occur over a longer period of time.

GEROthen®: Either single-layer extruded black pipes with medium-specific color stripe marking or double-layer co-extruded solid-wall pipes in material class PE100 in accordance with DIN EN 12201 or DIN EN 1555.

GEROblanco®: Sewer pipe systems in accordance with DIN EN 12201. They are a fully weldable pipe system made of PE100 or PE100-RC. It is so flexible that deformations can be absorbed by the system without causing cracks and, thus, leaks. Welding using electrofusion couplings guarantees a permanently tight and longitudinally and transversely force-locked connection between the pipes.

LHT INDUSTRY®: Pressure pipes made of PE-RT (Raised Temperature) in accordance with DIN EN ISO 15494 for industrial and environmental applications. Extended application potential and new areas of use at operating temperatures from -40°C to +95°C.

GEROtec MINING®: Abrasion-resistant pressure pipe made of PE100 or PE100-RC in accordance with DIN EN 12201 for mining and open-cast mining. The inner protective layer made of TPE guarantees long-term resistance to abrasive wear during the transportation of materials containing solids. Available as 2-layer (GEROtec MINING I) or 3-layer (GEROtec MINING II) system pipe.

GEROtec FIRE-MAIN®: Pipe system in accordance with DIN EN ISO 15494 for underground, public and industrial extinguishing water networks made of PE100-RC material with colored longitudinal stripes evenly distributed around the pipe circumference or co-extruded colored outer layer.

GEROtec ANERGIE®: Solid-wall pressure pipes made of resistant PE100-RC in accordance with DIN EN ISO 15494 with colored longitudinal stripes distributed around the pipe circumference. Used for highly efficient cooling and heating of buildings with cold district heating. Optimized as a supply and return pipe for heat absorption and dissipation.

LHT E-Power cable conduit®: Protective pipes made of PE-RT (Raised Temperature) in accordance with DIN 16874, DIN 16876 and DIN 16842 with colored longitudinal stripes evenly distributed around the pipe circumference or coextruded colored outer layer. Used for underground cabling of high and extra-high voltage lines up to 525 kV and a continuous service temperature of over 70°C.

EMDS®: Cable protection conduits made of the material PE-HD+ (PE according to DIN 16874), PE100 or PE100-RC according to DIN 16874, DIN 16876 and DIN 16842 with or without colored longitudinal stripes evenly distributed around the circumference of the conduit or a colored outer layer.

GEROtherm ground collector pipe®: Pressure pipe made of PE100-RC material to DIN EN ISO 15494 with green longitudinal stripes evenly distributed around the circumference of the pipe or co-extruded green outer layer. Used for underground installation and brine distribution up to 40°C.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The PE-pipes included in this EPD can be used for a wide array of functions. Depending on the specific pipe, they are being used for supply and disposal, industrial and environmental technology as well as industrial cable conduits.

Family	Usage
RCprotect®	Supply and disposal (drinking water, waste water or gas)
GEROthen®	Supply and disposal (drinking water, waste water or gas)
GEROblanco®	Sewage pressure and gravity pipe
LHT INDUSTRY®	Industrial pressure pipe for underground and surface installation with increased temperature load
GEROtec MINING®	Wet or dry solids extraction
GEROtec FIRE-MAIN®	Pressure pipe for fire extinguishing water distribution
GEROtec ANERGIE®	Pressure pipe for distribution of cold local heating

2 Product

Family	Usage
GEROtherm® Erdreichkollektorrohr	Pressure pipe for underground installation and brine distribution up to 40°C
LHT E-Power®	Cable conduit for underground cabling of high and extra-high voltage cables up to 525 kV
EMDS®	Cable conduit for energy, media, data and signals

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

According to the customer and relevant studies also mentioned in the secondary PCR, the reference service life for plastic pipes is 100 years.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Characteristic	Unit	PE80	PE 100 / PE 100-RC	PE-RT
Dimensions / nominal diameter	mm	32 - 630	32 - 630	32 - 630
Standard dimension ratio	-	7.4 / 9 / 11 / 13.6 / 17 / 21 / 26 / 33		
Density	g/cm³	0.95	0.96	0.94 - 0.95
Temperature resistance	°C	-40 to 40	-40 to 40	-40 to 95
Minimum required strength 20°/50a	Mpa	≥ 8	≥ 10	>9
Melt-mass flow rate 190°C/ 5kg	g/10min	0.4 - 0.7	0.2 - 0.4	0.4 - 0.6
Yield strength	N/mm²	19 - 23	23 - 25	20 - 23
Modulus of elasticity	MPa	750 - 1000	900 - 1100	650 - 900

