Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

The pre insulated steel pipes for district heating and cooling from

POLIURS

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-03081
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 Construction products (EN 15804:A2) (1.11)*
PCR review was conducted by: *IVL Swedish Environmental Research Institute Secretariat of the International EPD® System*
Life Cycle Assessment (LCA)
LCA accountability: *Dr. Ing. Kaspars Zudrags BM Certification*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Prof. Vladimír Kočí, PhD, LCA Studio, Czech Republic* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

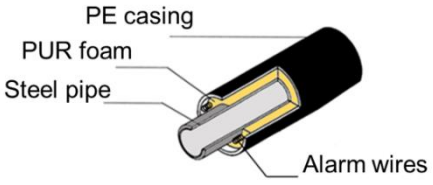
Company information

Owner of the EPD: Poliurs Ltd http://www.poliurs.lv/
Contact: Aleksandra Kiselova aleksandra@poliurs.lv
Description of the organisation: Poliurs Ltd. is established in 1995 and it is leading manufacturer of industrially isolated pipes in the Baltics. “Poliurs’’ Ltd. produces preinsulated bonded pipes and their fittings with diameters of main service pipes from 20 to 1000 mm (3/4 - 39 inches). Depending on diameter of used casing pipe for each service pipe 4 different thicknesses of foam insulation layers are possible.
Company has implemented quality and environmental management system in agreement with latest ISO standards, product compliance according EHP001 guidelines, SPZ-1 mark, constant investments in modernization of manufacturing equipment and improving of employees’ qualification.
Special attention is devoted towards high quality of the product and protection of surrounding environment. Developed quality system is certified according to standards ISO 9001 and ISO 14001. Introduced ISO 9001 and ISO 14001 Quality Management Systems ensure that the products of “POLIURS” Ltd. are manufactured according to the European standards.
Poliurs motto is THINK – DO – CHECK – IMPROVE is not only the precondition of offered quality production and services, but also a reason for loyalty of customers and achievement of mutual goals.
Product-related or management system-related certifications: ISO9001, ISO14001, Euroheat&Power certificate, QB19 certificate, Green Energy certificate
Name and location of production site(s): Poliurs Ltd, Saules iela 8, Ozolnieki, Ozolnieku pagasts, Ozolnieku novads, Latvia, LV-3018

Product information

Product name: pre insulated steel pipes for district heating and cooling
Product identification: pre insulated steel pipes for district heating and cooling are manufactured according to the European standards:
EN 253. District heating pipes - Pipe assembly of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.
EN 448. District heating pipes - Fitting assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.
EN 489. District heating pipes - Joint assembly for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene.
EN 13941-1. Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - design.
EN 13941-2. Design and installation of thermal insulated bonded single and twin pipe systems for directly buried hot water networks - installation.
EN 14419. Surveillance system.
EN 15698-1. Twin pipe systems, Part 1: Factory made fittings.
EN 15698-2. Twin pipe systems, Part 2: Factory made fittings and valve assemblies.

Product description: The pre insulated steel pipes for district heating and cooling consist of steel pipes (1), centred with spacers, insulated with polyurethane foam (PUR) (2), High Density Polyethylene (HDPE) (3) casing and equipped with alarm system (copper wire).



District Heating/Cooling pipeline consist of:

- Pipes
- Fittings
  - Bends
  - T-pieces
  - Reductions
  - Valves
- Joints
  - Non-shrinkable
  - Standard - Shrinkable
  - Two-Step – Shrinkable
  - Weldable
  - PEX
- Sealing Tape
- Welding Mesh
- Foam for joints
- Manchettes
- Plugs
- Splicing Sleeve
- Wire holders
- Expansion cushions
- etc

Pipes are divided into 4 categories – series:

Pipe Size mm	*Series 1 weight kg/m*	*Series 2 weight kg/m*	*Series 3 weight kg/m*	*Series 4 weight kg/m*
26.9	*2.45*	*2.98*	*3.26*	*3.67*
33.7	*3.04*	*3.42*	*3.96*	*4.19*
42.4	*4.10*	*4.40*	*4.90*	*5.50*
48.3	*4.29*	*4.59*	*5.20*	*6.10*
60.3	*5.72*	*6.00*	*6.90*	*7.56*
76.1	*7.05*	*7.90*	*8.54*	*9.30*
88.9	*8.93*	*9.92*	*10.70*	*11.80*
114.3	*13.4*	*14.50*	*15.70*	*17.30*
139.7	*15.66*	*17.50*	*17.85*	*21.10*
168.3	*20.33*	*22.60*	*23.09*	*27.3*
219.1	*30.90*	*33.60*	*36.80*	*40.90*
273.0	*42.46*	*48.30*	*52.90*	*58.90*
323.9	*57.10*	*61.60*	*67.60*	*75.60*
355.6	*64.50*	*70.50*	*78.50*	*90.80*
406.4	*78.49*	*89.60*	*99.00*	*115.30*
457.0	*84.26*	*94.36*	*106.69*	*120.06*
508.0	*95.92*	*103*	*111.14*	*124.51*
610.0	*118.36*	*130.70*	*144.06*	*160.64*
711.0	*165.00*	*181.00*	*205.00*	*221.35*
813.0	*209.18*	*224.31*	*246.19*	*268.90*
914.0	*260.39*	*282.28*	*304.98*	*297.53*
1016.0	*318.05*	*340.76*	*391.31*	-
1219.0	*458.53*	-	-	-

Technical data for declared products can be found in the table below. Most relevant standards for applications of preinsulated pipes are in EN 13941-1 (design) and 13941-2 (installation). Suggested operating pressure is 16 bar.

Technical information of pre insulated steel pipes.

Property	*Value*
Heat reversion, %	*1.5*
Stress crack resistance, h	*330*
Voids and bubbles, %	*1.1*
Compression strength, MPa	*0,48*
Water absorption, %	*3.9*
Closed cell content, %	*96-93.9*
Size of the cells, mm	*0.12-0.17*
Foam density, kg/m^3	*65-69*
Axial shear strength, MPa *+23 °C, new* *+23 °C, aged* *+140 °C, new* *+140 °C, aged*	 *0,40* *0,20* *0,18* *0,20*
Thermal conductivity, W/mK	*0,026*
Impact resistance	*No cracks*
Maximum continuous working temp.,	*< 140*

Property	*Value*
Center line deviation, mm	*2.1-2.9*
Linear water tightness	*No leakage*
Gas analysis, %	
Ageing – 168h at 170°C	*No remarks*
Ageing – 3600h at 90°C	*No remarks*
Cell size after ageing, mm	*0.17*
Compressive strength after ageing,	*0.42*
Foam density after ageing, kg/m3	*78.6*
Thermal conductivity after ageing,	*0.031*

Pipes consist of “pressure resistant” steel pipe, polypropylene spacers, copper alarm wires, polyurethane foam and HDPE casing. Product is marked with product description label, label with steel pipe certificate, series marking tape and if needed tape for “zebra” product. Ends are covered with polyethylene end caps with company logo and pipe size.

Composition of pre insulated steel pipes for heat supply per 1m

	Series 2			
	weight kg/m			
	Steel	HDPE	PUR	Total
26.9/90	1.2	1	0.5	2.7
33.7/90	1.8	1	0.5	3.3
42.4/110	2.6	1.1	0.7	4.4
48.3/110	2.9	1.1	0.7	4.7
60.3/125	4.1	1.2	0.8	6.1
76.1/140	5.2	1.4	1.1	7.7
88.9/160	6.8	1.6	1.4	9.8
114.3/200	9.8	2.2	2.2	14.2
139.7/225	12.1	2.6	2.8	17.5
168.3/250	16.2	3.2	3.5	22.9
219.1/315	23.8	4.7	5.6	34.1
273.0/400	33	6.9	9	48.9
323.9/450	44	8.2	11.2	63.4
355.6/500	48.3	9.9	14	72.2
406.4/560	62.2	12.2	17.8	92.2
457.0/630	70	15	22.6	107.6
508.0/710	77.9	18.6	28.7	125.2
610.0/800	105.6	23	36.3	164.9
711.0/900	138.7	27.6	44.9	211.2
813.0/1000	174.5	33	54.3	261.8
914.0/1100	222.9	38.8	64.6	326.3

