ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	TECE SE
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-TEE-20250129-IBA1-EN
Issue date	25.09.2026
Valid to	24.09.2031

PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

TECE SE

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

TECE SE

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-TEE-20250129-IBA1-EN

This declaration is based on the product category rules:

Plastic pipe systems for hot and cold water installation in the building, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

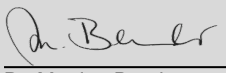
25.09.2026

Valid to

24.09.2031



Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

Owner of the declaration

TECE SE
Hollefeldstraße 57
48282 Emsdetten
Germany

Declared product / declared unit

1 kg TECEflex PE-Xc/Al/PE-RT Multi-composite pipe (pre-insulated)

Scope:

The following information relates to a specific product manufactured at the Strzelin plant in Poland.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



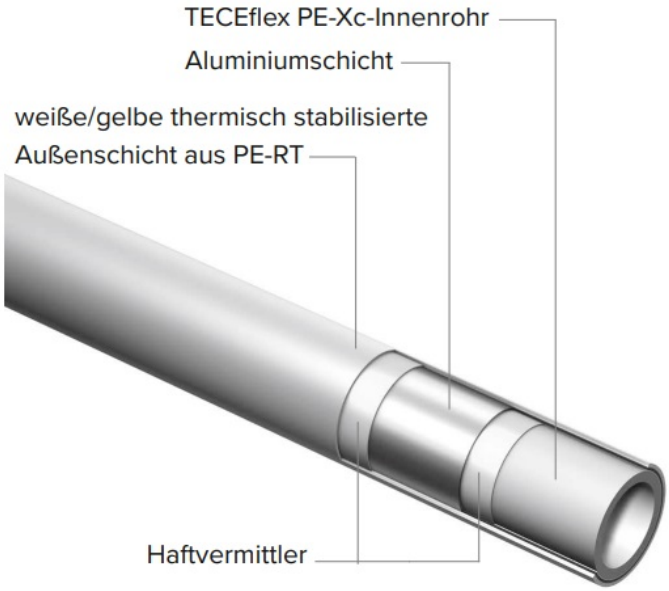
Dr. Eva Schmincke,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This EPD applies to the TECEflex and TECElogo PE-Xc aluminium multilayer composite pipes. The inner pipe is made of electron beam cross-linked, high-density polyethylene (PE-Xc). Its molecular structure and composition guarantee high thermal stability. The pipes fulfil application classes 2 and 5 at 10 bar in accordance with *EN ISO 21003*, making them suitable for universal use in drinking water and heating installations. The pipes have good long-term properties and a low corrosion and incrustation potential as well as a low roughness coefficient. The butt-welded aluminium layer applied around the inner pipe serves as a diffusion barrier on the one hand and reduces thermal elongation on the other.

The pipes have a five-layer pipe structure and are manufactured using an extrusion process. The aluminium layer provides a 100 % oxygen diffusion barrier, while the outer PE-RT layer protects the entire layer structure against external influences. The layers are permanently bonded using adhesion promoters. Only material qualities from renowned raw material manufacturers are used. The aluminium multi-layer composite pipes are factory-coated with pipe insulation made of closed-cell polyethylene foam. The pipe insulation has a robust PE outer skin on the outside to protect the foam from damage.



Aufbau des TECEflex Verbundrohres



Composite pipe Pre- insulated

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

The TECEflex multilayer composite pipe (Type MP-M) is manufactured and tested in strict accordance with international standards and holds major national certifications, ensuring its safety and performance for drinking water, heating, and compressed air installations.

DIN EN ISO 21003: The product complies with the primary international standard for multilayer pipe systems intended for hot and cold water installations inside buildings.
National Approvals and Certifications

DVGW, TÜV, and DIN CERTCO: The pipe is fully certified by these leading independent testing bodies, confirming its mechanical durability and strict adherence to hygiene and safety requirements for potable water systems.

