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A VERIFIED ENVIRONMENTAL DECLARATION

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Environmental Product Declaration

EN ISO 14025: 2010

EN 15804: 2012+A2:2019

EN 17160: 2019

Grespania, S.A.

COVERLAM Ceramic Tiles. Porcelain stoneware tiles (Bla)

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COVERLAM TECHNICAL STONE

The owner of this Declaration is responsible for its content, as well as for keeping the supporting documentation that justifies the data and statements included during the period of validity.

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AENOR is a founding member of ECO Platform, the European Association of Environmental Product Declaration Verification Programmes.

EN 17160:2019 PCR for Ceramic tiles EN 15804:2012+A2:2019 serves as the basis for the PCR
Independent verification of the declaration and data, in accordance with the Standard ISO 14025:2010 ☐ Internal ☒External
Verification Body AENOR Product certification body accredited by ENAC under accreditation Nº 1/C-PR468

1. General Information

1.1. Description of the organisation

Grespania is an international company with over 45 years of experience, dedicated to the manufacture and marketing of innovative ceramic products, both in terms of technical properties and design. Ongoing investment, continuous adoption of the latest advancements in manufacturing and design, and a strong commitment to environmental sustainability have cemented its global leadership in recent years.

Grespania currently operates three state-of-the-art manufacturing facilities equipped with the latest technologies and most advanced processes for the production of porcelain stoneware tiles, earthenware tiles, and large-format Porcelain stoneware tiles, up to 120x360 cm in size and with minimal thicknesses.

In addition to its production centers in Spain, the company has subsidiaries in France, Italy, the Netherlands, Poland, and the United Kingdom, as well as offices in the United States, Asia, and Mexico, providing local support and service. As a result, 70% of its total production is exported.

1.2. Scope of the Declaration

This Environmental Product Declaration includes environmental information for a group of products manufactured in a production centre in a geographical and technological environment in Spain 2023.

The location of this production centre is shown below:

GRESPANIA Moncófar
Cami de cabres S/N, Poligono Industrial
Casablanca, Moncófar, 12593,
Castellón (Spain)

The results shown the environmental performance of the porcelain stoneware tiles (group BIa), as average weighted by production. Moreover, the environmental data of the tiles with the lowest and highest impact, thus narrowing down the results obtained in the LCA are also declared. The scope of this Environmental Product Declaration (hereinafter EPD) is from cradle to grave.

1.3. Life cycle and compliance

This EPD has been developed and verified in accordance with EN ISO 14025:2006 and EN 15804:2012+A2:2019 and the following Category Rule:

INFORMATION ABOUT PRODUCT CATEGORY RULES	
Descriptive title	Product Category Rules for Ceramic Tiles
Registration code and version	EN 17160:2019
Publication date	2019
Compliance	EN 15804:2012+A2:2019
Programme Manager	AENOR

This Environmental Statement includes the following life cycle stages:

Limits of the system. Information modules considered

Product Stage	A1	Raw materials supply	X
	A2	Transport	X
	A3	Manufacturing	X
Construction	A4	Transport of the product	X
	A5	Installation and construction processes	X
Use	B1	Use	X
	B2	Maintenance	X
	B3	Repair	X
	B4	Replacement	X
	B5	Refurbishment	X
	B6	Use of energy in service	X
	B7	Use of water in service	X
End of Life	C1	Deconstruction	X
	C2	Transport	X
	C3	Waste management	X
	C4	Waste disposal	X
	D	Potential for reuse, recovery and recycling of materials	X

X = Module included in the LCA

This EPD may not be comparable with those developed in other Programmes or according to different reference documents, in particular it may not be comparable with EPDs not developed according to EN 15804+A2.

Similarly, this EPD may not be comparable if the origin of the data is different (e.g. databases), not all relevant information modules are included or they are not based on the same scenarios.

The comparison of construction products should be done on the same function, applying the same functional unit and at the level of the building (or architectural or engineering work), i.e. including the behaviour of the product throughout its life cycle, as well as the specifications of section 6.7.2 of the ISO 14025 standard.

2. Product information

2.1. Product identification

COVERLAM are large-format ceramic pieces belonging to group BIa, a classification based on standard EN 14411:2016 (equivalent to standard ISO 13006:2018), i.e. they have a water absorption of less than 0.5% and are formed by pressing. Its common name is Porcelain Stoneware Tile.

The porcelain stoneware tiles included in this study include 22 commercial formats. Their thicknesses range from 3.5 mm to 5.6 mm, with an average weight of 10.4 kg/m^2.

In the annexes, the results of the formats included in the scope of this EPD with the minimum and maximum environmental impact can be found, corresponding to the formats: 1000x3000 cm of 7.3 kg/m^2 and 3.5 mm thick and 1200x2600 cm of 12.4 kg/m^2 and 5.6 mm thick fired weight respectively.

The CPC code of the product is 37370.

2.2. Product technical features

The manufacturer declares the following information on the technical specifications of the product:

Product technical features

Description	Standard	Requirements
Dimensional stability and surface appearance	ISO 10545-2	Yes
Water absorption	ISO 10545-3	<0.1%
Modulus of Rupture	ISO 10545-4	< 50 N/mm^2
Breaking Strength	ISO 10545-4	<1000 N
Impact resistance	ISO 10545-5	e = 0.7
Surface abrasion resistance	ISO 10545-6	< 175 mm^3
Thermal Expansion	ISO 10545-8	< 7 x10^{-6} K^{-1}
Thermal Shock	ISO 10545-9	Yes
Frost Resistance	ISO 10545-12	Yes
Resistance to Chemicals	ISO 10545-13	ULA/UA
Stain Resistance	ISO 10545-14	5

This EPD contemplates residential interior floor coverings as a study scenario, however, the versatility of these ceramic tiles allows their installation in other places such as walls, roofs, façades, exterior flooring and in other types of buildings with different pedestrian traffic intensities, such as hospitals, schools, offices or shopping centres.