More information http://www.poliurs.lv/

UN CPC code: 41277

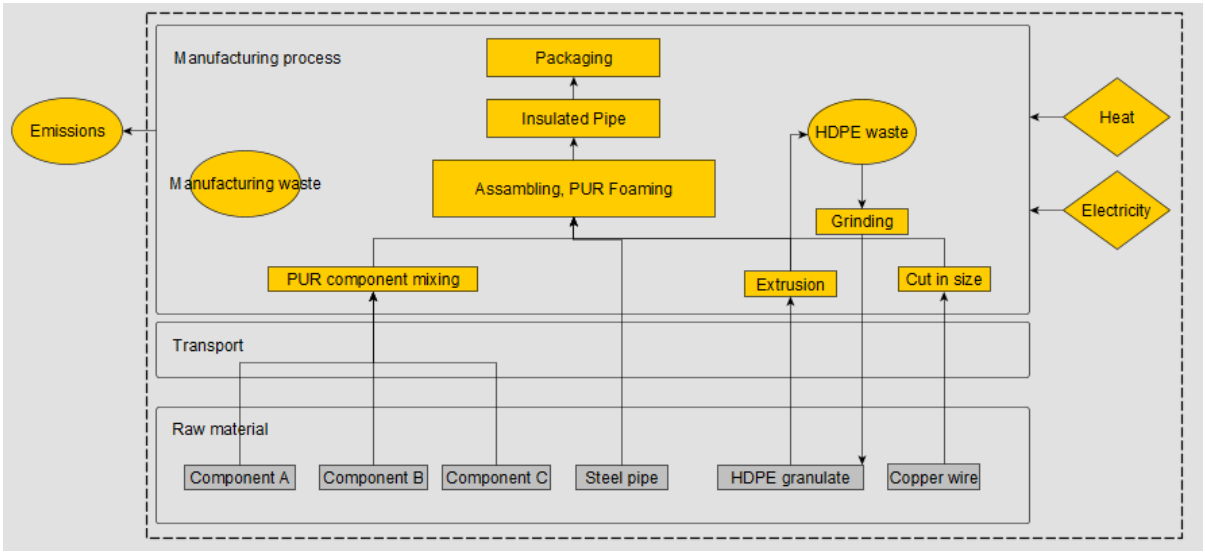
Geographical scope: The pre insulated steel pipes for district heating and cooling produced by Poliurs Ltd produced in Latvia, distribution 60% in Scandinavia, 14% Lithuania and 10% Latvia and the rest of Europe.

LCA information

Functional unit / declared unit: The functional unit of calculations is **one m of 219.1/355** diameter 2 series pre insulated steel pipes for district heating and cooling produced by Poliurs Ltd.
The product chosen as a reference is series 2 pipes as it is the most produced in the reference year of the study.

Reference service life: more than 30 years
Time representativeness: Data for calculation were collected by Poliurs Ltd and cover 12 months of year 2021.
Database(s) and LCA software used: The SimaPro 9 and Ecoinvent 3.8 is used for calculation of LCA.
Description of system boundaries:
Cradle to gate (A1–A3);

System diagram:



More information:

LCA practitioner: Dr. Ing. Kaspars Zudrags BM Certification

Inputs and outputs are recorded and cover 98% of all inputs, mass of excluded materials is <1% and is in line of the standard. The ancillary materials, polypropylene spacers and polyethylene caps have been cut-off due to insufficient and minor influence of data.

The following key assumptions and estimates for LCA modelling have been used:

Energy sources for electricity: Country electricity mix, medium voltage is used and allocated according to the area occupied by production and office where is no possibility for direct consumption counting.

Heat is allocated according to the area occupied by production and office.

The EURO 5 trucks considered to be used for modelling transportation of raw materials and allocation using shortest theoretical distance.

