

Environmental Product Declaration (EPD)

According to ISO 14025 and EN
15804+A2:2019

HakaGerodur Multilayer Metal Pipes (MMP) PE-RT/ Al/PE-RT

Registration number:	EPD-Kiwa-EE-221571-EN
Issue date:	12-03-2026
Valid until:	12-03-2031
Declaration owner:	HakaGerodur AG
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

kiwa



 HakaGerodur



1 General information

1.1 PRODUCT

HakaGerodur Multilayer Metal Pipes (MMP) PE-RT/Al/PE-RT

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-221571-EN

1.3 VALIDITY

Issue date: 12-03-2026

Valid until: 12-03-2031

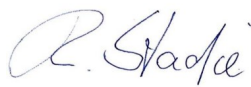
1.4 PROGRAMME OPERATOR

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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

Declaration owner: HakaGerodur AG

Address: Mooswiesstrasse 67 , 9201 Gossau SG, Switzerland

E-mail: sekretariat@hakagerodur.ch

Website: <https://www.hakagerodur.ch/>

Production location: hakaGerodur AG

Address production location: Mooswiesstrasse 67, 9201 Gossau SG, Switzerland

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+A2:2019 serves as the core PCR.

☐ Internal ☒ External



Max Laurén, Kiwa Sertifointi Oy

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-EE GPI R.3.0 (2025)

Kiwa-Ecobility Experts, General Programme Instructions "Product Level", SOP EE 1201_R.3.0 (03.06.2025)

Kiwa-EE GPI R.3.0 Annex B1 (2025)

Kiwa-Ecobility Experts, General Programme Instructions "Product Level" – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930 , SOP EE 1203_R.3.0 (03.06.2025)

Specific PCR: IBU PCR Part B

Requirements on the EPD for Plastic pipe systems for hot and cold water installation in the building, v6 (01.08.2024)

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+A2:2019.

1 General information

For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2:2019 and ISO 14025.

1.10 CALCULATION BASIS

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

LCA software*: Simapro 9.6

Characterization method: RETHINK characterization method (see references for more details)

LCA database profiles: ecoinvent (for version see references)

Version database: v3.20c (20260113)

** 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 'HakaGerodur Multilayer Metal Pipes (MMP) PE-RT/Al/PE-RT' with the calculation identifier ReTHiNK-121571.

2 Product

2.1 PRODUCT DESCRIPTION

The EPD is declared as average environmental performance for metal multilayer pipes that are being used for drinking water pipes, for heating or cooling systems (HVAC) and indoor gas installations. The pipes are produced from polyethylene and aluminium in different thicknesses and lengths.

Material	Composition [% mass]
Polyethylene	75 %
Aluminium	25 %

Multiple product families (HAKATHEN, HAKAflex) with no significant distinction in production, raw materials, transports and packaging are included in this EPD. In the case of HAKAflex only the metal multilayer pipe itself is included in this EPD, without the other components of the HVAC systems.

HAKATHEN: The combination of plastic and aluminium forms a unique synergy with outstanding properties and application possibilities for building technology. Plastic stands for flexibility, maximum tightness and chemical resistance. Aluminium impresses with low linear expansion as well as pressure and temperature resistance – the perfect combination for long-lasting and durable technology.

HAKAflex: The flexible HAKAflex metal multilayer pipes were specially developed for heating installers. The interaction of the temperature-resistant polyethylene and an aluminium layer makes the pipe very flexible and thus extremely durable and easy to install.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The metal multilayer pipes included in this EPD can be used for a wide range of applications. Depending on the specific pipe, they are being used for drinking water installations, surface heating, cooling systems, radiator connections and underfloor heating.