Operational Approvals (According to ISO 10508):

Application Class 2: Fully approved for hot water supply in drinking water installations, safely operating at a maximum pressure of 10 bar.

Application Class 5: Fully approved for high-temperature heating installations, safely operating at a maximum pressure of 10 bar.

2.2 Application

The TECEflex and TECElogo PE-Xc aluminium multilayer composite pipes, pre-insulated with a closed-cell polyethylene foam, are mainly used in drinking water installations. They are also used as connection pipes for radiator installations.

2.3 Technical Data

The inner pipe of the TECEflex and TECElogo PE-Xc aluminium multilayer composite pipes consists of electron-beam cross-linked, high-density polyethylene (PE-Xc), followed by a centrally applied butt-welded aluminium layer and an outer PE-RT protective layer. Finally, the installation pipe is factory-

wrapped with pipe insulation made of closed-cell polyethylene foam. The pipe insulation is provided with a robust PE outer skin on the outside to protect the foam from damage.

The pipe is manufactured in various dimensions (16, 20, 25 and 32) and lengths.

Constructional data

The following information refers to the TECEflex D16 17x2.7mm- PE-Xc/Al/PE 75m RS 9mm pipe. Further information on the other variants can be found on the website www.tece.com under the product database.

Name	Value	Unit
Dimension	16	-
Outside diameter	17	mm
Wall thickness	2.75	mm
Pipe roughness	0.007	-
Thermal conductivity (uninsulated)	0.35	W/m² *K
Coefficient of thermal expansion	0.026	mm/ (mK)
Minimum bend radius (5* dimension)	80	mm
Max. working pressure EN ISO 21003	10	bar

-The product's performance values in relation to its characteristics are in accordance with the relevant technical regulation (without CE marking).- Area of application: Drinking water installation, radiator connection
- Test standard: EN ISO 21003-2

The products are manufactured and tested in accordance with the following standards:
DIN 4726:2017-10
DIN EN ISO 21003-2:2011-07
DIN EN ISO 21003-3:2008-11
DIN EN ISO 21003-5:2008-11

2.4 Delivery status

The pipes are packed in cardboard or film and delivered to the construction site on disposable pallets. The declared unit is available on the market in a range of product variants, classified according to category (TECEflex and TECElogo) and characterised by specific dimensions and pipe lengths.