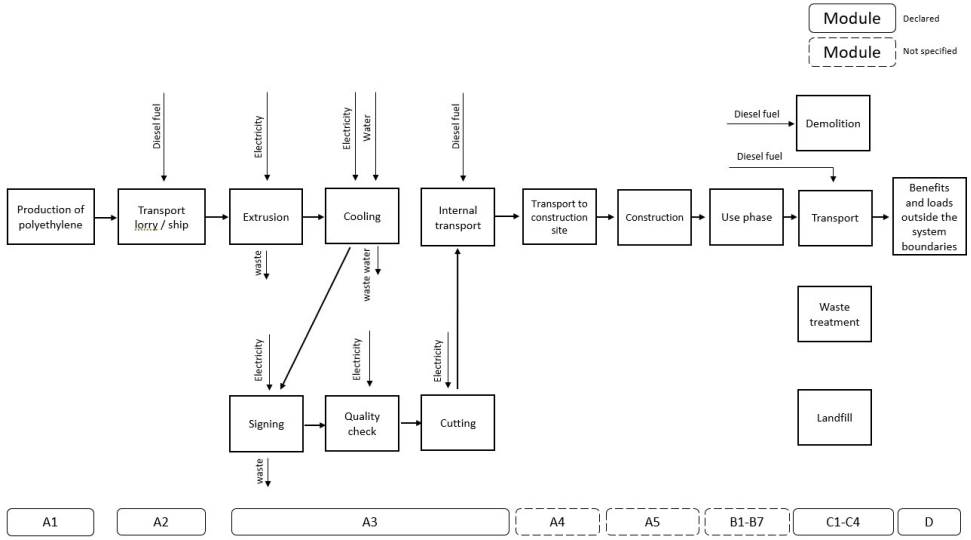
Characteristic	Unit	PE80	PE 100 / PE 100-RC	PE-RT
Thermal linear expansion coefficient	K^-1	0.0002	0.0002	0.0002
Thermal conductivity 20°C	W/mK	0.4	0.4	0.4

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any substances from the “Candidate List of Substances of Very High Concern” (SVHC) in amounts greater than 0,1% (1.000 ppm).

2.6 DESCRIPTION PRODUCTION PROCESS

The different types / grades of PE are being transported to the factory, where they will be transported internally via forklifts to the extrusion machine. There, the extrusion process is carried out, where the PE mix is heated and then pushed through a die with adjustable thickness. Through the sheer pressure the material is put through the die with, it gains the desired form and thickness for the needed pipe. The pipe is then cooled with water so it retains its form. It is then signed, checked for quality and lastly cut into the desired length. Then the product is packaged and prepared for transport.



3 Calculation rules

3.1 DECLARED UNIT

The declared unit is 1 kilogram polyethylene pipeline

One kilogram of polyethylene pipeline

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 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 standard PE pipes, as listed in the product description, a product of Gerodur MPM Kunststoffverarbeitung GmbH. The results of this EPD are representative for Germany.

The scenarios included are currently in use and are representative for one of the most likely scenario alternatives. 100% scenarios can be given. Additional declaration of representative mixes for the relevant region is permissible.

3 Calculation rules

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)
All relevant 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. Specifically, this calculation does not take into account the manufacturing process of the plant, buildings and other capital goods used in the production of the PE pipes. The transportation of personnel to the plant, within the plant, research and development activities and long-term emissions were also not taken into account. Furthermore, the disposal of packaging waste was not taken into account.

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 activitiesThe manufacture of equipment used in production, buildings or any other capital goods;

End of life stage (C1-C4)
All relevant 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 relevant 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. There are no coproducts or by-product in the manufacturing of the examined product. Based on energy consumption measurements, the energy requirements of the production were allocated to the individual products. Specific information about allocations within the background data is included in the documentation of the Ecoinvent datasets.

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 Germany.