The polypropylene spacers and polyethylene end caps have maximum 2% influence on environment descriptors (use of net fresh water), therefore assumed as negligible and excluded from the calculations.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

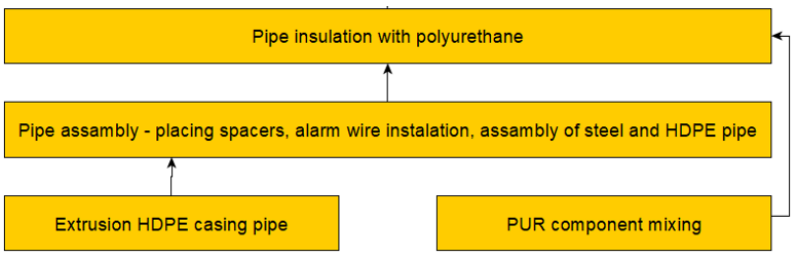
	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	GLO	GLO	EU	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data used	> 98%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
GWP-GHG variation-products*	8-929%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND – not decelerated

* - 100% correspond to 219.1/355 diameter 2 series

Product stage:

Figure below characterizes pre insulated steel pipes manufacturing process production process at Poliurs Ltd production site.



Pre insulated steel pipes manufacturing process

Construction and use stage: Are not described in this EPD

End of life stage: Most of the pipelines are buried in the ground and most common practice has left them under ground after their service life. Are not described in this EPD.

Content information

Product components per 1m	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Steel pipe	23.8	100	-
HDPE	4.7	100	-
PUR	5.6	100	-
TOTAL	34.1	100	

* No use of dangerous substances from the candidate list of SVHC for Authorisation

Environmental Information

For construction services, the total value of A1-A3 shall be replaced with the total value of A1-A5.

Potential environmental impact – mandatory indicators according to EN 15804

Environmental impact indicators	A1	A2	A3	A1-A3 Total
Climate Change - total [kg CO2 eq.]	9.43E+01	6.55E+00	5.06E+00	**1.06E+02**
Climate Change, fossil [kg CO2 eq.]	9.52E+01	6.55E+00	4.41E+00	**1.06E+02**
Climate Change, biogenic [kg CO2 eq.]	-9.59E-01	5.22E-03	6.48E-01	**-3.06E-01**
Climate Change, land use and land use change [kg CO2 eq.]	3.94E-02	4.97E-05	3.24E-03	**4.27E-02**
Ozone depletion [kg CFC-11 eq.]	4.43E-07	1.52E-06	8.21E-07	**2.78E-06**
Acidification [Mole of H+ eq.]	2.29E-01	2.36E-02	2.26E-02	**2.75E-01**
Eutrophication, freshwater [kg P eq.]	2.31E-03	2.88E-05	3.87E-04	**2.72E-03**
Eutrophication, marine [kg N eq.]	6.09E-02	7.52E-03	5.05E-03	**7.35E-02**
Eutrophication, terrestrial [Mole of N eq.]	6.49E-01	8.27E-02	5.43E-02	**7.86E-01**
Photochemical ozone formation, human health [kg NMVOC eq.]	1.97E-01	2.25E-02	1.53E-02	**2.34E-01**
Resource use, mineral and metals [kg Sb eq.]	4.81E-04	2.77E-07	1.04E-07	**4.81E-04**
Resource use, fossils [MJ]	1.80E+03	9.27E+01	6.47E+01	**1.96E+03**
Water use [m³ world equiv.]	8.57E+00	-1.97E-02	1.80E-01	**8.73E+00**
Global warming potential - Greenhause gases (GWP-GHG) [kg CO2 eq.]	6.36E+01	6.51E+00	4.40E+00	**7.46E+01**

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Use of resources

Ressource use indicators	A1	A2	A3	A1-A3 Total
Use of renewable primary energy (PERE) [MJ]	9.34E+01	9.70E-02	1.14E+01	**1.05E+02**
Use of renewable primary energy resources used as raw materials (PERM) [MJ]	3.33E+00	3.94E-02	7.24E+00	**1.06E+01**
Total use of renewable primary energy resources (PERT) [MJ]	9.67E+01	1.36E-01	1.86E+01	**1.16E+02**
Use of non-renewable primary energy (PENRE) [MJ]	1.80E+03	9.22E+01	6.09E+01	**1.95E+03**
Use of non-renewable primary energy resources used as raw materials (PENRM) [MJ]	5.91E+00	5.97E-01	3.77E+00	**1.03E+01**
Use of secondary material (SM) [kg]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Use of renewable secondary fuels (RSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Use of non-renewable secondary fuels (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Total use of non-renewable primary energy resources (PENRT) [MJ]	1.80E+03	9.27E+01	6.47E+01	**1.96E+03**
Use of net fresh water (FW) [m3]	1.40E+00	1.09E-04	1.18E-02	**1.42E+00**