PE-Xc/Al/PE-RT MLP, pre insul				
Serial Number	Article Nr.	Description	Dimension	Insulation
21	731116	TCfl D16 17x2,75 PE-Xc/Al/PE 75m RS 6mm	16	6 mm, rot
22	731120	TCfl D20 21x3,45 PE-Xc/Al/PE 75m RS 6mm	20	6 mm, rot
23	731125	TCfl D25 26x4,0 PE-Xc/Al/PE 50m RS 6mm	25	6 mm, rot
24	731132	TCfl D32 32x4,0 PE-Xc/Al/PE 25m RS 6mm	32	6 mm, rot
25	731316	TCfl D16 17x2,75 PE-Xc/Al/PE 75m RS 6mm	16	6mm, blau
26	731320	TCfl D20 21x3,45 PE-Xc/Al/PE 75m RS 6mm	20	6mm, blau
27	731325	TCfl D25 26x4,0 PE-Xc/Al/PE 50m RS 6mm	25	6mm, blau
28	731616	TCfl D16 17x2,75 PE-Xc/Al/PE 75m RS 9mm	16	9mm, rot
29	731620	TCfl D20 21x3,45 PE-Xc/Al/PE 75m RS 9mm	20	9 mm, rot
30	731625	TCfl D25 26x4,0 PE-Xc/Al/PE 50m RS 9mm	25	9mm, rot
31	731632	TCfl D32 32x4,0 PE-Xc/Al/PE 25m RS 9mm	32	9 mm, rot
32	731916	TCfl D16 17x2,75 PE-Xc/Al/PE 50m RS 13mm	16	13 mm, rot
33	731920	TCfl D20 21x3,45 PE-Xc/Al/PE 50m RS 13mm	20	13 mm, rot
34	731925	TCfl D25 26x4,0 PE-Xc/Al/PE 25m RS 13mm	25	13 mm, rot
40	732116	TCfl D16 17x2,75 PE-Xc/Al/PE 75m RS 9mm	16	9 mm, blau
41	732120	TCfl D20 21x3,45 PE-Xc/Al/PE 75m RS 9mm	20	9 mm, blau
42	732125	TCfl D25 26x4,0 PE-Xc/Al/PE 50m RS 9mm	25	9 mm, blau
63	732616	TCfl D16 17x2,75 PE-Xc/Al/PE 25m RS 26mm	16	26 mm, rot
64	732620	TCfl D20 21x3,45 PE-Xc/Al/PE 25m RS 26mm	20	26 mm, rot
65	732625	TCfl D25 26x4,0 PE-Xc/Al/PE 25m RS 26mm	25	26 mm, rot
99	8700316	TClg D16 16x2,0 PE-Xc/Al/PE 75m RS 9mm	16	9 mm, rot
100	8700320	TClg D20 20x2,25 PE-Xc/Al/PE 75m RS 9mm	20	9 mm, rot
111	8701416	TClg D16 16x2,0 PE-Xc/Al/PE 50m RS 13mm	16	13 mm, rot
112	8701420	TClg D20 20x2,25 PE-Xc/Al/PE 50m RS 13mm	20	13 mm, rot
113	8701425	TClg D25 25x2,5 PE-Xc/Al/PE 25m RS 13mm	25	13 mm, rot
120	8701616	TClg D16 16x2,0 PE-Xc/Al/PE 75m RS 6mm	16	6 mm, rot
121	8701620	TClg D20 20x2,25 PE-Xc/Al/PE 75m RS 6mm	20	6 mm, rot
122	8701625	TClg D25 25x2,5 PE-Xc/Al/PE 50m RS 6mm	25	6 mm, rot

2.5 Base materials/Ancillary materials

The composite pipe is composed mainly of modified polyethylene (PE), an aluminium layer and electron beam cross-linked high-density polyethylene (PE-Xc). In addition boanding agent, which is applied in two layers and PE-based additives. The pipe insulation is made of closed-cell polyethylene foam.

PE (modified) approx. 9 %
PE-Xc approx. 47 %
Aluminium layer approx. 16 %
Insulation approx. 23 %
Bonding agent approx. 3 %
PE-based Additives approx. 0,87 %

-This product/article/at least one partial article contains substances listed in the *Candidate List* (date: 05.03.2024) exceeding 0.1 percentage by mass: no.

-This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic *(CMR)* substances in categories 1A or 1B which are not on the *Candidate List*, exceeding 0.1 percentage by mass: no.

-Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by *the (EU) Ordinance on Biocide Products No. 528/2012)*: no.

2.6 Manufacture

To produce PE-Xc aluminium composite pipe, the first step is to melt a PE pipe in an extruder with the addition of processing aids while applying heat. The pipe is calibrated, cooled, wound onto large drums and then transported to the electron beam cross-linker. In a further work step, an adhesion promoter is co-extruded onto the cross-linked PE-Xc pipe and edged with aluminium, which is then welded with a laser. An outer PE protective layer is also co-extruded. In a final work step, the aluminium composite pipe is coated with PE insulation and then a PE film is co-extruded. The finished multilayer composite pipe is then cut to length, wound and packaged in cardboard or plastic film. Finished packaged goods are sent to the distribution warehouse.

The production site in Strzelin, Poland, is certified in accordance with the internationally recognised quality standard *DIN EN ISO 9001.*

2.7 Environment and health during manufacturing

It is not necessary to take measures for health protection or environmental protection that go beyond the legal and other regulations.