2.3. Product composition

The composition declared by the manufacturer is as follows:

Product composition

Substance/Component	Content
Support (clays, feldspars, sands, etc.)	97%
Decoration raw materials (grits, glazes, inks)	3%

Substances contained in the product that are listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" do not exceed 0.1% by weight of the product.

3. LCA information

3.1. Life Cycle Assessment

The LCA has been carried out with the support of the LCA for Experts software (Sphera-GaBi) [7] and with the database version 2024.2 (SP40.0) [8]) (SpheraSolutions). The characterisation factors used are those included in the EN 15804:2012+A2:2019 standard.

3.2. Functional unit / declared unit

The functional unit considered is *"Covering 1 m^2 of the interior floor of a dwelling with ceramic tiles of group BIa, 10.4 kg/m^2 and 4.8 mm thick, for 50 years".*

3.3. Reference service life (RSL)

The reference useful life of the product is the same as that of the building where it is installed, provided it is installed correctly, as it is a long-lasting product that does not require replacement. A useful life of 50 years has been considered.

Reference service life

Parameter	Unit (expressed per functional unit or per declared unit)
Reference service life	Minimum 50 years
Declared product properties (on gate), coatings, etc.	Minimum values of the relevant characteristics according to Annex G of the EN 14411. For more information request technical data sheets according to model.
Design parameters of the application (manufacturer's instructions), including references to good practices	For more information request technical data sheets according to model.
Estimated quality of work, when installed according to the manufacturer's specifications	For more information request technical data sheets according to model.
Installed from outside environment (for outdoor applications), e.g. weathering, pollutants, UV radiation and wind exposure, building orientation, shading, temperature, etc.	Results of the values of the relevant characteristics according to Annex G of the EN 14411. For more information request technical data sheets according to model.
Indoor environment (for indoor applications), e.g. temperature, humidity, chemical exposure	Results of the values of the relevant characteristics according to Annex G of the EN 14411. For more information request technical data sheets according to model.
Conditions of use, e.g.: frequency of use, mechanical exposure, etc.	For more information request technical data sheets according to model.
Maintenance, e.g.: required frequency, type and quality and replacement of replaceable components	For more information request technical data sheets according to model.

3.4. Allocation rules

In accordance with the standards and PCR, the principle of causality has been applied when assigning inputs and outputs in processes with multiple inputs and/or outputs. Therefore, an attempt has been made to establish the physical relationship between the inputs and outputs of the system and its different products.

Generally speaking, in the allocation of inputs and outputs to the declared unit, production-weighted averages have been carried out.

3.5. Cut-off rule and exclusions

In this cradle-to-grave LCA study, a cut-off rule of 1% for the energy use (renewable and non - renewable) and 1% of total mass in those unitary processes, whose data is insufficient, have been applied. In total, more than 95% of all mass and energy inputs and outputs of the system have been included, excluding the not available nor quantified data.

The excluded data are the following:

- Diffuse particle emissions to the atmosphere
- Atmospheric emissions of pollutants, non-regulated
- Recycling and reuse processes for waste generated throughout the life cycle of ceramic tile that is to form part of another system, based on the CPRs.
- Long-term emissions (>100 years)
- The production of some auxiliary materials used in the production of tiles representing less than 0.01% by total mass.
- Machinery and industrial equipment production.
- Mortar losses and its packaging at stage A5.

3.6. Representativeness, quality and selection of data

The primary data have been provided directly by the company Grespania, with a production centre located in Moncofa (Castellón), Spain. For the secondary data, the most updated Sphera-GaBi databases [8] have been used and modelled with the version of LCA for Experts (Sphera-GaBi) [7]. All data belong to a geographical scenario of Spain 2023.

The results presented are representative of ceramic tiles, expressed as an average weighted by the production of the ceramic tiles belonging to the BIa group range, limiting this average by the products with the minimum and maximum environmental impact.

The global warming potential (GWPtotal) of the different technologies that make up the electricity mix used is 0.324 $kgCO_2$ eq/kWh.

