Environmental Product Declaration

In accordance with ISO 14025:2006, EN 15804:2012+A2:2019/AC:2021:

Chrome-plated copper pipes

from

BML Produktion AB

Chrome-plated Hard copper pipes
Chrome-plated Half-hard copper pipes
Chrome-plated Annealed copper pipes

EPD of multiple products, based on a representative product. The EPD covers the following products: Chrome-plated hard copper pipes, chrome-plated half-hard copper pipes, and chrome-plated annealed copper pipes. The material composition for the three product variants is identical.

EPD Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products from a company
EPD registration number:	EPD-IES- 0032255:001
Version date:	2026-06-30
Validity date:	2031-06-30

Note: An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see 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:	support@environdec.com

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 v.2.0.1 (EN 15804+A2) (2.0.1) and UN CPC code 41516
PCR review Rob Rouwette (chair), Noa Meron (co-chair) PCR review was conducted by: The Technical Committee of the International EPD® System. *See www.environdec.com/TC for a list of members.*
Life Cycle Assessment (LCA)
LCA accountability: Sara Hidendahl and Anton Lenstrup, Trossa AB

Third-party Verification:

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ **Individual EPD verification without a pre-verified LCA/EPD tool**
Third-party verifier: Viktor Hakkarainen, CHM Analytics AB
Approved by: International EPD System

☐ Individual EPD verification with a pre-verified LCA/EPD tool
☐ EPD process certification* without a pre-verified LCA/EPD tool
☐ EPD process certification* with a pre-verified LCA/EPD tool
☐ Fully pre-verified EPD tool

**EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.*

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD

BML Produktion AB
Plastgatan 5, 261 73 Häljarp, SWEDEN
See more information about BML Produktion AB at www.bmlproduktion.com

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LCA practitioners

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Further information about the LCA practitioners commissioned by the EPD owner is available at www.trossa.se

Description of the organisation

BML Production AB, hereby BML, operates a fully automated surface treatment line capable of processing copper pipes. The process is designed with complete separation between operators and machinery to ensure safety and process stability. All metals, chemicals, and rinse water are separately treated, resulting in zero discharge to the municipal wastewater network. The production and market sales are based in Sweden.

PRODUCT INFORMATION

Product name

Half-hard Chrome-plated copper pipes
Annealed Chrome-plated copper pipes
Hard Chrome-plated copper pipes

UN CPC code

41516

Product description:

The products treated in this LCA are annealed, half-hard, and hard chrome-plated copper pipes, hereby plated copper pipes, including packaging. The plated copper pipes have a volumetric density of 8,96 kg/dm^3. Plated copper pipes are widely used in water, heating, and cooling systems in both new builds and renovations due to their durability and corrosion resistance. Annealed (soft) plated copper pipes are flexible and ideal for concealed installations that require bending. Half-hard and hard plated copper pipes are more rigid and are typically used for visible, straight pipe runs. Plated copper pipes are used in exposed areas where a decorative, easy-to-clean finish is desired, such as bathrooms.

Geographical scope

The plated copper pipes are produced in Häljarp, Sweden, and sold on the Swedish market. End-of-life for packaging and product is modelled with a geographical representativeness of Sweden.

Manufacturing site

The production site is located in Häljarp, Sweden

CONTENT DECLARATION

The content declaration is representative of all three plated copper pipe variants (hard, half-hard, annealed), as the raw material composition is identical for all product types. The differences between the variants arise solely from the copper processing used to achieve the required material properties (not in material composition), and the plating process remains identical.

PRODUCT CONTENT DECLARATION						
Components	**Raw material**	**Recycled material, mass % of product**	**Mass (kg)**	**Weight (%)****	**Biogenic material, mass% of product**	**Biogenic material, kg C/product**
Copper pipes	Copper	0%	0,992	88,65%	0%	0
Nickel	Nickel	0%	0,008	0,71%	0%	0
Chrome	Chrome	0%	0,0003	0,03%	0%	0
Product packaging	**Raw material**	**Recycled material, mass % of product**	**Mass (kg)**	**Weight (%)****	**Biogenic material, mass% of product**	**Biogenic material, kg C/product**
Plastic lids	Polyethylene	0%	0,0017	0,16%	0%	0
Cardboard	Cardboard	0%	0,1171	10,46%	100%	0,050*
Total product and packaging weight			1,1191	100%		

* Corresponding to 0,183 kg biogenic CO2
** The weight% relates to the total weight of the product, including its packaging. In other words, the weight% is the weight% of both the product and packaging

No substances included in the Candidate List of SVHC (Substances of Very High Concern) for authorization under the REACH regulations exceeding 0,1 wt % in any material. 1 kg of biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of biogenic CO2.