The production site in Strzelin, Poland is certified to the *ISRS Edition 8 Level 6 Occupational Health and Safety standard.*

2.8 Product processing/Installation

The TECEflex and TECElogo MLC pipes can be laid flush-mounted or surface-mounted. They are easy to bend and simple to lay. For smaller requirements, the pipes are offered as customised bar stock. The majority of the pipes are processed directly from the roll and therefore enable almost waste-free installation with few connectors. The pipes are connected with press connectors. The pipe connections are made by hand or with simple electric pressing tools.

2.9 Packaging

The pipes are packed in cardboard boxes and, if necessary, wrapped in film and transported on disposable wooden pallets. Foil, paper and wood can be disposed of in the usual way via collection centres.

2.10 Condition of use

No material changes to the product are to be expected during the utilisation phase if used correctly and as intended.

2.11 Environment and health during use

No material changes to the product are to be expected during the utilisation phase if used correctly and as intended.

2.12 Reference service life

All PE-Xc/AL/PE-RT multilayer composite pipes from TECE meet the requirements of *ISO 21003* Multilayer composite piping systems for hot and cold water installations inside buildings. The service life according to the standard is at least 50 years. The reference service life of the product under consideration is therefore specified as 50 years.

2.13 Extraordinary effects

Fire

The fire class according to *EN 13501-1* is specified as E and is based on literature data for the material polyethylene. A product-specific determination of the fire class is not available.

Water

No negative impacts on the environment are anticipated.

Mechanical destruction

PE-RT is a flexible plastic, so there are no sharp edges in the event of breakage or damage does not result in sharp edges. Negative effects on the environment are not to be expected. In principle, broken or residual pieces of the product should always be disposed of properly and not left in the environment.

2.14 Re-use phase

The product under consideration is basically suitable for both material and energy recovery.

2.15 Disposal

Product waste can be disposed of using the waste code *AVV 17 02 03* plastics.

2.16 Further information

Further information about the product and the manufacturer can be found on the declaration holder's website at *www.tece.com*.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit of the present assessment is one kilogram of TECEflex PE-Xc/Al-/PE-RT (Pre-Insulated) composite pipe.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg
Gross density	1400	kg/m^3

3.2 System boundary

Type of the EPD: Cradle-to-gate with options, modules C1-C4, and module D (A1-A3, A4, A5, C1-C4, and D). The following life cycle stages are declared:

Modules A1–A3 (Product Stage): Covers the extraction and processing of raw materials (PE, aluminium), upstream transport, core manufacturing (extrusion and cross-linking), and the provision of packaging.
The electricity consumed in modules A1-A3 was modelled using the PL: Residual grid mix dataset. The associated GWP is 0.873 kg CO_2e/kWh.

Modules A4–A5 (Construction Process): Includes the transport of the finished product to the construction site (A4) and the installation phase, specifically accounting for the thermal treatment of packaging waste (A5).

Modules C1–C4 (End-of-Life Stage): Encompasses manual deconstruction (C1), transport to the waste facility over 50 km (C2), thermal treatment of 95 % of the dismantled pipe in a municipal waste incinerator (C3), and landfill disposal of the remaining 5 % (C4).

Module D (Benefits and Loads Beyond the System Boundary): Declares the environmental substitution credits derived from the exported thermal and electrical energy generated by the incineration of production scrap (A3), packaging waste (A5), and the end-of-life pipe (C3).

3.3 Estimates and assumptions

Due to the lack of precise data regarding PE-Xc, we have opted to utilise the DE data set as a more suitable alternative: Polyethylene Cross-linked (PeXa).
Manufacturing (A1-A3): Production scrap is conservatively modeled at a 3 % rate and routed to thermal treatment. For minor chemical additives, equivalent proxy datasets from the Sphera database were utilized.
Installation (A5): Installation is assumed to be fully manual. 100 % of the packaging materials are collected and routed to municipal waste incineration.
End-of-Life (C1-C4): Deconstruction is assumed to be manual. Transport to the respective waste treatment or landfill facility is estimated at a regional average distance of 50 km.
Energy Substitution (Module D): Recovered thermal and electrical energy from the incineration of packaging and pipe materials is assumed to substitute average primary energy generation in the public grid.