3.7. Other calculation rules and assumptions

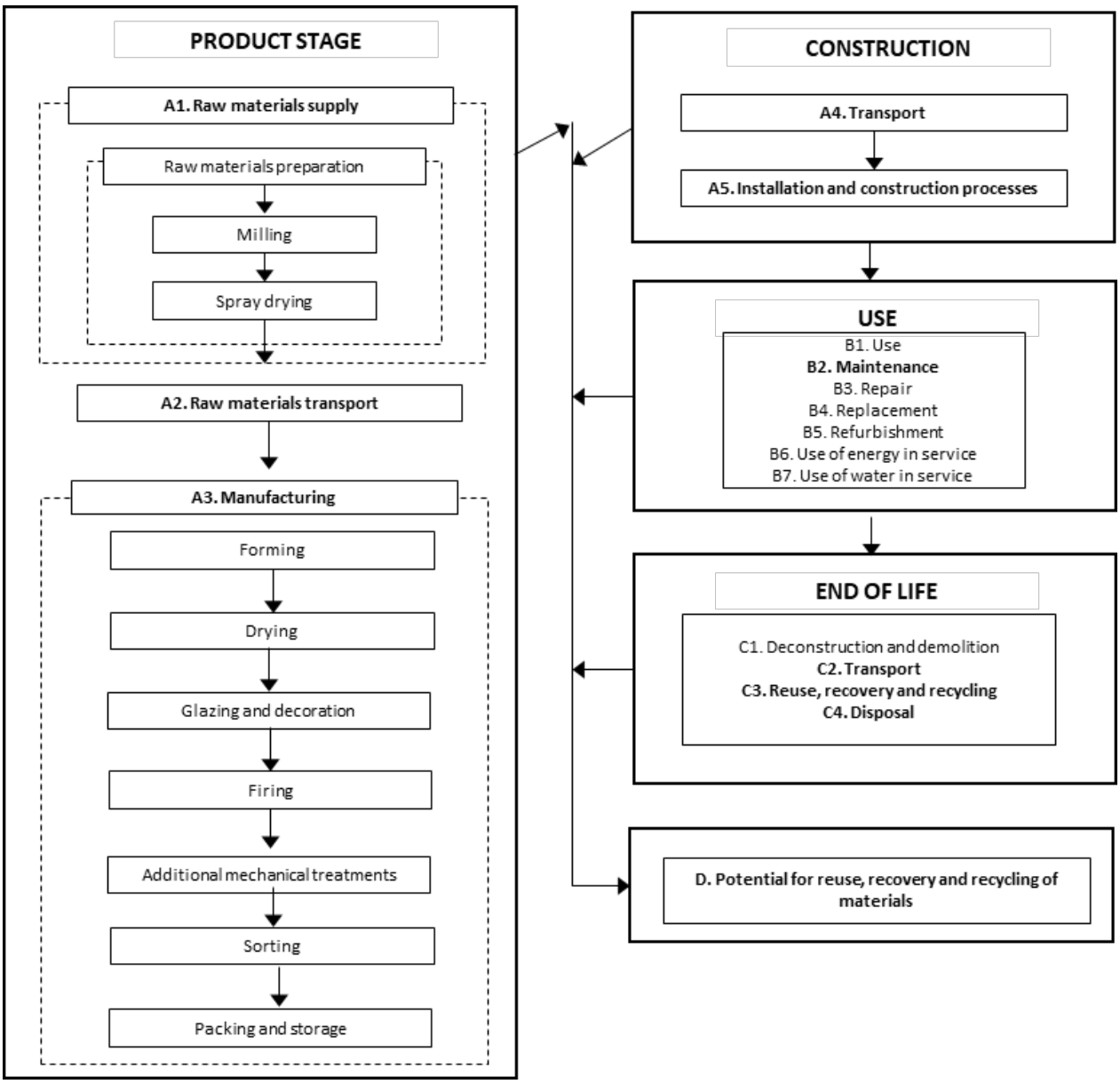
The 27 tile references have different weights and environmental impacts. The following table shows the deviations of the format with the highest and lowest environmental impact with respect to the average, in relation to the product stage (A1-A3). Annex I and Annex II show the environmental impact results of the reference with minimum and maximum impact values respectively.

Impact Indicator	Relative variation from the average
GWP-total	-20%/+12%
AP	-16%/+5%
POCP	-16%/+4%

4. System limits, scenarios and additional technical information.

All life cycle modules relevant to ceramic tiles according to the PCR have been included:

System diagram



4.1. Pre-manufacturing processes (upstream).

Raw materials (A1) and Transport (A2)

Ceramic tiles are composed of a ceramic support and a decorative layer.

The raw materials included in the composition of the support are mainly clays, feldspars, sands and ceramic waste generated during the manufacture.

The raw materials for decoration (grits, glazes and inks) are produced in specialised plants.

The raw materials used have different origins, according to their nature and properties; they are transported by road or by ship in bulk, depending on the distance and location of the extraction point.

4.2. Manufacturing of the product

Manufacturing (A3)

In the spray granule manufacturing plant that supplies Grespania, the raw materials are prepared by wet milling and spray drying with a high-performance cogeneration system.

Once at the Grespania plant, the spray dried granule is shaped by dry uniaxial pressing and then introduced into a continuous dryer.The pieces just out of the dryer are covered with a thin layer or several layers of engobe and glazes, and in some cases, they are decorated mainly by digital inks.

The pieces are then fired in single-layer roller kilns to produce a hard, water- and chemical-resistant material.

Optionally, the parts are subjected to mechanical surface treatments such as cutting, polishing or grinding.

After passing the quality control processes, the sorted parts are boxed and packaged.

4.3. Construction process

Transport (A4)

The product is distributed 20% in Spain, 36% in Europe and 44% in the rest of the world.

Module A4 Transport to site

Parameter	Result (expressed per functional unit)
Type and fuel consumption of the vehicle, type of vehicles used for transport, e.g. long distance trucks, ship, etc..	According to the destinations in the distribution as described above: 0.2 l diesel (Euro truck 6, 27 t) 0.02 l fuel oil (ship)
Distance	300 km national distribution: 20% 1390 km rest of Europe distribution: 36% 6520 km rest of the world distribution: 44%
Capacity utilisation (including no-load return)	85% in truck 100% ship
Bulk density of transported products	≈1800 kg/m3
Usable capacity factor (factor: = 1 or < 1 or ≥ 1 for products that are packed compressed or nested)	Not applicable

Product installation and construction process (A5).