Family	Usage
HAKATHEN	Drinking water installation, Cooling system, Surface heating, Heating installation, Radiator connection, Compressed air, Gas interior installation
HAKAflex	Surface heating, Cooling system, Radiator connection

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The reference service life is defined to be 50 years based on a testing conducted by the client according to EN ISO 21003 and DVGW W 542:2009-08.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Characteristic	Unit	HAKAflex	HAKATHEN
Outer pipe diameter	mm	16	10-20
Pipe wall thickness	mm	2.0	1.3-2.5
Inner pipe diameter	mm	12.0	7.4-16
Thickness of aluminium layer	mm	0.15	0.15-0.4
Smallest bending radius [mm] without bending device (T = 20 °C)	mm	80	50-100
Smallest bending radius [mm] with bending device (T = 20 °C)	mm	48	30-60
Weight per meter	g/m	100	41-175
Water content	liter/m	0.113	0.043-0.2
Linear expansion coefficient	mm/(m K)	0.023	0.023
Thermal resistance	m ² K/W	0.0046	0.003-0.006
Thermal conductivity	W/m K	0.43	0.45-0.49
Maximum operating temperature, over 50 years	°C	60	70
Maximum operating temperature, max. 1 year	°C	80	95
Emergency operating temperature, max. 100 hrs	°C	95	110
Maximum operating pressure, over 50 years	bar	6	10
Maximum operating pressure, max. 1 year	bar	8	12
Surface roughness	mm	0.007	0.007

2 Product

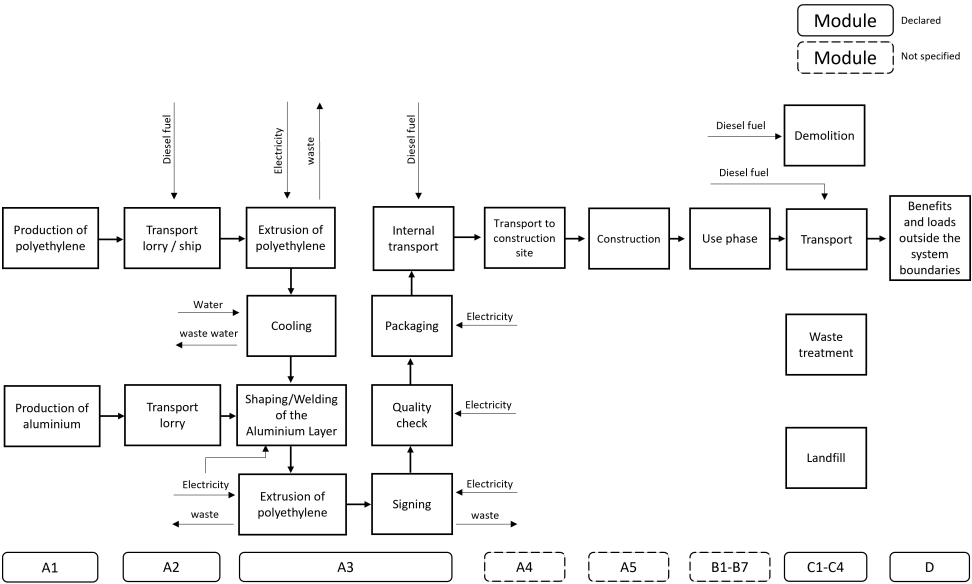
Characteristic	Unit	HAKAflex	HAKATHEN
Oxygen permeability	g/m ³ d	<0.1	<0.1

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

Granulate is delivered to the plasticizing units via silo systems using vacuum conveying technology. The plastic melts in the extruders primarily due to electric heaters and friction within the material itself. The base pipe, which consists of an inner layer and a bonding agent, is stabilized and cooled in a vacuum bath after the melt hose exits the shaping tool. Then, the base pipe is coated with an aluminum layer that serves as a diffusion barrier and is butt-welded using a laser. Frequency heating subsequently activates the adhesion promoters, creating a bond between the aluminum and the base pipe. The pipe then passes through another coating tool in which an outer layer and another adhesion promoter are extruded onto the existing pipe. This protects the functional layers from external influences. Finally, the pipe is given a signature, checked for quality using testing equipment, and cut to the required length. The pipe is packaged in bar form or wound into coils.