Waste production and output flows

Waste production

Waste categories	A1	A2	A3	A1-A3 Total
Hazardous waste disposed (HWD) [kg]	2.55E-02	2.45E-04	1.05E-04	**2.58E-02**
Non-hazardous waste disposed (NHWD) [kg]	3.37E+00	4.90E-03	1.12E-01	**3.49E+00**
Radioactive waste disposed (RWD) [kg]	5.35E-02	6.72E-04	3.62E-04	**5.46E-02**

Output flows

Output flows	A1	A2	A3	A1-A3 Total
Components for re-use, [kg]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Material for recycling, [kg]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Materials for energy recovery, [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Exported energy, electricity, [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Exported energy, thermal, [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

Additional information

Cradle-to-Gate assessment of other diameter pipes

	Pipes size, mm				
Environmental impact indicators	**26.9/110**	**33.7/110**	**42.4/125**	**48.3/125**	**60.3/140**
Climate Change - total [kg CO2 eq.]	8.82E+00	1.03E+01	1.38E+01	1.45E+01	1.83E+01
Climate Change, fossil [kg CO2 eq.]	8.72E+00	1.02E+01	1.37E+01	1.44E+01	1.83E+01
Climate Change, biogenic [kg CO2 eq.]	9.07E-02	9.03E-02	7.16E-02	7.14E-02	6.51E-02
Climate Change, land use and land use change [kg CO2 eq.]	3.23E-03	3.85E-03	5.28E-03	5.59E-03	7.17E-03
Ozone depletion [kg CFC-11 eq.]	3.31E-07	3.54E-07	4.38E-07	4.50E-07	5.33E-07
Acidification [Mole of H+ eq.]	2.33E-02	2.76E-02	3.65E-02	3.86E-02	4.93E-02
Eutrophication, freshwater [kg P eq.]	2.54E-04	3.00E-04	3.84E-04	4.07E-04	5.18E-04
Eutrophication, marine [kg N eq.]	6.21E-03	7.31E-03	9.70E-03	1.03E-02	1.30E-02
Eutrophication, terrestrial [Mole of N eq.]	6.45E-02	7.64E-02	1.02E-01	1.08E-01	1.38E-01
Photochemical ozone formation, human health [kg NMVOC eq.]	2.10E-02	2.43E-02	3.18E-02	3.34E-02	4.20E-02
Resource use, mineral and metals [kg Sb eq.]	2.45E-05	3.65E-05	5.27E-05	5.87E-05	8.28E-05
Resource use, fossils [MJ]	1.97E+02	2.14E+02	2.77E+02	2.86E+02	3.44E+02
Water use [m³ world equiv.]	1.84E+00	1.78E+00	1.98E+00	1.95E+00	2.05E+00
Global warming potential - Greenhause gases (GWP-GHG) [kg CO2 eq.]	5.92E+00	7.40E+00	9.76E+00	1.05E+01	1.38E+01
Ressource use indicators					
Use of renewable primary energy (PERE) [MJ]	9.77E+00	1.06E+01	1.41E+01	1.45E+01	1.74E+01
Use of renewable primary energy resources used as raw materials (PERM) [MJ]	1.55E+00	1.59E+00	1.89E+00	1.91E+00	2.17E+00
Total use of renewable primary energy resources (PERT) [MJ]	1.13E+01	1.22E+01	1.59E+01	1.64E+01	1.96E+01
Use of non-renewable primary energy (PENRE) [MJ]	1.96E+02	2.13E+02	2.76E+02	2.84E+02	3.42E+02
Use of non-renewable primary energy resources used as raw materials (PENRM) [MJ]	1.28E+00	1.45E+00	1.74E+00	1.82E+00	2.22E+00
Use of secondary material (SM) [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (PENRT) [MJ]	1.97E+02	2.15E+02	2.77E+02	2.86E+02	3.44E+02
Use of net fresh water (FW) [m3]	2.76E-01	2.75E-01	3.08E-01	3.08E-01	3.37E-01
Output flows and waste categories					
Hazardous waste disposed (HWD) [kg]	1.34E-03	1.99E-03	2.85E-03	3.17E-03	4.46E-03
Non-hazardous waste disposed (NHWD) [kg]	2.82E-01	3.57E-01	4.72E-01	5.09E-01	6.67E-01
Radioactive waste disposed (RWD) [kg]	3.20E-03	4.31E-03	6.16E-03	6.72E-03	9.12E-03
Total use of non-renewable primary energy resources (PENRT) [MJ]	5.92E+00	7.40E+00	9.76E+00	1.05E+01	1.38E+01