Once the product is unpacked, it is installed. According to the PCRs for ceramic tiles, it has been established that the application of mortar is required for installation.

The waste derived from the packaging of the pieces is managed separately according to the geographical location of the installation site. Otherwise, 5% of product losses have been considered at the installation stage.

Module A5 - Installation

Parameter	Result (expressed per functional unit)
Supplementary materials for installation	3.3 kg of mortar
Water use	0.8 l/m^2
Use of other resources	Not applicable
Quantitative description of the type of energy (regional mix) and consumption during the installation process	Not applicable
Waste of materials at the construction site before processing of waste generated at the product installation (specified by type)	Product losses: 718 g Packaging wastes: Cardboard: 8 g Plastic: 3 g Wood: 1258 g
Output of materials (specified by type) as a result of waste treatment waste at the construction site, e.g. from waste collected for recycling, energy recovery, disposal (specified by route)	Product losses for recycling: 523 g Product losses for final deposition:216 g Incinerated cardboard: 0g Recycled cardboard: 8g Cardboard for final deposition: 0 g Incinerated plastic: 0 g Recycled plastic: 3 g Plastic for final deposition:0 g Incinerated wood: 435 g Recycled wood: 1258 g Wood for final deposition: 39 g
Direct emissions to ambient air, soil and water	Not applicable

4.4. Use Stage

B1 Use

Once it had been installed, the product needed neither water nor energy input for use and do not emissions into the environment. At this stage, there are no processes that generate environmental impacts. For this reason, only the environmental burdens attributable to the maintenance of the product (module B2) are considered.

B2 Maintenance

It can be done with a damp cloth and, if the surface is dirty or greasy, cleaning agents such as detergents or bleaches can be used.

Use linked to the building structure

Parameter	Result (expressed per functional unit)
B2 Maintenance	
Maintenance process	According to RCP for ceramic tiles (EN17160) residential floor and wall cleaning scenario
Maintenance cycle	Washing once a week with water and once every two weeks with detergent.
Auxiliary materials for maintenance (e.g. cleaning products) (specify each material)	Detergent: 6.7E-05 kg/m^2 per cleaning cycle
Material wastage during maintenance (specify type))	Not applicable
Net tap water consumption	0.1 l/m^2 per cleaning cycle
Energy input during maintenance (e.g. vacuum cleaning), type of energy carrier (e.g. electricity) and amount, if applicable and relevant	Not applicable

B3-B4-B5 Repair, replacement and refurbishment

The tiles do not require repair, replacement or renovation if the tiles are correctly installed.

4.5. Use linked to the operation of the building

B6-B7 Operational energy use and Operational water use

These modules are not relevant for ceramic tiles.

4.6. End of Life Stage

C1 Deconstruction and demolition

At the end of its service life, the product will be removed, either as part of a building renovation or during demolition. In the context of the demolition of a building, the impacts attributable to the removal of the product are negligible.

C2 Transport

Product waste is transported 50 km by a truck to be managed either by deposition in inert landfills or recycling.

C3 Waste management for reuse, recovery and recycling

70% of tiles are considered to be recycled and/or reused, as indicated in the PCR.

C4 Final disposal

It was assumed that 30% of the product was sent to controlled landfills after its service life had ended.

End of life

Parameter	Result (expressed per functional unit)
Collection process, specified by type	18.1 kg total
Recovery system, specified by type	12.6 kg for recycling
Disposal, specified by type	5.4 kg to landfill
Assumptions for scenario development (e.g.: transport)	The product waste is transported in a Euro 6 compliant heavy-duty truck (27 t) to be managed either to landfilling or recycling. An average distance of 50km from the building site to the final destination is considered. The return journey of the lorries is also included (100% empty return).

4.7. Benefits and burdens beyond the system

Module D

The net environmental burdens and net benefits of obtaining the secondary material from waste at the installation stage and at the end of life of the product have been considered.

4.8. Information on biogenic carbon content

Ceramic tiles are mineral products; therefore, they do not contain biogenic carbon and plastic packaging contains carbon from fossil sources. However, other packaging such as cardboard or wooden pallets contain biogenic carbon. In this respect, the information for each product studied is shown below.

Biogenic carbon content	Unit	Value
Biogenic carbon content in the product (at the door)	kg C/m^2	-
Biogenic carbon content in the packaging (at the door)	kg C/m^2	6.9 E-01

5. Environmental Information.

Environmental impacts.

The estimated impact results are relative and do not indicate the final value of the impact categories, nor do they refer to threshold values, safety margins or risks.