2.7 CONSTRUCTION DESCRIPTION

Not applicable because the construction process is not considered.

3 Calculation rules

3.1 DECLARED UNIT

kg

One kilogram of multilayer metal pipes

Reference unit: kilogram (kg)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	kg
Conversion factor to 1 kg	0.999438	kg

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options EPD. The life cycle stages included are as shown below:

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

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

The modules of the EN 15804 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 HakaGerodur Multilayer Metal Pipes (MMP) PE-RT/Al/PE-RT, a product of HakaGerodur AG. The results of this EPD are representative for Switzerland.

The scenarios included are currently in use and are representative of one of the most likely scenario alternatives. 100% scenarios can be given. Additional declaration of representative mixes of 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. Excluded processes/inputs 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 (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. Excluded processes/inputs are:

- handheld power tools

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 co-products or by-products in the manufacturing of the examined product. Based on energy consumption measurements, the energy requirements of the production were allocated to the individual products. Double counting was avoided. 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 2024 operating year from 1st of January till 31st of December 2024. The quantities of raw materials, consumables and supplies used and the energy consumption were recorded and averaged over the entire 2024 operating year. The reference area is Switzerland.

3.8 ESTIMATES AND ASSUMPTIONS

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. A5 has been declared to include the waste processing of the packaging with the goal of removing the otherwise apparent disbalance of GWP-b. No other values in A5 have been declared.

For the deconstruction of the product (module C1) it was assumed that the piping is deconstructed by hand, or with handheld power tools. As their impact is negligible, they will be put in the cut-off criteria and the C1 impact assumed to be 0.

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 3.9.1) 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 and the residual mix was applied. The GWP-total of the applied electricity mix is 0.0262 kg CO₂ eqv. per kWh.

4 Scenarios and additional technical information

4.1 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

There are no significant environment impacts as a result of materials or energy used in the construction stage (A5).

FLOWS LEAVING THE SYSTEM

The following output flows leaving the system at module A5 are assumed.

Description	Value	Unit
Output materials as result of loss during construction	3	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	0.000	kg
Output materials as result of waste processing of used packaging	0.059	kg

4.2 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4.3 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
(ei3.9.1) aluminium (GLO), wrought alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 5)	(ei3.9.1) Lorry (Truck), unspecified (default) market group for (GLO)	0	100	150	50	50
(ei3.9.1) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	(ei3.9.1) Lorry (Truck), unspecified (default) market group for (GLO)	0	100	150	50	50

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

Value and unit

4 Scenarios and additional technical information

Vehicle type used for transport	(ei3.9.1) 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

4.4 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables.
First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
(ei3.9.1) aluminium (GLO), wrought alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 5)	NL	0	3	3	94	0
(ei3.9.1) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	NL	0	10	85	5	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
(ei3.9.1) aluminium (GLO), wrought alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 5)	0.000	0.007	0.007	0.231	0.000
(ei3.9.1) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.000	0.075	0.641	0.038	0.000
Total	0.000	0.083	0.649	0.269	0.000

4.5 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

4 Scenarios and additional technical information

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
(ei3.9.1) aluminium (GLO), wrought alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 5)	0.231	0.000
(ei3.9.1) polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.038	20.262
Total	0.269	20.262