3.8 ESTIMATES AND ASSUMPTIONS

To maintain supplier anonymity in the LCA for suppliers, they were categorized into groups. For each group, a weighted average transportation distance was calculated to accurately represent the environmental impacts associated with material transport. The weighting was based on the volume of PE supplied by each supplier, ensuring that larger suppliers had a proportionally greater influence on the overall transportation impact.

Moreover, in the production process, PE offgrade material was utilized. The environmental impacts associated with the production of offgrade material were assumed to be equivalent to those of standard-grade material, as both materials undergo identical manufacturing processes. This assumption ensures that the environmental footprint of the offgrade material is aligned with the overall life cycle assessment of the primary product.

For packaging of the products, the majority of the products are not individually packaged. The resulting values are derived from the calculation of average values, which are determined by considering all relevant variables such as weight, volume, or specific product characteristics. These averages are based on the annual production data.

For the deconstruction of the product (module C1) a scenario was used that reflects an average deconstruction process. The weight of the raw material was set in relation to the hourly deconstruction potential of the construction machine. The value of the environmental impact was taken from a Nationale Milieudatabase (NMD) dataset stored in R<THiNK. The NMD is the Netherlands' national environmental database, providing standardized data for assessing the environmental impact of building materials. The assumptions regarding the deconstruction potential of the construction machine were taken from a study, carried out by the NMD, listed in the references. The scenario was determined using LCA Rapportage categorie 3 data Nationale Milieudatabase - Hoofdstuk 25 Leidingwerken. In Table 12 provided data for PE pipes per meter (C1). It was assumed that the smallest diameter and lowest standard dimension ratio were used to maximize pipe length per kg of PE material, representing a worst-case scenario.

3 Calculation rules

3.9 DATA QUALITY

The quality level of geographical representativeness can be considered “good”.
The quality level of technical representativeness can be considered “good”.
The time representativeness can also be regarded as “good”.

The overall data quality for this EPD can, therefore, be described as “good”. All relevant process-specific data were collected during data collection.

In all possible cases, primary data from customers was used, which has very good data quality because it comes directly from the source. In addition, secondary data from the EcoInvent database (2019, version 3.6) was used when no primary data could be supplied. 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 quantities of raw materials, consumables and supplies used and the energy consumption were recorded and averaged over the entire operating year.

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 adhered to. Data for processes over which the manufacturer has no influence were assigned to generic data/scenarios. When selecting these, care was taken to always choose the data set/scenario that most realistically represents the processes.

3.10 POWER MIX

The “*market-based approach*” was taken into account for this Environmental Product Declaration, so Guarantees of Origin (GOs) have been provided for the electricity used.

The GWP-total of the applied electricity mix is 0.1044783 kg CO2 eqv. per kWh.

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]	0.007	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]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57) Germany	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.

4 Scenarios and additional technical information

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	NL	0	10	85	5	0
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57) Germany	NL	0	10	85	5	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.000	0.085	0.726	0.043	0.000
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57) Germany	0.000	0.015	0.124	0.007	0.000
Total	**0.000**	**0.100**	**0.850**	**0.050**	**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]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.043	16.652
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57) Germany	-0.010	3.189
Total	**0.033**	**19.841**