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq	14.4	6.9E-01	2.3	0	1.9E-01	0	0	0	0	0	0	8.9E-02	1.2E-02	8.2E-02	-1.6E-01
GWP-biogenic	kg CO_2 eq	1.8E-01	8.5E-05	6.0E-02	0	4.4E-03	0	0	0	0	0	0	0	7.0E-06	8.5E-04	-1.1E-04
GWP-luluc	kg CO_2 eq	1.3E-02	9.5E-03	2.7E-03	0	2.4E-05	0	0	0	0	0	0	1.4E-03	4.8E-06	3.6E-04	-3.3E-04
GWP-total	kg CO_2 eq	14.6	7.0E-01	2.4	0	1.9E-01	0	0	0	0	0	0	9.1E-02	1.2E-02	8.4E-02	-1.6E-01
ODP	kg CFC11 eq	1.8E-07	9.1E-14	9.0E-09	0	6.6E-11	0	0	0	0	0	0	1.2E-14	1.2E-13	4.8E-14	-3.2E-09
AP	mol H^+ eq	2.4E-02	3.3E-03	3.8E-03	0	6.1E-04	0	0	0	0	0	0	9.5E-05	1.4E-05	6.1E-04	-6.6E-04
EP-freshwater	kg P eq	3.0E-04	2.4E-06	1.8E-05	0	6.1E-06	0	0	0	0	0	0	3.5E-07	1.4E-09	1.8E-06	-6.9E-07
EP-marine	kg N eq	7.3E-03	8.6E-04	1.3E-03	0	1.4E-04	0	0	0	0	0	0	3.3E-05	4.0E-06	1.7E-04	-2.0E-04
EP-terrestrial	mol N eq	7.6E-02	9.6E-03	1.4E-02	0	1.4E-03	0	0	0	0	0	0	3.9E-04	4.4E-05	1.8E-03	-2.2E-03
POCP	Kg NMVOC eq	2.5E-02	2.5E-03	3.8E-03	0	3.8E-04	0	0	0	0	0	0	1.1E-04	1.2E-05	4.9E-04	-6.7E-04
ADP-minerals& metals [2]	kg Sb eq	5.1E-05	5.1E-08	2.6E-06	0	3.2E-09	0	0	0	0	0	0	7.1E-09	1.4E-09	8.5E-09	-5.8E-08
ADP-fossil [2]	MJ	237.9	8.4	18.3	0	3.3	0	0	0	0	0	0	1.1	3.4E-01	1.1	-1.9
WDP [2]	m^3	3.5	8.9E-03	3.5E-01	0	22.0	0	0	0	0	0	0	1.3E-03	6.7E-03	6.3E-03	-2.0E-02

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.

Additional environmental impacts

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Incidence of diseases	4.8E-06	5.5E-08	2.8E-07	0	3.7E-09	0	0	0	0	0	0	1.0E-09	1.3E-10	7.5E-09	-4.5E-09
IRP [1]	kBq U235 eq	1.8	2.1E-03	1.2E-01	0	2.1E-02	0	0	0	0	0	0	2.8E-04	3.8E-03	1.5E-03	-9.9E-03
ETP-fw [2]	CTUe	54.4	6.2	6.0	0	4.4	0	0	0	0	0	0	8.0E-01	1.9E-02	6.7E-01	-9.2E-01
HTP-c [2]	CTUh	8.8E-09	1.2E-10	6.0E-10	0	2.6E-10	0	0	0	0	0	0	1.6E-11	2.0E-12	8.5E-11	-3.1E-12
HTP-nc [2]	CTUh	1.2E-07	5.2E-09	1.7E-08	0	2.9E-08	0	0	0	0	0	0	7.2E-10	1.2E-11	9.0E-09	-9.3E-10
SQP [2]	-	321.6	3.7	28.1	0	7.3E-01	0	0	0	0	0	0	5.3E-01	4.0E-03	2.6E-01	-1.0

PM: Potential for disease incidence due to emissions of particulate matter (PM); IRP : Exposure efficiency of human potential relative to U235; ETP-fw : Ecosystem toxic unit comparative potential - freshwater; HTP-c : Ecosystem toxic unit comparative potential - carcinogenic effects; HTP-nc : Ecosystem toxic unit comparative potential - non-carcinogenic effects; SQP : Soil quality potential index.

Note 1: This impact category deals mainly with potential impacts of low doses of ionising radiation on human health from the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents or occupational exposure due to disposal of radioactive waste in underground facilities. Ionising radiation potential of soil, due to radon or some building materials is also not measured by this parameter.

Note 2: The results of this environmental impact indicator should be used with caution, as the uncertainties of the results are high and experience with this parameter is limited.

Use of resources

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	82.3	6.4E-01	2.1	0	4.3	0	0	0	0	0	0	9.3E-02	5.6E-02	1.3E-01	-2.1E+01
PERM	MJ	33.4	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	115.6	6.4E-01	3.8	0	4.3	0	0	0	0	0	0	9.3E-02	5.6E-02	1.3E-01	-2.1E+01
PENRE	MJ	237.9	8.4	6.0	0	3.3	0	0	0	0	0	0	1.1	3.4E-01	1.1	-1.9
PENRM	MJ	1.4E-01	0	6.8E-03	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	238.0	8.4	6.0	0	3.3	0	0	0	0	0	0	1.1	3.4E-01	1.1	-1.9
SM	kg	2.2	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	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	6.7E-02	7.2E-04	7.2E-03	0	2.9E-01	0	0	0	0	0	0	1.0E-04	8.8E-05	2.1E-04	-1.8E-03

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 categories

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	4.2E-04	3.2E-10	2.1E-05	0	1.7E-10	0	0	0	0	0	0	4.1E-11	1.4E-10	1.8E-08	-2.5E-08
NHWD	kg	9.3E-01	1.3E-03	4.9E-01	0	7.7E-02	0	0	0	0	0	0	1.8E-04	5.1E-05	5.1	-9.9E-04
RWD	kg	1.1E-02	1.5E-05	7.9E-04	0	1.0E-05	0	0	0	0	0	0	2.0E-06	5.9E-05	1.5E-05	-4.5E-05

HWD: Hazardous waste disposed of; NHWD: Non-hazardous waste disposed of; RWD: Radioactive waste disposed of.

Output flows

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	6.5	0	2.0	0	0	0	0	0	0	0	0	0	12.6	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CRU: Components for reuse; MFR: Materials for recycling; MER: Materials for energy recovery; EE: Energy exported.