LCA INFORMATION

Functional unit

The LCA study was based on a declared unit defined as 1 kg of plated copper pipes.

Conversion factors

The ability to convert the declared unit into specific products is essential to make the results user-friendly and easy to apply. The tables below list all the different copper pipes covered by the group EPD, their dimensions, and the weight per pipe, respectively. The environmental impact of a given copper pipe is calculated by multiplying the results by the pipe's weight. When the results are converted, the environmental impacts are presented by specific article number. The total environmental impact is then calculated by multiplying the results by the quantity of the corresponding copper pipe article.

RSK Article nr	Dimensions	Length	Weight
Hard plated copper pipes (Chrome 6)	**Diameter (mm)**	**mm**	**kg/pipe**
8564374	28x1,2	2500	2,28
8564375	35x1,5	2500	3,88
Half-hard plated copper pipes (Chrome 6)	**Diameter (mm)**	**mm**	**kg/pipe**
8564361	10x0,8	1000	0,21
8564362	10x0,8	2000	0,42
8564363	12x0,8	2750	0,58
8564364	12x1,0	1000	0,29
8564365	12x1,0	2000	0,58
8564366	12x1,0	2750	0,78
8564367	15x1,0	1000	0,39
8564368	15x1,0	2000	0,78
8564369	15x1,0	2750	0,98
8564370	18x1,0	2000	0,96
8564371	18x1,0	2750	1,33
8564372	22x1,0	2000	1,19
8564373	22x1,0	2750	1,64
Annealed plated copper pipes (Chrome 6)	**Diameter (mm)**	**mm**	**kg/pipe**
8564033	10x0,8	1200	0,25
8564034	10x0,8	2000	0,42
8564035	12x1,0	1200	0,34
8564036	12x1,0	2000	0,58
8564037	15x1,0	1200	0,47
8564038	15x1,0	2000	0,78
8564039	18x1,0	2000	0,96
Half-hard plated copper pipes (Chrome 3)	**Diameter (mm)**	**mm**	**kg/pipe**
4811028	10x0,8	2000	0,42
4811029	10x0,8	2750	0,58
4811031	12x1,0	2000	0,58
4811032	12x1,0	2750	0,78
4811033	15x1,0	2000	0,78
4811034	15x1,4	2750	0,98
4811035	22x1,0	2000	1,19
4811036	22x1,0	2750	1,64
1752041	10x0,8	1000	0,21
1752042	12x1,0	1000	0,29
1752043	15x1,0	1000	0,39
1752047	12x1,0	1000	0,29
1752048	15x1,0	1000	0,39
Annealed plated copper pipes (Chrome 3)	**Diameter (mm)**	**mm**	**kg/pipe**
1752044	10x0,8	1200	0,25
1752045	12x1,0	1200	0,34
1752046	15x1,0	1200	0,47

Reference service life
Not relevant

Time representativeness:
The data are representative of production practices for 2025.

Geographical scope
Europe (A1-A2), Sweden (A3-C4)