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

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
AP	mol H+ eqv.	9.65E-3	6.38E-4	4.74E-4	1.08E-2	3.74E-3	1.10E-4	1.02E-3	9.25E-6	-8.19E-4
GWP-total	kg CO2 eqv.	2.37E+0	9.83E-2	7.97E-2	2.54E+0	3.58E-1	1.89E-2	2.28E+0	1.48E-2	-7.97E-1
GWP-b	kg CO2 eqv.	4.50E-3	4.29E-5	-5.26E-2	-4.81E-2	9.95E-5	8.72E-6	3.46E-4	1.14E-5	-1.12E-3
GWP-f	kg CO2 eqv.	2.36E+0	9.82E-2	1.32E-1	2.59E+0	3.58E-1	1.89E-2	2.28E+0	1.48E-2	-7.96E-1
GWP-luluc	kg CO2 eqv.	8.33E-4	3.71E-5	1.38E-4	1.01E-3	2.82E-5	6.92E-6	1.83E-4	5.24E-7	-1.16E-4
EP-m	kg N eqv.	1.78E-3	2.15E-4	1.15E-4	2.11E-3	1.65E-3	3.86E-5	2.78E-4	5.60E-6	-2.26E-4
EP-fw	kg P eq	4.87E-5	9.74E-7	5.16E-6	5.48E-5	1.30E-6	1.91E-7	6.81E-6	1.90E-8	-1.92E-6
EP-T	mol N eqv.	1.98E-2	2.37E-3	1.35E-3	2.35E-2	1.81E-2	4.26E-4	3.10E-3	3.40E-5	-2.60E-3
ODP	kg CFC 11 eqv.	6.46E-8	2.16E-8	5.55E-9	9.18E-8	7.72E-8	4.17E-9	6.94E-8	3.28E-10	-1.02E-7
POCP	kg NMVOC eqv.	8.26E-3	6.71E-4	4.13E-4	9.34E-3	4.98E-3	1.22E-4	8.30E-4	1.30E-5	-8.35E-4
ADP-f	MJ	7.27E+1	1.47E+0	2.02E+0	7.62E+1	4.92E+0	2.85E-1	1.74E+0	2.51E-2	-1.37E+1
ADP-mm	kg Sb-eqv.	2.20E-5	2.44E-6	1.37E-6	2.58E-5	5.48E-7	4.79E-7	2.88E-6	1.13E-8	-1.08E-6
WDP	m3 world eqv.	1.06E+0	5.20E-3	9.55E-2	1.16E+0	6.59E-3	1.02E-3	1.16E-1	1.07E-3	-7.38E-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	2.60E+1	1.31E+0	2.32E+0	2.96E+1	2.97E+0	2.54E-1	2.86E+1	2.67E-2	-1.75E+0
PM	disease incidence	8.09E-8	8.66E-9	6.13E-9	9.57E-8	9.91E-8	1.70E-9	8.13E-9	1.74E-10	-3.77E-9
HTP-c	CTUh	6.63E-10	4.33E-11	4.66E-11	7.53E-10	1.04E-10	8.24E-12	4.33E-10	7.00E-13	-7.56E-11
HTP-nc	CTUh	1.71E-8	1.42E-9	1.38E-9	1.99E-8	2.55E-9	2.78E-10	9.03E-9	1.74E-11	-1.40E-9
IR	kBq U235 eqv.	3.48E-2	6.18E-3	3.59E-3	4.45E-2	2.11E-2	1.19E-3	7.16E-3	9.82E-5	-5.09E-3
SQP	Pt	3.50E+0	1.25E+0	6.12E+0	1.09E+1	6.28E-1	2.47E-1	6.23E-1	5.93E-2	-2.80E+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	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	9.78E-1	1.83E-2	1.02E+0	2.02E+0	2.66E-2	3.57E-3	1.78E-1	4.44E-4	-1.05E+0
PERM	MJ	0.00E+0	0.00E+0	3.92E-1	3.92E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	9.78E-1	1.83E-2	1.41E+0	2.41E+0	2.66E-2	3.57E-3	1.78E-1	4.44E-4	-1.05E+0
PENRE	MJ	5.46E+1	1.56E+0	1.70E+0	5.79E+1	5.23E+0	3.03E-1	1.85E+0	2.67E-2	-1.46E+1
PENRM	MJ	2.34E+1	0.00E+0	4.42E-1	2.38E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-5.10E-1
PENRT	MJ	7.80E+1	1.56E+0	2.14E+0	8.17E+1	5.23E+0	3.03E-1	1.85E+0	2.67E-2	-1.51E+1
SM	Kg	1.75E-2	0.00E+0	2.97E-4	1.78E-2	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	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	M3	2.34E-2	1.77E-4	2.38E-3	2.60E-2	2.53E-4	3.47E-5	3.40E-3	2.62E-5	-1.12E-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

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	1.19E-5	3.68E-6	1.89E-6	1.75E-5	1.34E-5	7.22E-7	3.32E-6	3.81E-8	-1.85E-5
NHWD	Kg	1.65E-1	9.13E-2	1.47E-2	2.71E-1	5.83E-3	1.81E-2	4.19E-2	1.00E-1	-9.45E-3
RWD	Kg	3.37E-5	9.69E-6	4.38E-6	4.77E-5	3.42E-5	1.87E-6	6.25E-6	1.49E-7	-7.11E-6