6. Additional environmental impacts

Indoor air emissions

Ceramic tiles, in their manufacturing process, are subjected to a thermal process that exceeds 1000°C. At these temperatures, any organic compounds present in the compositions decompose, resulting in a final product that is inert and free of volatile organic compounds that may be emitted during the use phase.

Release to soil and water

Ceramic tiles do not emit any compounds into the soil or water during the use phase, as it is a totally inert product, which does not undergo physical, chemical or biological transformations, is not soluble or combustible, does not react physically, chemically or in any other way, is not biodegradable, does not adversely affect other materials with which it comes into contact in a way that could lead to environmental pollution or harm human health. It is a non-leaching product and therefore does not pose a risk to surface or groundwater quality**.**

Environmental information about the company

Environmental respect is a top priority for Grespania, from the selection of raw materials to the dispatch of finished products from its warehouses.

ISO 14001 Certification

Grespania has implemented a structured environmental management system certified according to the ISO 14001 standard. This system is subject to annual external audits and allows the company to identify, assess, and minimize the environmental impact of its production activities.

Recycled Content Declaration

Grespania's ceramic tiles are manufactured using raw materials with high percentages of recycled content from 16% in porcelain stoneware tiles to up to 70% in earthenware tiles.

Energy Management System

Grespania has integrated an Energy Management System (EMS) into its production facilities. This system contributes to meeting the requirements of RD 56/2016 on energy audits and aligns with key elements of the ISO 50001 standard. Some of the main objectives pursued with this system include:

- Monitoring and parameterization of the energy behavior of key equipment and sections.
- Tracking of Energy Performance Indicators (EPIs).
- Establishment of energy cost breakdowns and allocation.
- Pursuit of operational excellence in terms of energy savings and efficiency.

Zero Discharge

At Grespania's factories, all wastewater from the industrial process is treated through a physico-chemical process that separates pollutants. Once concentrated and inerted, the residues are recycled and reintroduced into the production process.

Air Emissions

The emission of solid particles into the atmosphere negatively affects air quality, human health, and agricultural productivity. Grespania has installed bag filters in all processes where dust generation may occur, effectively preventing emissions and enabling the particles to be recovered and reintegrated into the production process**.**

Cogeneration and Energy Savings

In the drying process, Grespania employs a cogeneration system that uses natural gas not only for drying but also for generating electricity. This leads to significant primary energy savings.

Paris Agreement Compliance

Grespania complies with the Paris Agreement (formerly the Kyoto Protocol), the most important international accord on climate change, which regulates greenhouse gas emissions.

Annex I. Declaration of the environmental parameters of the LCA and LCI for the format with minimum impacts

Environmental impacts

The estimated impact results are relative and do not indicate the final value of the impact categories, nor do they refer to threshold values, safety margins or risks.

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq	11.3	5.2E-01	2.1	0	2.2E-02	0	0	0	0	0	0	7.0E-02	9.6E-03	6.5E-02	-1.4E-01
GWP-biogenic	kg CO_2 eq	1.7E-01	6.3E-05	6.1E-02	0	1.8E-03	0	0	0	0	0	0	0	5.5E-06	6.7E-04	-8.7E-05
GWP-luluc	kg CO_2 eq	1.0E-02	7.1E-03	2.4E-03	0	2.4E-05	0	0	0	0	0	0	1.1E-03	3.7E-06	2.8E-04	-2.6E-04
GWP-total	kg CO_2 eq	11.5	5.3E-01	2.2	0	2.4E-02	0	0	0	0	0	0	7.1E-02	9.6E-03	6.5E-02	-1.4E-01
ODP	kg CFC11 eq	1.6E-07	6.8E-14	8.1E-09	0	1.3E-13	0	0	0	0	0	0	9.4E-15	9.6E-14	3.7E-14	-3.3E-09
AP	mol H^+ eq	2.1E-02	2.5E-03	3.5E-03	0	3.7E-05	0	0	0	0	0	0	7.4E-05	1.1E-05	4.8E-04	-6.2E-04
EP-freshwater	kg P eq	3.0E-04	1.8E-06	1.8E-05	0	3.2E-06	0	0	0	0	0	0	2.7E-07	1.1E-09	1.4E-06	-5.5E-07
EP-marine	kg N eq	6.2E-03	6.4E-04	1.2E-03	0	2.3E-05	0	0	0	0	0	0	2.6E-05	3.2E-06	1.3E-04	-1.9E-04
EP-terrestrial	mol N eq	6.5E-02	7.2E-03	1.3E-02	0	1.2E-04	0	0	0	0	0	0	3.0E-04	3.4E-05	1.4E-03	-2.0E-03
POCP	Kg NMVOC eq	2.1E-02	1.9E-03	3.5E-03	0	3.2E-05	0	0	0	0	0	0	8.3E-05	9.7E-06	3.9E-04	-6.3E-04
ADP-minerals& metals [2]	kg Sb eq	5.0E-05	3.8E-08	2.5E-06	0	1.6E-09	0	0	0	0	0	0	5.6E-09	1.1E-09	6.7E-09	-4.6E-08
ADP-fossil [2]	MJ	194.4	6.3	16.0	0	3.3E-01	0	0	0	0	0	0	8.4E-01	2.6E-01	8.7E-01	-1.7
WDP [2]	m^3	3.2	6.7E-03	3.4E-01	0	21.5	0	0	0	0	0	0	9.9E-04	5.3E-03	5.0E-03	-3.2E-02

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.