5 Results

For the impact assessment long-term emissions (>100 years) are not considered. 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 EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1- A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	4.05E+0	1.04E-1	-1.44E-2	4.14E+0	2.90E-1	0.00E+0	1.77E-2	1.79E+0	9.91E-3	-5.42E+0
GWP-f	kg CO ₂ eq.	3.99E+0	1.03E-1	7.48E-2	4.17E+0	1.95E-1	0.00E+0	1.77E-2	1.79E+0	9.91E-3	-5.40E+0
GWP-b	kg CO ₂ eq.	1.22E-2	3.36E-5	-9.06E-2	-7.83E-2	9.30E-2	0.00E+0	5.76E-6	1.47E-3	6.12E-6	-4.26E-3
GWP-luluc	kg CO ₂ eq.	4.31E-2	3.68E-4	1.48E-3	4.50E-2	1.38E-3	0.00E+0	6.30E-5	2.45E-4	9.95E-7	-1.34E-2
ODP	kg CFC 11 eq.	6.26E-8	1.84E-9	2.51E-9	6.69E-8	3.83E-9	0.00E+0	3.14E-10	4.76E-8	2.42E-11	-9.20E-8
AP	mol H ⁺ eq.	2.37E-2	4.96E-4	3.11E-4	2.45E-2	8.24E-4	0.00E+0	8.46E-5	1.06E-3	8.33E-6	-2.94E-2
EP-fw	kg P eq.	1.30E-4	1.03E-6	4.01E-6	1.35E-4	4.47E-6	0.00E+0	1.76E-7	7.01E-6	2.31E-8	-1.38E-4
EP-m	kg N eq.	3.26E-3	1.88E-4	7.07E-5	3.52E-3	1.30E-4	0.00E+0	3.21E-5	2.64E-4	4.72E-6	-4.82E-3
EP-T	mol N eq.	3.61E-2	2.01E-3	4.95E-4	3.86E-2	1.43E-3	0.00E+0	3.43E-4	2.94E-3	3.06E-5	-5.31E-2
POCP	kg NMVOC eq.	1.47E-2	6.85E-4	2.87E-4	1.57E-2	5.52E-4	0.00E+0	1.17E-4	8.74E-4	1.27E-5	-1.70E-2
ADP-mm	kg Sb-eq.	9.81E-6	3.23E-7	3.87E-6	1.40E-5	4.86E-7	0.00E+0	5.53E-8	2.44E-6	2.46E-9	2.17E-5
ADP-f	MJ	8.44E+1	1.48E+0	7.15E+0	9.30E+1	2.95E+0	0.00E+0	2.53E-1	1.96E+0	2.35E-2	-5.78E+1
WDP	m ³ world eq.	1.17E+0	8.07E-3	6.66E-2	1.25E+0	4.12E-2	0.00E+0	1.38E-3	8.63E-2	9.21E-4	-5.50E-1

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratospheric ozone layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) depreciation potential, deprivation-weighted water consumption (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
PM	disease incidence	2.45E-7	1.02E-8	2.12E-10	2.55E-7	8.77E-9	0.00E+0	1.74E-9	1.16E-8	1.65E-10	-3.81E-7
IR	kBq U235 eq.	1.24E-1	5.76E-4	1.51E-1	2.76E-1	8.56E-3	0.00E+0	9.87E-5	6.89E-3	1.76E-5	-2.60E-2
ETP-fw	CTUe	1.11E+1	1.09E+0	1.35E+0	1.36E+1	1.15E+0	0.00E+0	1.87E-1	2.02E+1	7.56E-2	-1.16E+1
HTP-c	CTUh	6.39E-9	5.46E-11	1.77E-10	6.62E-9	2.30E-10	0.00E+0	9.36E-12	3.66E-10	7.91E-13	-5.81E-9
HTP-nc	CTUh	7.26E-8	1.19E-9	3.69E-9	7.75E-8	2.61E-9	0.00E+0	2.03E-10	5.23E-9	2.41E-11	-6.06E-8
SQP	Pt	4.26E+0	1.17E+0	6.23E+0	1.17E+1	4.12E-1	0.00E+0	2.00E-1	9.49E-1	4.89E-2	-8.15E+0

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality index (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
	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
ILCD type / level 3	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

