DAPHabitat System

Environmental Product Declaration

www.daphabitat.pt

[according to ISO 14025, EN 15804:2012+A2:2019 e EN 15942]

Declaration number: DAP 004:2025

PORCELAIN TILES (GROUP BIa)

Issue date: 06/01/2025

Valid until: 29/12/2029

Aleluia Cerâmicas, S.A.

Version 1.5 Edition June 2024

1. GENERAL INFORMATION

1.1. The DAPHabitat System

Programme operator:	Associação Plataforma para a Construção Sustentável www.clusterhabitat.pt geral@clusterhabitat.pt
Address:	Departamento Engenharia Civil, Universidade de Aveiro, 3810-193 Aveiro
Email address:	deptecnico@clusterhabitat.pt
Telephone number:	(+351) 234 401 576
Website:	www.daphabitat.pt
Logo:	

1.2. EPD owner

Name of the owner:	Aleluia Cerâmicas, SA
Production site:	Manufacturing unit: - Esgueira Unit: Avenida Europa, 466. Quinta do Simão, Esgueira | 3800-230 Aveiro. Portugal
Address (head office):	Avenida Europa, 466. Quinta do Simão, Esgueira, 3800-230 Aveiro. Portugal
Telephone number:	(T) +351 234 305 600
Email address:	geral@aleluia.pt ; dir.qualidade@aleluia.pt
Website:	https://aleluia.pt/
Logo:	
Information concerning the applicable management Systems:	Certification, at the level of floor products, under the NF-UPEC brand, by CSTB – Centre Scientifique et Technique du Bâtiment – France.
Specific aspects regarding production:	CAERev.3 n.º 23312 – Manufacture of tiles, mosaics, and ceramic plates
Organization's environmental policy:	The integration of environmental concerns into Aleluia's regular operations has proven to be a competitive advantage, both in terms of resource efficiency and the quality of the production process, as well as in reducing environmental impact. • Commitment to compliance with applicable legislation and other requirements;

• Control and reduction, as far as possible, the production of liquid effluents, gaseous effluents and waste;
• Commitment to environmental protection, including pollution prevention.

1.3. Information concerning the EPD

Authors:	1. Centro Tecnológico da Cerâmica e do Vidro 2. Aleluia Cerâmicas, SA
Contact of the authors:	1. CTCV materials: habitat | iParque – Parque Tecnológico de Coimbra – Lote 6 | 3040-540 Antanhol – Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. Aleluia: Avenida Europa, 466. Quinta do Simão, Esgueira | 3800-230 Aveiro (T) +351 234 305 600 e-mail: https://aleluia.pt/
Issue date:	24/01/2024
Registration date:	06/01/2025
Registration number:	DAP 004:2025
Valid until:	31/12/2019
Representativity of the EPD (location, manufacturer, group of manufacturers):	The Porcelain floor tiles produced by the Esgueira unit comply with the European standard EN 14411 dry-pressed ceramic floors and wall tiles and ceramic floors and wall tiles with water absorption below 0.5% (Group Bla - Annex G - GL/UGL). The Bla porcelain tile products developed by ALELUIA are multiple, depending on their application. These types of products are available on the market with a wide range of aesthetic and dimensional options, both in terms of visual effects as well as textures and colors.
Type of EPD	EPD from "cradle-to-grave" including module D (A1-D)

1.4. Verification demonstration

External independent verification, accordingly, with the standard ISO 14025:2010 and EN 15804:2012+A2:2019	
Certification Body	Verifier
This EPD was validated based on FDES registry number 20240136724, verified by the INIES (France) verification program on 24/01/2024	INIES Programme Verifier
(name)	(name)

1.5. EPD registration

Programme operator

(Plataforma para a Construção Sustentável)

1.6. PCR (Product Category Rules) basic model

Name:	RCP de modelo base para produtos e serviços de construção
Issue date:	Edição Junho 2024
Number of registrations on the database:	RCP-mb001
Version:	Versão 3.0
Identification and contact of the coordinator(s):	Marisa Almeida | marisa@ctcv.pt Luís Arroja | arroja@ua.pt José Dinis Silvestre | jose.silvestre@ist.utl.pt
Identification and contact of the authors:	Marisa Almeida | marisa@ctcv.pt Luís Arroja | arroja@ua.pt José Silvestre | jds@civil.ist.utl.pt Fausto Freire Cristina Rocha Ana Paula Duarte Ana Cláudia Dias Helena Gervásio Victor Ferreira Ricardo Mateus António Baio Dias
Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016 12/08/2023 – 30/11/2023
Valid until:	01/06/2027

CEN standard EN 15804 serves as the core Product Category Rules (PCR).