	Pipes size, mm				
Environmental impact indicators	**76.1/160**	**88.9/180**	**114.3/225**	**139.7/250**	**168.3/280**
Climate Change - total [kg CO2 eq.]	2.34E+01	2.98E+01	4.37E+01	5.41E+01	7.02E+01
Climate Change, fossil [kg CO2 eq.]	2.34E+01	2.97E+01	4.37E+01	5.42E+01	7.03E+01
Climate Change, biogenic [kg CO2 eq.]	4.07E-02	1.59E-02	-4.45E-02	-9.34E-02	-1.42E-01
Climate Change, land use and land use change [kg CO2 eq.]	9.25E-03	1.18E-02	1.75E-02	2.17E-02	2.82E-02
Ozone depletion [kg CFC-11 eq.]	6.65E-07	8.16E-07	1.18E-06	1.45E-06	1.84E-06
Acidification [Mole of H+ eq.]	6.23E-02	7.89E-02	1.15E-01	1.41E-01	1.84E-01
Eutrophication, freshwater [kg P eq.]	6.43E-04	8.07E-04	1.15E-03	1.41E-03	1.84E-03
Eutrophication, marine [kg N eq.]	1.65E-02	2.09E-02	3.05E-02	3.77E-02	4.89E-02
Eutrophication, terrestrial [Mole of N eq.]	1.75E-01	2.23E-01	3.25E-01	4.02E-01	5.23E-01
Photochemical ozone formation, human health [kg NMVOC eq.]	5.31E-02	6.70E-02	9.77E-02	1.21E-01	1.56E-01
Resource use, mineral and metals [kg Sb eq.]	1.05E-04	1.37E-04	1.98E-04	2.45E-04	3.27E-04
Resource use, fossils [MJ]	4.39E+02	5.49E+02	8.11E+02	1.01E+03	1.28E+03
Water use [m³ world equiv.]	2.45E+00	2.80E+00	3.97E+00	4.75E+00	5.76E+00
Global warming potential - Greenhause gases (GWP-GHG) [kg CO2 eq.]	1.72E+01	2.19E+01	3.13E+01	3.84E+01	5.06E+01
Ressource use indicators					
Use of renewable primary energy (PERE) [MJ]	2.26E+01	2.86E+01	4.28E+01	5.34E+01	6.81E+01
Use of renewable primary energy resources used as raw materials (PERM) [MJ]	2.67E+00	3.20E+00	4.60E+00	5.60E+00	7.02E+00
Total use of renewable primary energy resources (PERT) [MJ]	2.53E+01	3.17E+01	4.74E+01	5.90E+01	7.51E+01
Use of non-renewable primary energy (PENRE) [MJ]	4.37E+02	5.47E+02	8.08E+02	1.00E+03	1.28E+03
Use of non-renewable primary energy resources used as raw materials (PENRM) [MJ]	2.68E+00	3.27E+00	4.54E+00	5.48E+00	7.05E+00
Use of secondary material (SM) [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (PENRT) [MJ]	4.40E+02	5.50E+02	8.12E+02	1.01E+03	1.28E+03
Use of net fresh water (FW) [m3]	4.00E-01	4.63E-01	6.47E-01	7.72E-01	9.52E-01
Output flows and waste categories					
Hazardous waste disposed (HWD) [kg]	5.66E-03	7.39E-03	1.07E-02	1.31E-02	1.76E-02
Non-hazardous waste disposed (NHWD) [kg]	8.27E-01	1.05E+00	1.48E+00	1.82E+00	2.38E+00
Radioactive waste disposed (RWD) [kg]	1.17E-02	1.52E-02	2.23E-02	2.77E-02	3.66E-02
Total use of non-renewable primary energy resources (PENRT) [MJ]	1.72E+01	2.19E+01	3.13E+01	3.84E+01	5.06E+01