5 Results

ILCD classification	Indicator	Disclaimer
	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	A5	C1	C2	C3	C4	D
PERE	MJ	1.14E+1	2.09E-2	1.57E+0	1.30E+1	4.03E-1	0.00E+0	3.58E-3	2.34E-1	6.37E-4	-4.95E+0
PERM	MJ	0.00E+0	0.00E+0	7.57E-1	7.57E-1	2.27E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	1.14E+1	2.09E-2	2.33E+0	1.38E+1	4.26E-1	0.00E+0	3.58E-3	2.34E-1	6.37E-4	-4.95E+0
PENRE	MJ	6.06E+1	1.48E+0	6.25E+0	6.83E+1	2.21E+0	0.00E+0	2.53E-1	1.96E+0	2.35E-2	-5.67E+1
PENRM	MJ	2.38E+1	0.00E+0	9.05E-1	2.47E+1	7.43E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.11E+0
PENRT	MJ	8.44E+1	1.48E+0	7.15E+0	9.30E+1	2.95E+0	0.00E+0	2.53E-1	1.96E+0	2.35E-2	-5.78E+1
SM	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
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m³	6.86E-2	3.57E-4	6.54E-3	7.55E-2	2.41E-3	0.00E+0	6.12E-5	2.75E-3	2.30E-5	-2.35E-2

PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | **PERM**=Use of renewable primary energy resources used as raw materials | **PERT**=Total use of renewable primary energy resources | **PENRE**=Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | **PENRM**=Use of non-renewable primary energy resources used as raw materials | **PENRT**=Total use of non-renewable primary energy resources | **SM**=Use of secondary material | **RSF**=Use of renewable secondary fuels | **NRSF**=Use of non-renewable secondary fuels | **FW**=Net use of fresh water

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A5	C1	C2	C3	C4	D
HWD	Kg	9.18E-5	9.42E-6	1.29E-4	2.30E-4	5.12E-5	0.00E+0	1.61E-6	1.53E-3	1.09E-7	1.98E-3
NHWD	Kg	7.33E-1	9.76E-2	4.76E-2	8.78E-1	9.68E-2	0.00E+0	1.67E-2	7.02E-1	8.31E-2	-8.40E-1
RWD	Kg	9.21E-5	3.38E-7	8.11E-5	1.74E-4	5.42E-6	0.00E+0	5.79E-8	5.06E-6	1.09E-8	-1.73E-5

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	A5	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
MFR	Kg	0.00E+0	0.00E+0	1.73E-2	1.73E-2	2.51E-2	0.00E+0	0.00E+0	2.69E-1	0.00E+0	2.39E-1
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	2.17E-1	2.17E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.67E+0
EEE	MJ	0.00E+0	0.00E+0	1.26E-1	1.26E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.87E+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:

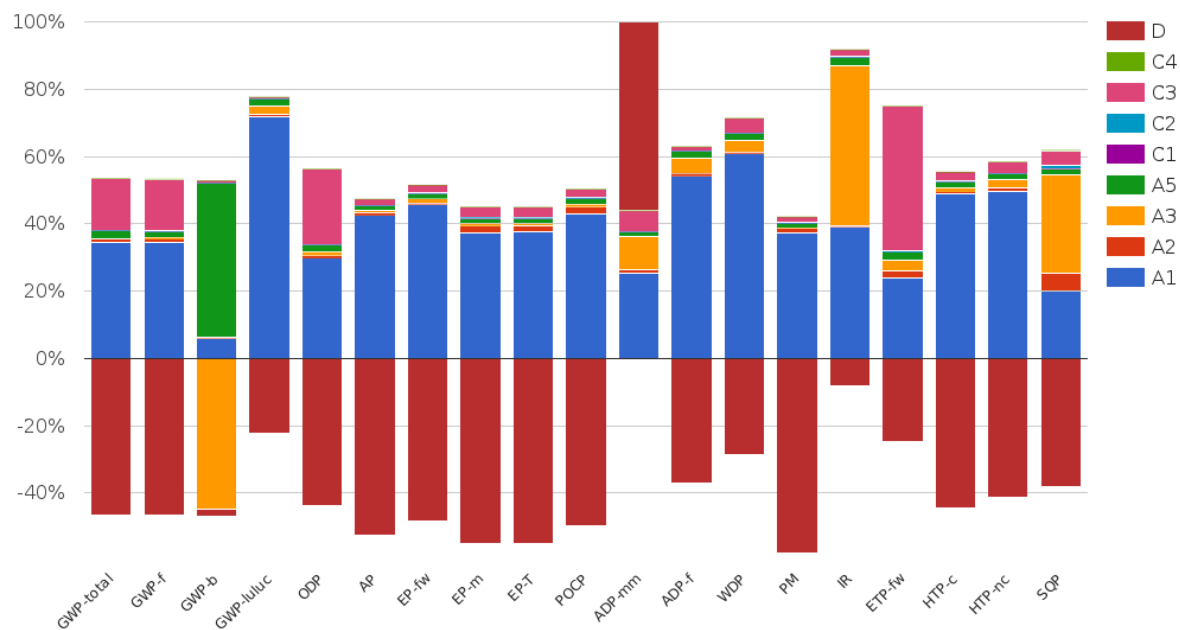
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.02529	kg C

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	0.09275	kg CO2 (biogenic)

6 Interpretation of results



A1 is responsible for a major of environmental impact in most categories. Especially the impact category GWP-luluc (Global warming potential - land use and land use change) with around 70%, WDP (Water depletion potential) with around 60 % and ADP-f (Abiotic depletion for fossil resources potential) with 55 % are impacted by A1. The impact category ETP-freshwater (Potential Comparative Toxic Unit for ecosystems) is impacted with around 40% by the module C3, and IR (Potential Human exposure efficiency relative to U235) is impacted by module A3 with around 50 %. A benefit is granted in almost every impact category because of module D (as indicated by the negative values), with the exception of the impact category ADP-mm (Abiotic depletion potential for non fossil resources).

A3 is negative in GWP-b (Global Warming Potential - biogenic) due to the packaging material consisting mainly of paper. This negative GWP-b is counteracted in A5 due to the processing of the packaging waste.

6 Interpretation of results

Annex: GWP conversion table for the product stage A1-A3 based on product variant weight per meter

Outer pipe diameter [mm]	10	12	12	16	16	16	16	16	16	17	20	20	20	20	20	20
Pipe wall thickness [mm]	1.3	1.4	1.8	2.0	2.0	2.2	2.25	2.0	2.25	2.0	2.0	2.0	2.25	2.25	2.5	2.5
Thickness of aluminium layer [mm]	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.4	0.4	0.2	0.25	0.4	0.25	0.4	0.25	0.4
Weight per meter [g/m]	0.041	0.056	0.067	0.100	0.105	0.112	0.113	0.120	0.144	0.110	0.140	0.155	0.150	0.165	0.160	0.175
GWP total [kg CO ₂ e]	4.14E+0															
GWP total per meter [kg CO ₂ e / m]	0.170	0.232	0.277	0.414	0.435	0.464	0.468	0.497	0.596	0.455	0.580	0.642	0.621	0.683	0.662	0.725

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

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

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Requirements on the EPD for Plastic pipe systems for hot and cold water installation in the building, v6 (01.08.2024)

ecoinvent

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R<THINK characterization method

ecoinvent 3.9.1: EN 15804+A2 indicators (EF 3.1)

NMD Hoofdstuk 25 Leidingwerken

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

DIN EN ISO 21003

Multilayer piping systems for hot and cold water installations inside buildings

7 References

DVGW W 542:2009-08

Compound pipes in the drinking water installation; requirements and testing

DIN EN ISO 21003

Multilayer piping systems for hot and cold water installations inside buildings

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