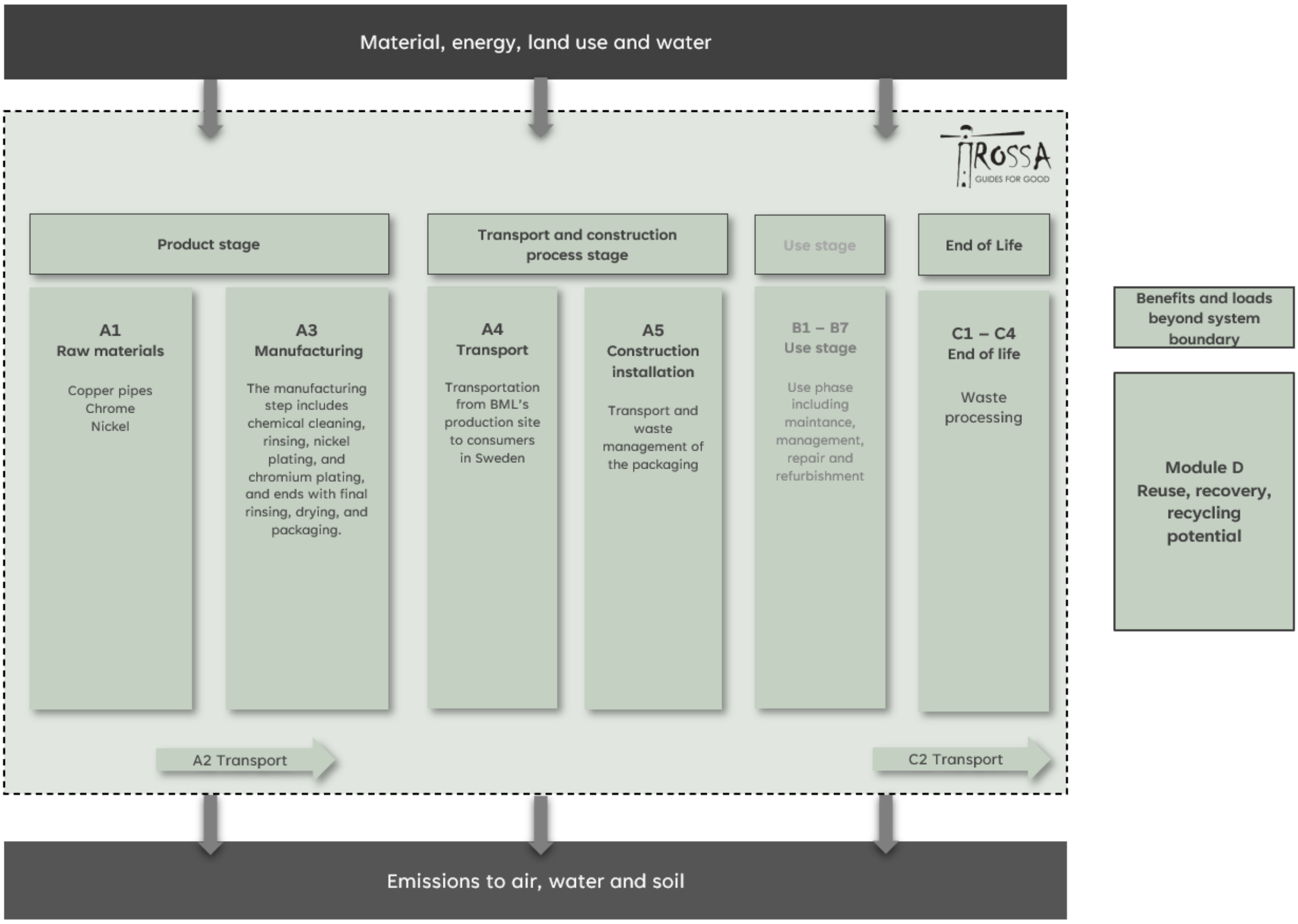
Database and LCA software used
The LCA study was modelled in the LCA software SimaPro version 10.4 with the LCA library Ecoinvent 3.12 allocation, cut-off, EN15804. Furthermore, the EN 15804 reference package (EF 3.1) was employed in the assessment.

Cut-off criteria
Life Cycle Inventory (LCI) data shall, according to EN 15804 and PCR 2019:14, include a minimum of 95% of the total mass and energy inflows per module (A1-A5, C1-C4) and aggregated modules (B1-B5, B6-B7, D). Furthermore, the PCR 2019:14 requires compliance with ISO 21930, which states that at least 95 % of the environmental impact per aggregated module shall be included. In addition, the LCI shall include a minimum of 99% of the mass and energy inflows per unit process. If less than 100% of the inflows are accounted for, proxy data or extrapolation should be used to achieve 100% completeness. Exclusions and cut-offs made in the study are presented below; the sum of the neglected material flows does not exceed 5% of mass and energy. No other materials or energy flows were excluded from the remaining modules, which was concluded by the data collection conducted by the EPD owner and the practitioners.