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	8.50E-4	8.50E-4	0.00E+0	0.00E+0	5.00E-2	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	-1.05E-1	-1.05E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-6.15E+0
EEE	MJ	0.00E+0	0.00E+0	-6.07E-2	-6.07E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-3.57E+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:

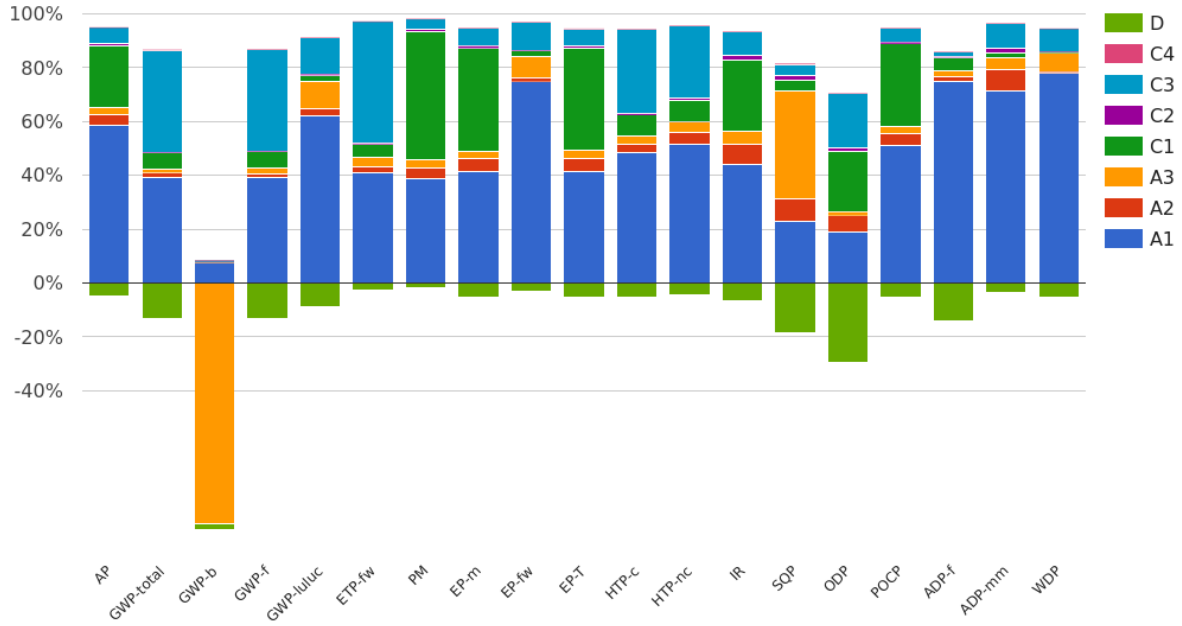
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.01273	kg C

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	0.04669	kg CO2 (biogenic)

6 Interpretation of results



A1 is responsible for a major of environmental impact in most categories. Especially WDP (Water depletion potential) with ~80% and ADP-mm (Resource use minerals and metal), ADP-f (Resource use fossils) and EP-fw (Eutrophication potential) with each ~65% are impacted by A1. Another significant impactor is C1 in PM (Particulate Matter), EP-m (Eutrophication potential, marine) and EP-T (Eutrophication potential, terrestrial) with between ~40% and ~50%. This stems from C1 including the removal of a pipe dug into earth.

The majority of the CO2 emissions within the impact category GWP-biogenic originate from the packaging in A3. Since the module A5, which includes the waste processing of packaging, is not declared, there seems to be a disbalance of biogenic CO2 emissions. If A5 would be declared, this imbalance would disappear.

6 Interpretation of results

Lastly, C3 is responsible for ~60% of the impact in ETP-fw (Ecotoxicity freshwater).

7 References

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

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

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

DIN EN 12201
Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE)

DIN EN 1555
Plastic piping systems for gas supply - Polyethylene (PE)

DIN EN 16903
Product Category Rules complementary to EN 15804, for buried plastics piping systems; German and English version prEN 16903:2021 (2022-10-22)

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

NMD Hoofdstuk 25 Leidingwerken
Nationale Milieudatabase (NMD) LCA Rapportage categorie 3 data NMD Hoofdstuk 25 Leidingwerken C1 Scenario

PAS 1075
Pressure pipes made of PE 100-RC

8 Contact information

Publisher	Operator	Owner of declaration

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