Additional environmental impacts

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Incidence of diseases	3.6E-06	4.1E-08	2.2E-07	0	7.9E-10	0	0	0	0	0	0	7.8E-10	1.0E-10	5.8E-09	-4.2E-09
IRP [1]	kBq U235 eq	1.6	1.6E-03	1.1E-01	0	1.1E-03	0	0	0	0	0	0	2.2E-04	3.0E-03	1.1E-03	-8.8E-03
ETP-fw [2]	CTUe	47.2	4.7	5.5	0	2.3E-01	0	0	0	0	0	0	6.2E-01	1.5E-02	5.2E-01	-7.4E-01
HTP-c [2]	CTUh	8.4E-09	9.2E-11	5.8E-10	0	2.6E-11	0	0	0	0	0	0	1.3E-11	1.6E-12	6.6E-11	-3.1E-12
HTP-nc [2]	CTUh	1.1E-07	3.9E-09	1.7E-08	0	2.6E-09	0	0	0	0	0	0	5.7E-10	9.1E-12	7.0E-09	-7.5E-10
SQP [2]	-	318.7	2.7	27.9	0	4.3E-02	0	0	0	0	0	0	4.1E-01	3.2E-03	2.0E-01	-7.9E-01

PM: Potential for disease incidence due to emissions of particulate matter (PM); IRP : Exposure efficiency of human potential relative to U235; ETP-fw : Ecosystem toxic unit comparative potential - freshwater; HTP-c : Ecosystem toxic unit comparative potential - carcinogenic effects; HTP-nc : Ecosystem toxic unit comparative potential - non-carcinogenic effects; SQP : Soil quality potential index.

Note 1: This impact category deals mainly with potential impacts of low doses of ionising radiation on human health from the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents or occupational exposure due to disposal of radioactive waste in underground facilities. Ionising radiation potential of soil, due to radon or some building materials is also not measured by this parameter.

Note 2: The results of this environmental impact indicator should be used with caution, as the uncertainties of the results are high and experience with this parameter is limited.

Use of resources

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	77.8	4.8E-01	2.1	0	7.3E-02	0	0	0	0	0	0	7.2E-02	4.4E-02	1.0E-01	-2.1E+01
PERM	MJ	33.4	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	111.2	4.8E-01	3.8	0	7.3E-02	0	0	0	0	0	0	7.2E-02	4.4E-02	1.0E-01	-2.1E+01
PENRE	MJ	194.4	6.3	6.0	0	3.3E-01	0	0	0	0	0	0	8.4E-01	2.6E-01	8.7E-01	-1.7
PENRM	MJ	1.4E-01	0	6.8E-03	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	194.5	6.3	6.0	0	3.3E-01	0	0	0	0	0	0	8.4E-01	2.6E-01	8.7E-01	-1.7
SM	kg	1.6	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	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	6.0E-02	5.4E-04	6.9E-03	0	2.8E-01	0	0	0	0	0	0	8.1E-05	6.9E-05	1.6E-04	-1.8E-03

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 categories

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	3.1E-04	2.4E-10	1.6E-05	0	1.8E-10	0	0	0	0	0	0	3.2E-11	1.1E-10	1.4E-08	-1.9E-08
NHWD	kg	8.9E-01	9.7E-04	4.3E-01	0	7.9E-02	0	0	0	0	0	0	1.4E-04	4.0E-05	4.0	-7.7E-04
RWD	kg	1.1E-02	1.1E-05	7.5E-04	0	1.0E-05	0	0	0	0	0	0	1.5E-06	4.6E-05	1.2E-05	-4.6E-05

HWD: Hazardous waste disposed of; NHWD: Non-hazardous waste disposed of; RWD: Radioactive waste disposed of.

Output flows

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	6.5	0	1.8	0	0	0	0	0	0	0	0	0	10.0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CRU: Components for reuse; MFR: Materials for recycling; MER: Materials for energy recovery; EE: Energy exported.

Annex II. Declaration of the environmental parameters of the LCA and LCI for the format with maximum impacts

Environmental impacts

The estimated impact results are relative and do not indicate the final value of the impact categories, nor do they refer to threshold values, safety margins or risks.