	Pipes size, mm				
Environmental impact indicators	**219.1/355**	**273.0/450**	**323.9/500**	**355.6/560**	**406.4/630**
Climate Change - total [kg CO2 eq.]	1.06E+02	1.55E+02	2.00E+02	2.32E+02	2.96E+02
Climate Change, fossil [kg CO2 eq.]	1.06E+02	1.56E+02	2.00E+02	2.33E+02	2.97E+02
Climate Change, biogenic [kg CO2 eq.]	-3.06E-01	-5.85E-01	-7.78E-01	-1.01E+00	-1.34E+00
Climate Change, land use and land use change [kg CO2 eq.]	4.27E-02	6.28E-02	8.09E-02	9.39E-02	1.20E-01
Ozone depletion [kg CFC-11 eq.]	2.78E-06	4.13E-06	5.18E-06	6.15E-06	7.77E-06
Acidification [Mole of H+ eq.]	2.75E-01	3.99E-01	5.14E-01	5.91E-01	7.53E-01
Eutrophication, freshwater [kg P eq.]	2.72E-03	3.88E-03	5.00E-03	5.69E-03	7.24E-03
Eutrophication, marine [kg N eq.]	7.35E-02	1.07E-01	1.38E-01	1.59E-01	2.03E-01
Eutrophication, terrestrial [Mole of N eq.]	7.86E-01	1.14E+00	1.47E+00	1.70E+00	2.17E+00
Photochemical ozone formation, human health [kg NMVOC eq.]	2.34E-01	3.42E-01	4.39E-01	5.09E-01	6.48E-01
Resource use, mineral and metals [kg Sb eq.]	4.81E-04	6.69E-04	8.91E-04	9.80E-04	1.26E-03
Resource use, fossils [MJ]	1.96E+03	2.94E+03	3.71E+03	4.42E+03	5.61E+03
Water use [m³ world equiv.]	8.73E+00	1.35E+01	1.58E+01	1.98E+01	2.44E+01
Global warming potential - Greenhause gases (GWP-GHG) [kg CO2 eq.]	7.46E+01	1.05E+02	1.37E+02	1.54E+02	1.97E+02
Ressource use indicators					
Use of renewable primary energy (PERE) [MJ]	1.05E+02	1.60E+02	2.02E+02	2.42E+02	3.08E+02
Use of renewable primary energy resources used as raw materials (PERM) [MJ]	1.06E+01	1.59E+01	1.96E+01	2.36E+01	2.97E+01
Total use of renewable primary energy resources (PERT) [MJ]	1.16E+02	1.76E+02	2.21E+02	2.66E+02	3.37E+02
Use of non-renewable primary energy (PENRE) [MJ]	1.95E+03	2.93E+03	3.70E+03	4.40E+03	5.59E+03
Use of non-renewable primary energy resources used as raw materials (PENRM) [MJ]	1.03E+01	1.45E+01	1.85E+01	2.10E+01	2.66E+01
Use of secondary material (SM) [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (PENRT) [MJ]	1.96E+03	2.94E+03	3.72E+03	4.42E+03	5.61E+03
Use of net fresh water (FW) [m3]	1.42E+00	2.11E+00	2.53E+00	3.07E+00	3.80E+00
Output flows and waste categories					
Hazardous waste disposed (HWD) [kg]	2.58E-02	3.59E-02	4.78E-02	5.26E-02	6.77E-02
Non-hazardous waste disposed (NHWD) [kg]	3.49E+00	4.89E+00	6.43E+00	7.17E+00	9.19E+00
Radioactive waste disposed (RWD) [kg]	5.46E-02	7.80E-02	1.02E-01	1.16E-01	1.48E-01
Total use of non-renewable primary energy resources (PENRT) [MJ]	7.46E+01	1.05E+02	1.37E+02	1.54E+02	1.97E+02