Excluded materials	Motivation or description
Labels	Considered negligible
Chrome (3 or 6)	The chrome plating adds a microscopic layer of chrome (oxidation state 0) on the surface of the copper pipes. The mass percentage of chrome is below 0,03% determined by the manufacturer. Thus, this material input was excluded to facilitate data collection, as its weight and environmental impact were considered negligible based on expert assessment by the LCA practitioners.
Module C1	The demolition phase’s environmental impact was considered negligible as previously mentioned in Chapter 4.7.6. This assumption was investigated in a sensitivity analysis, see Chapter 6.3.2.

System boundaries and Process flow diagram
The EPD is type B, Cradle to gate with options, module C1-C4, module D and optional modules A4 and A5. More specifically, the product stage includes modules A1 - raw material extraction and processing, A2 - transport to the manufacturer, and A3 - manufacturing. In module A3, the end-of-life and waste management scenario of the packaging that surrounds the raw materials during transportation is also included. Module A4 is included in the study and represents transportation from the manufacturing site to the consumer. Module A5 includes the transport and waste management of the product’s packaging.

Furthermore, module C1 (deconstruction and demolition) is considered to have negligible environmental impacts and is therefore assumed to be zero. Given the product's nature, no significant dismantling occurs before waste transportation. If it is dismantled, this is done manually with simple tools and does not consume any energy. The included End-of-Life (EoL) modules C2–C4 encompass transport, waste processing, and the product's EoL. Module D is included in the study and accounts for benefits and loads beyond the system boundary, including reuse, recovery, and recycling potentials. All energy carriers used, such as electricity generation and upstream fuel production, are included in each module.



More information:

Recycled Material

The product contains no intentionally added post-consumer or pre-consumer recycled material according to the information provided by the supplier. However, the Resource Use Indicator "Secondary Materials" reports the use of secondary materials, as these values were derived from the underlying Ecoinvent datasets and reflect the background datasets rather than the products' specific recycled content.

Personnel, capital goods, and Infrastructure

Personnel-related, capital goods, and infrastructure processes were excluded from the studied product system, as the PCR 2019:14 explicitly requires exclusion of these processes.

Additional information regarding electricity modelling

According to the PCR 2019:14, market-based electricity modeling shall be applied in the manufacturing stage (A3). BML has purchased 100% hydropower from Vattenfall AB since 2021 and will continue to buy the electricity during the EPD validity period. Thus, the electricity was modelled with Ecoinvent hydropower datasets (SE). More specifically, the electricity modeling was conducted as followed: 1. The electricity dataset for the transformation of high to medium voltage was modified from the dataset "Electricity, high voltage {SE}| market for electricity, high voltage | EN15804, U" to 80% "Electricity, high voltage {SE}| electricity production, hydro, reservoir, non-alpine region | EN15804, U" and 20% “Electricity, high voltage {SE}| electricity production, hydro, run-of-river | EN15804, U”; 2. The dataset “Electricity, medium voltage {SE}| market for electricity, medium voltage | EN15804, U” was modified by removing the electricity datasets for various sources and adding the “Electricity, medium voltage {SE}| 100% Hydropower | electricity voltage transformation from high to medium voltage | EN15804, U”. In addition, as the electricity medium voltage dataset was in itself, accounting for the losses, "Electricity, medium voltage {SE}| market for electricity, medium voltage | EN15804, U" was substituted for the adjusted dataset itself "Electricity, medium voltage {SE}| 100% Hydropower | EN15804, U". The GWP-GHG emission factor for the electricity was derived from Ecoinvent 3.12 and was 0,0393 kg CO2e/kWh.

Qualitative Data Quality Assessment

The inventory data were collected to represent production during the reference period, with Ecoinvent 3.12, cut-off, EN15804 (ecoinvent, 2025), serving as the applied LCI library. The Ecoinvent datasets representative for 2025 resulted in a “very good” rating for temporal representativeness across all processes. Moreover, the chosen processes were evaluated and considered sufficiently representative to fulfil the LCA study’s goal and scope. Overall, the assessed processes, including all relevant flows based on collected supplier activity data, demonstrate a high level of data quality in terms of geographical, temporal, and technological representativeness, as well as in completeness, precision, and consistency.