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq	16.4	8.4E-01	2.4	0	2.2E-02	0	0	0	0	0	0	1.1E-01	1.4E-02	9.7E-02	-1.8E-01
GWP-biogenic	kg CO_2 eq	1.8E-01	1.0E-04	6.1E-02	0	1.8E-03	0	0	0	0	0	0	0	8.2E-06	1.0E-03	-1.4E-04
GWP-luluc	kg CO_2 eq	1.5E-02	1.1E-02	2.9E-03	0	2.4E-05	0	0	0	0	0	0	1.6E-03	5.6E-06	4.2E-04	-3.9E-04
GWP-total	kg CO_2 eq	16.6	8.5E-01	2.5	0	2.4E-02	0	0	0	0	0	0	1.1E-01	1.4E-02	9.9E-02	-1.8E-01
ODP	kg CFC11 eq	1.6E-07	1.1E-13	8.1E-09	0	1.3E-13	0	0	0	0	0	0	1.4E-14	1.4E-13	5.6E-14	-3.3E-09
AP	mol H^+ eq	2.5E-02	4.0E-03	3.9E-03	0	3.6E-05	0	0	0	0	0	0	1.1E-04	1.7E-05	7.2E-04	-6.9E-04
EP-freshwater	kg P eq	3.0E-04	2.9E-06	1.8E-05	0	3.1E-06	0	0	0	0	0	0	4.1E-07	1.6E-09	2.1E-06	-8.0E-07
EP-marine	kg N eq	7.7E-03	1.0E-03	1.3E-03	0	2.2E-05	0	0	0	0	0	0	3.9E-05	4.8E-06	2.0E-04	-2.2E-04
EP-terrestrial	mol N eq	8.2E-02	1.2E-02	1.4E-02	0	1.2E-04	0	0	0	0	0	0	4.6E-04	5.2E-05	2.1E-03	-2.4E-03
POCP	Kg NMVOC eq	2.6E-02	3.1E-03	3.9E-03	0	3.1E-05	0	0	0	0	0	0	1.3E-04	1.5E-05	5.8E-04	-7.1E-04
ADP-minerals& metals [2]	kg Sb eq	5.1E-05	6.2E-08	2.6E-06	0	1.6E-09	0	0	0	0	0	0	8.4E-09	1.6E-09	1.0E-08	-6.8E-08
ADP-fossil [2]	MJ	263.8	10.2	19.7	0	3.2E-01	0	0	0	0	0	0	1.3	4.0E-01	1.3	-2.1E+00
WDP [2]	m^3	3.6	1.1E-02	3.6E-01	0	21.1	0	0	0	0	0	0	1.5E-03	8.0E-03	7.5E-03	-1.0E-02

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.

Additional environmental impacts

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Incidence of diseases	5.7E-06	6.6E-08	3.3E-07	0	7.7E-10	0	0	0	0	0	0	1.2E-09	1.5E-10	8.8E-09	-4.7E-09
IRP [1]	kBq U235 eq	1.7	2.6E-03	1.2E-01	0	1.1E-03	0	0	0	0	0	0	3.4E-04	4.5E-03	1.7E-03	-1.1E-02
ETP-fw [2]	CTUe	55.6	7.5	6.1	0	2.2E-01	0	0	0	0	0	0	9.4E-01	2.2E-02	7.9E-01	-1.1
HTP-c [2]	CTUh	9.0E-09	1.5E-10	6.1E-10	0	2.5E-11	0	0	0	0	0	0	1.9E-11	2.4E-12	1.0E-10	-3.2E-12
HTP-nc [2]	CTUh	1.2E-07	6.2E-09	1.7E-08	0	2.5E-09	0	0	0	0	0	0	8.5E-10	1.4E-11	1.1E-08	-1.1E-09
SQP [2]	-	323.7	4.4	28.3	0	4.2E-02	0	0	0	0	0	0	6.2E-01	4.8E-03	3.1E-01	-1.2

PM: Potential for disease incidence due to emissions of particulate matter (PM); IRP : Exposure efficiency of human potential relative to U235; ETP-fw : Ecosystem toxic unit comparative potential - freshwater; HTP-c : Ecosystem toxic unit comparative potential - carcinogenic effects; HTP-nc : Ecosystem toxic unit comparative potential - non-carcinogenic effects; SQP : Soil quality potential index.

Note 1: This impact category deals mainly with potential impacts of low doses of ionising radiation on human health from the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents or occupational exposure due to disposal of radioactive waste in underground facilities. Ionising radiation potential of soil, due to radon or some building materials is also not measured by this parameter.

Note 2: The results of this environmental impact indicator should be used with caution, as the uncertainties of the results are high and experience with this parameter is limited.

Use of resources

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	85.3	7.8E-01	2.1	0	7.2E-02	0	0	0	0	0	0	1.1E-01	6.6E-02	1.5E-01	-2.1E+01
PERM	MJ	33.4	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	118.6	7.8E-01	3.8	0	7.2E-02	0	0	0	0	0	0	1.1E-01	6.6E-02	1.5E-01	-2.1E+01
PENRE	MJ	263.8	10.2	6.0	0	3.2E-01	0	0	0	0	0	0	1.3	4.0E-01	1.3	-2.1
PENRM	MJ	1.4E-01	0	6.8E-03	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	263.9	10.2	6.0	0	3.2E-01	0	0	0	0	0	0	1.3	4.0E-01	1.3	-2.1
SM	kg	2.7	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	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	6.8E-02	8.7E-04	7.3E-03	0	2.7E-01	0	0	0	0	0	0	1.2E-04	1.0E-04	2.5E-04	-1.8E-03

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 categories

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	5.0E-04	3.8E-10	2.5E-05	0	1.7E-10	0	0	0	0	0	0	4.9E-11	1.7E-10	2.1E-08	-2.9E-08
NHWD	kg	9.6E-01	1.6E-03	5.4E-01	0	7.7E-02	0	0	0	0	0	0	2.1E-04	6.1E-05	6.1	-1.2E-03
RWD	kg	1.2E-02	1.8E-05	8.3E-04	0	1.0E-05	0	0	0	0	0	0	2.3E-06	7.0E-05	1.8E-05	-4.5E-05

HWD: Hazardous waste disposed of; NHWD: Non-hazardous waste disposed of; RWD: Radioactive waste disposed of.

Output flows

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	6.5	0	2.1	0	0	0	0	0	0	0	0	0	18.4	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CRU: Components for reuse; MFR: Materials for recycling; MER: Materials for energy recovery; EE: Energy exported.

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Index

1. General Information 3
2. Product information 5
3. LCA information 6
4. System limits, scenarios and additional technical information. 8
5. Environmental Information. 12
6. Additional environmental impacts 16

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