	Pipes size, mm					
Environmental impact indicators	**457/710**	**508/800**	**610/900**	**711/1000**	**813/1100**	**914/1200**
Climate Change - total [kg CO2 eq.]	3.52E+02	4.19E+02	5.46E+02	6.93E+02	8.54E+02	1.05E+03
Climate Change, fossil [kg CO2 eq.]	3.54E+02	4.21E+02	5.49E+02	6.96E+02	8.58E+02	1.06E+03
Climate Change, biogenic [kg CO2 eq.]	-1.75E+00	-2.27E+00	-2.94E+00	-3.72E+00	-4.55E+00	-5.48E+00
Climate Change, land use and land use change [kg CO2 eq.]	1.43E-01	1.70E-01	2.21E-01	2.82E-01	3.48E-01	4.29E-01
Ozone depletion [kg CFC-11 eq.]	9.41E-06	1.14E-05	1.46E-05	1.82E-05	2.22E-05	2.70E-05
Acidification [Mole of H+ eq.]	8.87E-01	1.04E+00	1.37E+00	1.74E+00	2.15E+00	2.66E+00
Eutrophication, freshwater [kg P eq.]	8.43E-03	9.79E-03	1.29E-02	1.64E-02	2.03E-02	2.53E-02
Eutrophication, marine [kg N eq.]	2.40E-01	2.84E-01	3.71E-01	4.72E-01	5.83E-01	7.20E-01
Eutrophication, terrestrial [Mole of N eq.]	2.57E+00	3.03E+00	3.96E+00	5.04E+00	6.23E+00	7.70E+00
Photochemical ozone formation, human health [kg NMVOC eq.]	7.69E-01	9.13E-01	1.19E+00	1.51E+00	1.86E+00	2.29E+00
Resource use, mineral and metals [kg Sb eq.]	1.42E-03	1.59E-03	2.15E-03	2.82E-03	3.54E-03	4.52E-03
Resource use, fossils [MJ]	6.82E+03	8.31E+03	1.07E+04	1.34E+04	1.63E+04	1.98E+04
Water use [m³ world equiv.]	3.11E+01	3.99E+01	4.88E+01	5.80E+01	6.88E+01	7.95E+01
Global warming potential - Greenhause gases (GWP-GHG) [kg CO2 eq.]	2.26E+02	2.59E+02	3.44E+02	4.43E+02	5.52E+02	6.93E+02
Ressource use indicators						
Use of renewable primary energy (PERE) [MJ]	3.78E+02	4.64E+02	5.94E+02	7.43E+02	9.07E+02	1.10E+03
Use of renewable primary energy resources used as raw materials (PERM) [MJ]	3.65E+01	4.51E+01	5.69E+01	7.00E+01	8.46E+01	1.01E+02
Total use of renewable primary energy resources (PERT) [MJ]	4.14E+02	5.09E+02	6.51E+02	8.13E+02	9.92E+02	1.20E+03
Use of non-renewable primary energy (PENRE) [MJ]	6.80E+03	8.29E+03	1.06E+04	1.33E+04	1.63E+04	1.97E+04
Use of non-renewable primary energy resources used as raw materials (PENRM) [MJ]	3.09E+01	3.59E+01	4.68E+01	5.94E+01	7.33E+01	9.10E+01
Use of secondary material (SM) [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (PENRT) [MJ]	6.83E+03	8.32E+03	1.07E+04	1.34E+04	1.63E+04	1.98E+04
Use of net fresh water (FW) [m3]	4.70E+00	5.86E+00	7.28E+00	8.78E+00	1.05E+01	1.24E+01
Output flows and waste categories						
Hazardous waste disposed (HWD) [kg]	7.63E-02	8.51E-02	1.15E-01	1.51E-01	1.90E-01	2.42E-01
Non-hazardous waste disposed (NHWD) [kg]	1.05E+01	1.20E+01	1.60E+01	2.08E+01	2.59E+01	3.27E+01
Radioactive waste disposed (RWD) [kg]	1.72E-01	1.98E-01	2.63E-01	3.41E-01	4.24E-01	5.33E-01
Total use of non-renewable primary energy resources (PENRT) [MJ]	2.26E+02	2.59E+02	3.44E+02	4.43E+02	5.52E+02	6.93E+02

References

General Programme Instructions of the International EPD® System. Version 3.01.
ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework
ISO 14020:2000 Environmental Labels and Declarations - General Principles
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