Data quality assessment, Qualitative					
Process Group	**Data source**	**Data category**	**Geographical Representativeness**	**Temporal Representativeness**	**Technological Representativeness**
Copper pipe	EPD	Representative Secondary Data	Very good	Very good	Very good
Manufacturer's electricity consumption	BML (GOs), Database	Primary data	Very good	Very good	Very good

Quantitative Data Quality Assessment

Data quality assessment and declaration A1-A3, Quantitative					
Process	**Source Type**	**Source**	**Reference Year**	**Data category**	**Share of primary data, of GWP-GHG results for A1-A3**
Transport of Nickel and Copper pipes, and electricity consumption at manufacturing site	BML (GOs), Database	Ecoinvent 3.12 allocation, cut-off, EN 15804 - unit	2025	Primary data	1,61%

Impact Assessment Method

The method used to calculate the product’s environmental impacts was by using the adopted version of EN 15804 + A2 Method V1.04 EF 3.1 (adapted for SimaPro substances). The 2019 EN 15804 + A2 revision of this standard has aligned the methodology with the Environmental Footprint method, except for the approach on biogenic CO2 emissions. According to EN 15804, biogenic CO2 emissions cause the same amount of Climate change as fossil CO2, but can be neutralized by uptake. The biogenic CO2 characterization factor was neutralized, and the biogenic CO2 uptake and emissions were manually added to the modules where the uptake and release occur. Over the product’s complete life cycle, the biogenic CO2 is neutralized and does not contribute to or mitigate climate change. Regarding the resource use indicators, they were partly derived from the extended method EN 15804 + A2 Method LCIA & LCI, an add-on included in the Ecoinvent 3.12 allocation, cut-off, EN15804. PERM and PENRM were calculated manually using the Ecoinvent 3.12 EN15804 library.

Module A4 Scenarios

In this study, transportation distances and types were based on a weighted average, which was derived from collected data from BML Produktion AB facility to the final consumer, reflecting the company’s sales and market distribution during the reference period.

Module A5 Scenarios

The end-of-life and waste management scenario of the product packaging is included in module A5. The transport of packaging waste, which occurs after the customer receives the product, includes packaging materials for the plated copper pipes. The recycling scenarios in module A5 were based on recycling statistics from (Eurostat 2. , 2025) and necessary assumptions to reach 100% scenarios, which were the following:

Cardboard packaging waste: Based on data from 2023 for Sweden, the mean recycling rate for Paper and cardboard packaging was 80,9%. The remaining 18% was assumed to be incinerated with energy recovery. The assumed average distance and transportation mode used are derived from the Ecoinvent dataset for "Waste paperboard {SE}| market for waste paperboard | EN15804, U".

Plastic packaging waste: Based on data from 2023 for Sweden, the mean recycling rate for general plastic packaging was 28,6%. Moreover, the remaining share of 70,4% was assumed to be incinerated and 1% to be landfilled. The assumed average distance and transportation mode are derived from the Ecoinvent dataset for “Waste polyethylene {SE}| market for waste polyethylene | EN15804, U”.

Module C1

The deconstruction phase (C1) is assumed to consist primarily of manual dismantling using hand-held tools, such as a pipe cutter, with negligible energy consumption. Potential energy use from small electrical tools is considered insignificant and therefore excluded.

Module C2

Given variations in the product’s market representation, an assumption was made based on a European context. The transportation modes and distances applied in the waste scenario for Module C2 were derived from a dataset for cardboard packaging waste and were considered representative of both the geographical scope and the product under study.

Module C3 and C4 Scenarios

The LCA study has assumed 100% recycling as the EoL scenario due to the following: 1. The plated copper pipes are of very high quality (>99% Cu); 2. They are easily separated from other waste flows when switched out/or removed during demolition of a building; 3. There is a high market value of copper, and the market for secondary copper is well-developed; 4. The quality of copper during recycling is conserved; and 5: There are no hazardous substances in the product. Consequently, the EoW criteria are met when the copper pipes are collected and sorted, after which it is ready to be remelted. As a consequence, the copper pipes leave the product system after sorting. The remelting and substitution of virgin copper are included in module D. The EoW criteria for copper pipes were backed up with a publication directly related to the copper pipes EoW criteria (Union, u.d.). Even if a 100% recycling scenario was applied, the applied sorting dataset assumed 2% impurities, sent to landfill after the sorting of the waste, which was not altered to maintain dataset consistency. The 2% sent to landfill was extracted and separated from this dataset to enable reporting the environmental impact in Module C4.