3.4 Cut-off criteria

The manufacturing of machinery, transport vehicles and infrastructure, as well as the maintenance and operation of facilities, business administration and water consumption, are not included in the assessment.
To simplify the modelling and due to the lack of accuracy of the available data, the PE-based additives used in the product were excluded from the study, the mass fraction of which is <1 %.

3.5 Background data

All the background data used were taken from the *LCA-for Experts Software (Content Version 2024)*

3.6 Data quality

All background data records relevant for the calculation were provided by the declaration owner and processed with the data base of the accounting software. The manufacturer-specific data used comes from the year 2023. The background data used shows a high degree of temporal, technical and geographical representativeness and is compatible with the aim of the study. The data quality can generally be described as good.

3.7 Period under review

The observation period for the data collection is the year 2023.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Germany

3.9 Allocation

Production Data (A1-A3): General plant-level inputs at the manufacturing facility were allocated to the declared product based on its mass proportion of the total annual factory output.
End-of-Life & Module D: The "end of waste" state is applied. The Environmental burdens from waste processing (C3) are allocated entirely to the pipe system. The resulting environmental credits from energy recovery are allocated to Module D, calculated based on the lower heating value (LHV) of the specific incinerated materials.
Background Datasets: All allocations within the Sphera background datasets (refinery processes or electricity generation) comply with the *EN 15804+A2* standard, utilizing mass or energy-based allocation principles where appropriate.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The *LCA for Experts Software database (Content Version 2024.2)* was used for the background data.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The study determined the amount of biogenic carbon. A distinction was made between the biogenic carbon in the product and in the packaging materials. The product is composed predominantly of inorganic materials. The proportion of biogenic carbon in the total mass of the product is far less than 1 %.

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.22	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Transport to the building site (A4)

A distance to the construction site of 100 km by Truck is assumed. The value can therefore be scaled for any distance to the construction site.

Name	Value	Unit
Transport distance - Truck	100	km

Assembly (A5)

The installation of the declared product in the building (A5) is carried out manually, without relevant consumption of energy or materials. Furthermore, packaging materials are disposed of via thermal utilization.

Name	Value	Unit
Electricity consumption	-	kWh

Reference service life

Name	Value	Unit
Life Span according to the manufacturer	50	a

End of life (C1-C4)

It is assumed that the product will be collected separately during demolition. Demolition (C1) is carried out manually, without the use of additional energy or materials. It is also assumed that transporting the dismantled product for waste treatment (C2) involves 50 km of truck travel. It is also assumed that 95 % of the declared quantity is thermally treated (C3), with the remaining 5 % going to landfill (C4).

Scenarios

C3.1 Scenario: 100 % Incineration plant
This scenario models a 'best-case' pathway where 100 % of the pipe is treated in a municipal waste incineration plant.
C4.2 Scenario: 100 % Landfill
All product waste is transported to and disposed of in a inert landfill. It is included to provide a 'worst-case' and to ensure transparency for projects where local recycling infrastructure may be unavailable.

Name	Value	Unit
Collected separately waste type waste type	1	kg
Energy recovery	0.95	kg
Landfilling	0.05	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Scenario 1 (D.1): Encompasses substitution credits from the energetic recovery of packaging waste (A5), production scrap (A3), and 100 % of the end-of-life pipe (C3.1).

Scenario 2 (D.2): Encompasses substitution credits strictly from the energetic recovery of packaging waste (A5). The end-of-life pipe itself does not generate credits in this scenario.

Energy substitution: The exported thermal (EET) and electrical (EEE) energy from the respective incineration processes are modeled as substituting the corresponding average primary energy generation within the public grid.