1.7. C-PCR (Complementary Product Category Rules)

Name:	1. PCR: Floor covering 2. PCR: Wall covering 3. EN 17160:2019 – Product category rules for ceramic tiles
Issue date:	1. 10/02/2014 2. 10/02/2014 3. February 27, 2019, in effect since April 15, 2019
Number of registrations on the database:	1. RCP001:2014 2. RCP002:2014 3. --
Version:	1. Version 1.2 (june 2022) 2. Version 1.2 (june 2022) 3. --
Identification and contact of the coordinator(s):	1. PCR: Floor covering • Marisa Almeida | marisa@ctcv.pt • Luís Arroja | arroja@ua.pt 2. PCR: Wall covering • Marisa Almeida | marisa@ctcv.pt • Luís Arroja | arroja@ua.pt
Identification and contact of the authors:	1. PCR: Floor covering • Marisa Almeida | marisa@ctcv.pt • Luís Arroja | arroja@ua.pt • Ana Cláudia Dias | acdias@ua.pt 2. PCR: Wall covering • Marisa Almeida | marisa@ctcv.pt • Luís Arroja | arroja@ua.pt • Ana Cláudia Dias | acdias@ua.pt
Composition of the Sectorial Panel:	1. PCR: Floor covering • RMC - Revestimentos de Mármore Compactos, S.A. • Dominó – Indústrias Cerâmicas, S.A. • APICER – Associação Portuguesa da Indústria de Cerâmica • Sonae Indústria, SGPS, S.A. 2. PCR: Wall covering • RMC - Revestimentos de Mármore Compactos, S.A. • Dominó – Indústrias Cerâmicas, S.A. • Sonae Indústria, SGPS, S.A. • APICER – Associação Portuguesa da Indústria de Cerâmica
Consultation period:	1. 01/08/2013 - 30/11/2013 2. 12/08/2013 - 30/11/2013
Valid until:	1. 01/06/2027 2. 01/06/2027 3. --

1.8. Information concerning the product/product class

Identification of the product:

Porcelain - Group Bla dry-pressed ceramic floor and wall coverings with water absorption below 0.5%, for indoor or outdoor use.

Illustration of the product:

Piazen Sand 45x90

Natura Kalacata 60x60

Figure 1 - Examples of porcelain products manufactured by Aleluia.

Porcelain products are available on the market with a wide range of aesthetic and dimensional options, both in terms of visual effects as well as textures and colors.

Brief description of the product:

Pressed Ceramic Tiles, with water absorption Eb ≤ 0.5%, for use in floor and/or wall coverings, both indoors and outdoors.

Main technical characteristics of the product:

Table 1: Technical characteristics of Porcelain tiles – EN 14411: Group Bla – Esgueira manufacturing unit.

Features	Standard	Specification EN 14411 Group Bla – GL/UGL	ALELUIA Specification
Size Tolerance (%)	**EN ISO 10545 – 2**	± 0.6 (± 2 mm limit)	±0.4
Thickness (%)		± 5 (± 0.5 mm limit)	± 5 (± 0.5 mm limit)
Rectilinearity (%)		± 0.5 (± 1.5 mm limit)	±0.3
Orthogonality (%)		± 0.5 (± 2 mm limit)	±0.4
Flatness • Central Curvature (%) • Lateral rotation (%) • Diagonal deflection (%)		 ± 0.5 (± 2 mm limit) ± 0.5 (± 2 mm limit) ± 0.5 (± 2 mm limit)	 - 0.10 / + 0.15 - 0.10 / + 0.15 - 0.10 / + 0.20
Surface quality (%)		≥95	≥95
Water absorption (%)	**EN ISO 10545 – 3**	≤ 0.5	≤ 0.1
Modulus of rupture (N/mm²)	**EN ISO 10545 – 4**	≥35	≥35
Flexion resistance (N)		≥1300	≥ 1500 (1)
Thermal Shock Resistance	**EN ISO 10545 – 9**	Resistant	Resistant
Crack Resistance	**EN ISO 10545-11**	Resistant	Resistant
Stain resistance	**EN ISO 10545-14**	Minimum Class 3	Class 4 or 5
Chemical Resistance • Household Detergents • Additives for Pools • Acids • Alkalis	**EN ISO 10545-13**	 Minimum Class B (2) Minimum Class B (2) (2) (2)	 Class A Class A Class LA (2a) Class LA (2a)
Resistance to abrasion	**EN ISO 10545 – 7**	I to V	I to V (3)
Resistance to deep abrasion (mm³)	**EN ISO 10545 – 6**	≤ 175	≤ 150
Frost resistance	**EN ISO 10545-12**	Resistant	Resistant
Resistance to Slipping	**DIN 51130**	Available test	product by product
	DIN 51097		
	UNE 41901EX		

(1) Formats: Thickness ≥ 7.5 mm; (2) To be indicated by the Producer – Product by Product; (2a) Acids and bases (Low Concentration); (3) Depending on the glass/color