Furthermore, no dataset exists in Ecoinvent for sorting of source-separated copper pipes waste from construction applications. Therefore, the dataset "treatment of used beverage cans, for recycling, unsorted, sorting" was used as a proxy for the sorting activity only. Aluminum-specific material flows were replaced with copper scrap flows, while energy and infrastructure requirements were retained to represent the sorting effort. The geographical representativeness of the electricity was adjusted from the European to the Swedish electricity mix. The chosen dataset was analyzed as the most appropriate one to model the recycling scenario due to: 1. It is a pure flow of the material going into the sorting process; 2. It has a high yield of 98%; 3. It does not contain any magnetic separation. Ultimately, these three properties apply well to the copper pipes EoL scenario.

Module D

Module D provides information on potential benefits and loads beyond the system boundary associated with the recovery of energy and materials from waste treatment processes occurring in Modules A–C. It includes the effects of exported energy from waste incineration, as well as the potential substitution/consumption of primary materials and energy through recycling and energy recovery. The substitution potential reflects the extent to which recovered materials and energy can replace primary resources in subsequent product systems. These effects are quantified in Module D in accordance with the applicable methodological requirements. For products containing recycled input materials, the corresponding share is deducted to avoid double-counting environmental benefits.

More specifically, each waste flow that had fulfilled its EoW criteria had a corresponding scenario in module D. Moreover, modules A5, and C3 included module D calculations, which were related to the recycling of waste streams and the exported electricity and heat from incineration. The module D calculations were structured according to the EN 15804 equations (D.5-D.9) found in Annex D. Equation D.6 regards the burdens and benefits of the use of secondary materials and substitution of virgin material as a result of recycling. Equation D.7 considers the export of secondary fuels, while Equations D.8 and D.9 relate to the export of electricity and heat from incineration and the collection of gas from landfills, respectively.

Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results)

	Product stage			Distribution/ installation stage		Use stage							End-of-life stage				Beyond the product's life cycle
	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	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU27	EU27	SE	SE	SE	-	-	-	-	-	-	-	SE	SE	SE	SE	SE
Share of primary data	1,61 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	1,26 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-

ENVIRONMENTAL PERFORMANCE

Mandatory impact category indicators according to EN 15804

Results per declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	5,54E+00	8,33E-02	1,91E-01	0	8,40E-03	1,85E-03	4,34E-04	-3,55E+00
GWP-fossil	kg CO_2 eq.	5,66E+00	8,33E-02	7,43E-03	0	8,40E-03	1,81E-03	4,33E-04	-3,53E+00
GWP-biogenic	kg CO_2 eq.	-1,76E-01	2,83E-06	1,84E-01	0	2,88E-07	5,92E-06	7,20E-07	-9,82E-03
GWP-luluc	kg CO_2 eq.	5,24E-02	1,29E-06	1,19E-06	0	1,31E-07	3,42E-05	5,20E-08	-7,15E-03
ODP	kg CFC 11 eq.	6,90E-08	1,87E-09	3,56E-11	0	1,90E-10	2,69E-11	1,68E-11	-5,46E-08
AP	mol H^+ eq.	3,70E-01	9,65E-05	1,44E-05	0	3,53E-05	1,60E-05	5,18E-06	-5,08E-01
EP-freshwater	kg P eq.	3,07E-02	4,43E-07	5,39E-07	0	4,50E-08	5,00E-08	8,19E-07	-4,08E-02
EP-marine	kg N eq.	2,11E-02	2,36E-05	7,70E-06	0	1,73E-04	8,21E-05	1,41E-05	-2,19E-02
EP-terrestrial	mol N eq.	2,84E-01	2,57E-04	5,92E-05	0	1,73E-04	8,21E-05	1,41E-05	-3,20E-01
POCP	kg NMVOC eq.	7,88E-02	2,09E-04	1,77E-05	0	5,67E-05	2,42E-05	5,17E-06	-8,94E-02
ADP-minerals&metals*	kg Sb eq.	5,14E-03	2,23E-09	4,29E-10	0	2,26E-10	1,81E-10	1,19E-10	-6,73E-03
ADP-fossil*	MJ	7,21E+01	1,09E+00	2,89E-02	0	1,11E-01	6,41E-02	1,08E-02	-4,69E+01
WDP*	m^3	4,98E+00	7,61E-04	1,31E-03	0	7,72E-05	1,04E-03	1,39E-10	-6,61E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