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
GWP-total	kg CO_2 eq	3.5071	0.0128	0.849	0	0.00419	2.97	3.13	0	0.00151	0	0.0303	-1.56	-1.63	-0.205
GWP-fossil	kg CO_2 eq	4.3187	0.013	0.173	0	0.00424	2.97	3.13	0	0.00151	0	0.0302	-1.55	-1.62	-0.204
GWP-biogenic	kg CO_2 eq	-8.35E-01	-2.89E-04	6.76E-01	0	-9.43E-05	8.95E-05	9.42E-05	0	-4.24E-07	0	-8.47E-06	-8.02E-03	-8.39E-03	-1.05E-03
GWP-luluc	kg CO_2 eq	1.71E-02	1.34E-04	2.73E-05	0	4.38E-05	2.52E-05	2.65E-05	0	4.14E-06	0	8.27E-05	-2.14E-03	-2.24E-03	-2.8E-04
ODP	kg CFC11 eq	2.93E-11	2.17E-15	1.09E-13	0	7.07E-16	1.66E-13	1.75E-13	0	5.15E-15	0	1.03E-13	-1.46E-11	-1.53E-11	-1.91E-12
AP	mol H^+ eq	1.4E-02	9.18E-05	4.21E-04	0	2.99E-05	2.99E-04	3.15E-04	0	9E-06	0	1.8E-04	-1.83E-03	-1.92E-03	-2.4E-04
EP-freshwater	kg P eq	1.69E-05	3.52E-08	2.46E-08	0	1.15E-08	2.02E-08	2.13E-08	0	8.42E-07	0	1.68E-05	-1.42E-06	-1.49E-06	-1.86E-07
EP-marine	kg N eq	3.41E-03	4.6E-05	1.93E-04	0	1.5E-05	6.43E-05	6.77E-05	0	1.95E-06	0	3.9E-05	-5.3E-04	-5.54E-04	-6.95E-05
EP-terrestrial	mol N eq	3.63E-02	5E-04	2.23E-03	0	1.63E-04	1.42E-03	1.49E-03	0	2.13E-05	0	4.25E-04	-5.92E-03	-6.19E-03	-7.76E-04
POCP	kg NMVOC eq	1.13E-02	8.72E-05	4.98E-04	0	2.84E-05	1.91E-04	2.01E-04	0	6.16E-06	0	1.23E-04	-1.44E-03	-1.5E-03	-1.89E-04
ADPE	kg Sb eq	2.24E-06	8.68E-10	1.33E-09	0	2.83E-10	1.87E-09	1.97E-09	0	1.03E-10	0	2.05E-09	-1.54E-07	-1.61E-07	-2.01E-08
ADPF	MJ	1.77E+02	1.67E-01	2.81E-01	0	5.46E-02	3.49E-01	3.67E-01	0	2.5E-02	0	5E-01	-2.74E +01	-2.87E +01	-3.6E+00
WDP	m^3 world eq deprived	5.92E-01	5.97E-05	9.04E-02	0	1.95E-05	2.74E-01	2.89E-01	0	1.86E-04	0	3.72E-03	-1.62E-01	-1.69E-01	-2.11E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
PERE	MJ	33.5538	0.0126	0.0636	0	0.00411	0.0959	0.101	0	0.00417	0	0.0834	-8.96	-9.37	-1.17
PERM	MJ	2.08	0	-2.08	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	35.6338	0.0126	0.0636	0	0.00411	0.0959	0.101	0	0.00417	0	0.0834	-8.96	-9.37	-1.17
PENRE	MJ	94.758	0.167	0.281	0	0.0546	0.349	0.367	0	0.025	0	0.5	-27.4	-28.7	-3.6
PENRM	MJ	82.082	0	-0.082	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	176.84	0.167	0.281	0	0.0546	0.349	0.367	0	0.025	0	0.5	-27.4	-28.7	-3.6
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	2.94E-02	6.23E-06	2.13E-03	0	2.03E-06	6.43E-03	6.76E-03	0	5.45E-06	0	1.09E-04	-6.98E-03	-7.3E-03	-9.11E-04