** Disclaimer: 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 experience with the indicator.*

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

ENVIRONMENTAL PERFORMANCE

Additional mandatory impact category indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	5,72E+00	8,33E-02	8,35E-03	0	8,40E-03	1,85E-03	4,34E-04	-3,55E+00

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Human toxicity, cancer [2]	CTUh	7,61E-08	4,95E-12	3,07E-12	0	1,52E-12	1,54E-13	1,54E-13	-5,33E-08
Human toxicity, non-cancer	CTUh	4,19E-06	4,39E-10	1,18E-10	0	6,64E-11	4,34E-12	1,15E-11	-5,48E-06
Ecotoxicity, freshwater	CTUh	4,52E+02	4,84E-02	5,43E-02	0	5,21E-03	2,04E-03	6,86E-03	-5,74E+02
Land use	Pt	1,46E+02	1,43E-03	2,44E-03	0	1,46E-04	9,88E-03	2,72E-02	-1,48E+02
Ionizing radiation[3]	kBq U-235 eq	5,52E-01	2,66E-04	1,97E-04	0	1,46E-04	9,88E-03	2,72E-02	-6,53E-01
Particulate matter	disease inc.	8,96E-07	4,12E-09	1,69E-10	0	7,22E-10	4,55E-10	7,79E-11	-9,88E-07

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

[2] The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.

[3] 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 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.

ENVIRONMENTAL PERFORMANCE

Resource use indicators

The Resource Use Indicators results are presented below. Furthermore, the energy indicators were calculated in accordance with option A specified in the PCR 2019:14.

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	2,22E+01	2,69E-03	1,87E-03	0	2,73E-04	2,82E-02	1,75E-04	-2,13E+01
PERM	MJ	2,98E+00	0,00E+00	-2,98E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,52E+01	2,69E-03	0,00E+00	0	2,73E-04	2,82E-02	1,75E-04	-2,13E+01
PENRE	MJ	6,92E+01	1,09E+00	2,89E-02	0	1,11E-01	6,41E-02	1,08E-02	-4,69E+01
PENRM	MJ	2,93E+00	0,00E+00	-2,93E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	7,21E+01	1,09E+00	-2,90E+00	0	1,11E-01	6,41E-02	1,08E-02	-4,69E+01
SM	kg	5,06E-01	5,60E-07	2,84E-05	0	5,68E-08	1,31E-07	5,25E-07	-2,08E-01
RSF	MJ	9,64E-02	4,88E-08	1,30E-07	0	4,96E-09	8,89E-09	5,06E-08	8,65E-03
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	2,07E+00	1,86E-05	3,11E-05	0	1,89E-06	4,33E-05	-1,38E-04	-1,64E-01
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0	0	0	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	0	0	0	0	0	0
Radioactive waste disposed	kg	0	0	0	0	0	0	0	0

ENVIRONMENTAL PERFORMANCE

Output flow indicators

Results per declared unit									
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	4,21E-01	2,78E-08	9,39E-02	0	2,82E-09	9,50E-01	9,70E-08	-1,20E-02
Materials for energy recovery	kg	3,85E-05	2,72E-10	5,55E-10	0	2,77E-11	8,49E-11	4,92E-11	-3,01E-05
Exported energy, electricity	MJ	6,33E-02	4,24E-05	3,73E-05	0	4,31E-06	1,01E-03	4,91E-06	-1,17E-01
Exported energy, thermal	MJ	1,72E-01	1,04E-04	4,83E-06	0	1,06E-05	3,01E-07	1,02E-05	-6,93E+00

ABBREVIATIONS

Abbreviations	Definition
CO_2eq	Carbon dioxide equivalents
EoW	End of Waste
EoL	End of Life
EPD	Environmental Product Declaration
ESL	Estimated Service Life
GLO	Global
GOs	Guarantees of origin
GPI	General Programme Instructions
GWP	Global Warming Potential
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
PCR	Product Category Rules
RER	The European region
RoR	Run of River
RoW	Rest of the world
RSL	Reference Service Life

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VERSION HISTORY

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