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 = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
HWD	kg	7E-08	6.71E-12	1.27E-10	0	2.19E-12	1.9E-10	2E-10	0	5.59E-12	0	1.12E-10	-1.74E-08	-1.81E-08	-2.27E-09
NHWD	kg	5.76E-01	2.34E-05	2.69E-02	0	7.62E-06	1.18E-02	1.24E-02	0	4.98E-02	0	9.96E-01	-1.37E-02	-1.43E-02	-1.79E-03
RWD	kg	1.85E-03	3.16E-07	1.23E-05	0	1.03E-07	2E-05	2.11E-05	0	3.6E-07	0	7.2E-06	-2.07E-03	-2.16E-03	-2.7E-04

CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	9.5E-01	1E+00	0	0	0	0	0	0	0
EEE	MJ	0	0	8.7E-01	0	0	6.35E+00	6.68E+00	0	0	0	0	0	0	0
EET	MJ	0	0	1.6E+00	0	0	1.13E+01	1.19E+01	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 kg PE-Xc/Al/PE-RT Composite pipe (pre-Insulated)

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C3/2	C4	C4/1	C4/2	D	D/1	D/2
PM	Disease incidence	2.61E-07	3.79E-10	1.6E-09	0	1.24E-10	1.75E-09	1.84E-09	0	9.26E-11	0	1.85E-09	-1.5E-08	-1.56E-08	-1.96E-09
IR	kBq U235 eq	2.3E-01	4.53E-05	1.91E-03	0	1.48E-05	3.21E-03	3.38E-03	0	4.83E-05	0	9.67E-04	-3.41E-01	-3.57E-01	-4.45E-02
ETP-fw	CTUe	49.938	0.218	0.102	0	0.0709	0.129	0.136	0	0.0572	0	1.14	-2.42	-2.53	-0.316
HTP-c	CTUh	2.56E-09	2.94E-12	7.25E-12	0	9.57E-13	1.89E-11	1.99E-11	0	7.87E-13	0	1.57E-11	-2.81E-10	-2.94E-10	-3.68E-11
HTP-nc	CTUh	2.98E-08	1.64E-10	2.49E-10	0	5.35E-11	8.74E-11	9.2E-11	0	1.4E-11	0	2.8E-10	-4.64E-09	-4.85E-09	-6.06E-10
SQP	SQP	125.645	0.074	0.0708	0	0.0241	0.109	0.115	0	0.00386	0	0.0773	-5.25	-5.5	-0.686

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

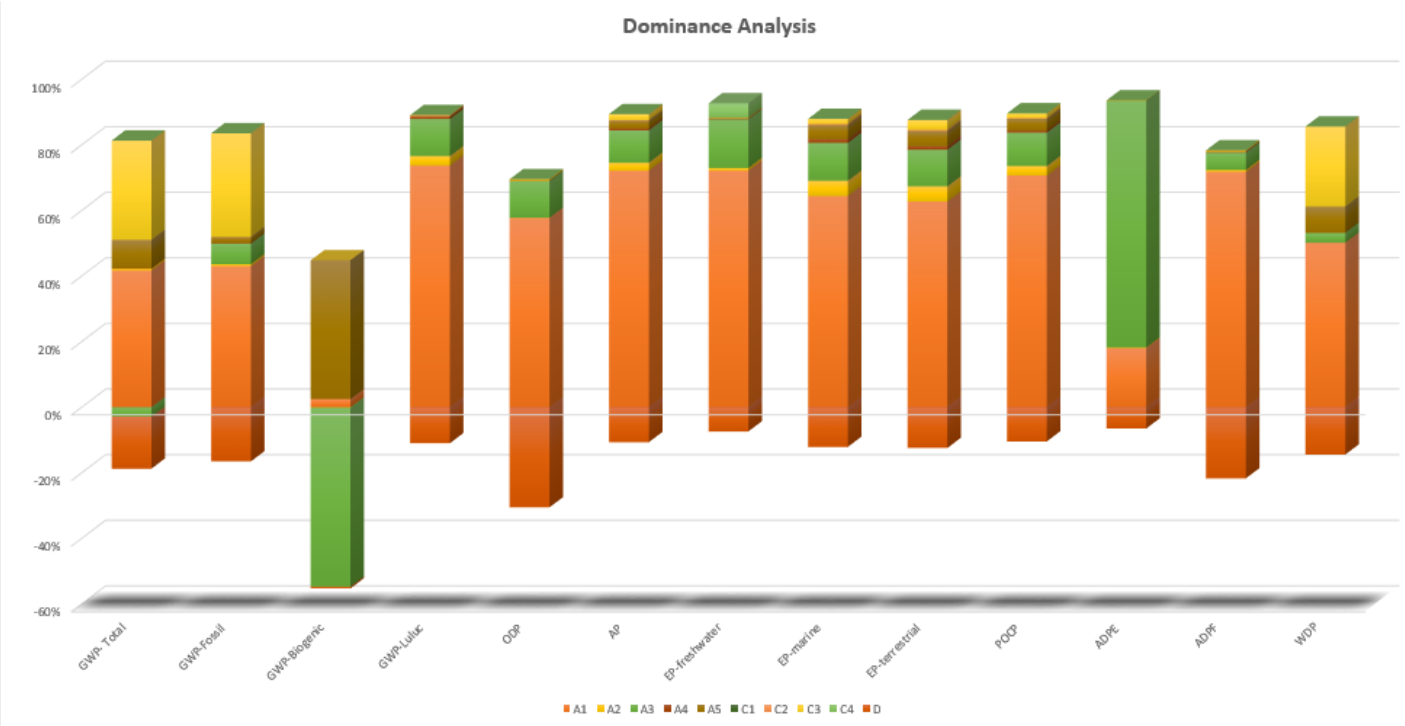
Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

This EPD was created using a software tool.

6. LCA: Interpretation

Module A1 is the dominant driver in most categories, including GWP-Fossil, Fossil Depletion (ADPF) and Acidification (AP). This is due to the energy-intensive processing of the core polymers and aluminium barrier. Module A3 (manufacturing) is the dominant hotspot for non-fossil resource depletion (ADPE), indicating a heavy reliance on the specific auxiliary materials and packaging required for this variant. Furthermore, the biogenic carbon cycle is highly pronounced, with module A3 showing a significant negative value in GWP-Biogenic (carbon uptake from renewable wooden/cardboard packaging). This carbon is subsequently released during packaging disposal at the installation site (module A5).
The net Global Warming Potential (GWP-Total) for this variant is 6.14 kg CO_2 eq. per declared unit. Similar to the standard pipe, the carbon footprint is primarily driven by the raw material supply (Module A1, 4.09 kg CO_2 eq.) and the end-of-life thermal treatment (Module C3, 2.97 kg CO_2 eq.).

The dominance analysis chart illustrates the relative percentage contributions of the individual life cycle modules to each impact category, rather than absolute values. Consequently, visual anomalies can occur in categories with extremely low absolute totals.


Dominance Analysis
100%
80%
60%
40%
20%
0%
-20%
-40%
-60%
GWP-Total
GWP-Fossil
GWP-Biogenic
GWP-Luluc
ODP
AP
EP-freshwater
EP-marine
EP-terrestrial
POCP
ADPE
ADPF
WDP
A1 A2 A3 A4 A5 C1 C2 C3 C4 D

7. Requisite evidence

8. References

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ISO 14044
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