Description of the product's application/use:	These products have a wide range of applications in construction. They are used on interior and exterior floors of the following buildings: • residential, • public, • industrial.
Placing on the market / Rules of application in the market / Technical rules of the product:	NP EN ISO 10545 EN 14411 :2012 DIN 51130 DIN 51097
Quality control	In accordance with the product's technical standards.
Special delivery conditions:	Not applicable.
Components and substances to declare:	This product does not contain hazardous substances listed in the REACH candidate lists above the 0.1% limit (declaration). Table 2: Porcelain Tiles – Bla Group composition
Where explanatory material may be obtained:	https://aleluia.pt/collection/
History of the LCA studies:	--

Parameters	*Percentage (%)*	*Mass (kg)*
Ceramic support	97.5	20.30
Glaze, colorants, frits, and additives	2.5	0.52

1.9. Calculation rules of the LCA

Functional unit:	To cover and decorate 1m² of interior or exterior surface/floor over the reference period of 50 years with Porcelain tiles - Group Bla, according to the installation conditions.
System boundaries:	The type of Environmental Product Declaration conducted is "cradle to grave" with module D (A1-D).
Criteria for the exclusion:	According to paragraph 6.3.5 of EN 15804, the exclusion criterion for unit processes is 1% of the total energy consumed and 1% of the total mass of inputs, with particular attention to ensuring that no more than 5% of the energy and mass flows are excluded at the product stage. The following processes were not considered in this study, as they may fall under the exclusion criteria or the scope of the standard: • Environmental impacts associated with the construction of industrial infrastructure and the manufacturing of machinery and equipment; • Environmental impacts related to infrastructure (production and maintenance of vehicles and roads) for the transportation of pre-products;

	• Long-term emissions.
Assumption and limitations:	For processes over which the producers have no influence or specific information, such as raw material extraction, generic data from the Ecoinvent v3.7 databases were used. The dataset used to model electricity and natural gas production was adapted to the national reality. The electricity mix was updated for the year 2021 using information from Redes Energéticas Nacionais (REN), the Entidade Reguladora dos Serviços Energéticos (ERSE), and Direção-Geral de Energia e Geologia (DGEG) to obtain more up-to-date results regarding the environmental impacts generated by the electricity grid in Portugal. The natural gas process was modeled based on information provided by the DGEG's Energy in Portugal report (2021), regarding the countries from which it is imported. The environmental impacts indicated in this EPD are a weighted average of all ceramic tiles manufactured in 2021, based on the Aleluia industrial production.
Quality and other characteristics about the information used in the LCA:	The production data collected corresponds to the year 2021 and reflects the actual situation. The generic data used is sourced from the Ecoinvent v3.7 database and adheres to the quality criteria (age, geographical and technological coverage, plausibility, etc.) for generic data. The quality of data (primary and secondary) ranges from reasonable to very good for most processes, based on a five-level qualitative scale from very poor to very good, in accordance with the criteria of Annex E of EN 15804:2012+A2:2019.
Allocation rules:	In this study associated with the manufacturing of Porcelain Tiles - Group Bla, no co-products are generated during the production process. However, the same factory also produces ceramic floor tiles (Blb). For certain flows, allocation was determined based on measurements taken at each facility. For any other flow, allocation is based on mass.
Software used for the assessment:	SimaPro versão 9
Background database used for the LCA:	Ecoinvent 3.7
Comparability of EPD for construction products:	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15942 and according to the comparability conditions determined by ISO 14025.

1.10. Use of the average environmental performance

The porcelain ceramic floor tiles included in the study is manufactured using the same raw materials, auxiliary materials, energy resources, and technological process and it encompasses different models with various formats. The thickness of the formats covered by this EPD ranges on average from 8.5 to 11.5 mm, with an average mass of 20.82 kg/m².

1.11. Technical information for Reference Service Life (RSL)

In accordance with EN 17160, the PCR of this product, based on EN 14411:2012 (Ceramic tiles - Definitions, classification, characteristics, and marking), the reference service life of the product is estimated to be 50 years. See also Table H.2 — List of standard RSLs by product category (NF EN 15804+A2/CN). No repairs, renovations, or replacements are required during the service life.

Parameter	Results**
Reference Service Life	50 years
Declared product properties (at the gate) and finishes, etc.	See Table 1
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes	NF P 61-204-1 – DTU52.2
An assumed quality of work, when installed in accordance with the manufacturer's instructions	According to the manufacturer's instructions
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	NF P 61-204-2/3 – DTU52.2
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	NF P 61-204-1/3 – DTU52.2
Usage conditions, e.g. frequency of use, mechanical exposure	NF P 61-204-1 – DTU52.2
Maintenance e.g. required frequency, type and quality and replacement of components	Wash with water and detergent once a week
** expressed by functional unit	

1.12. Flow diagram of input and output of the process

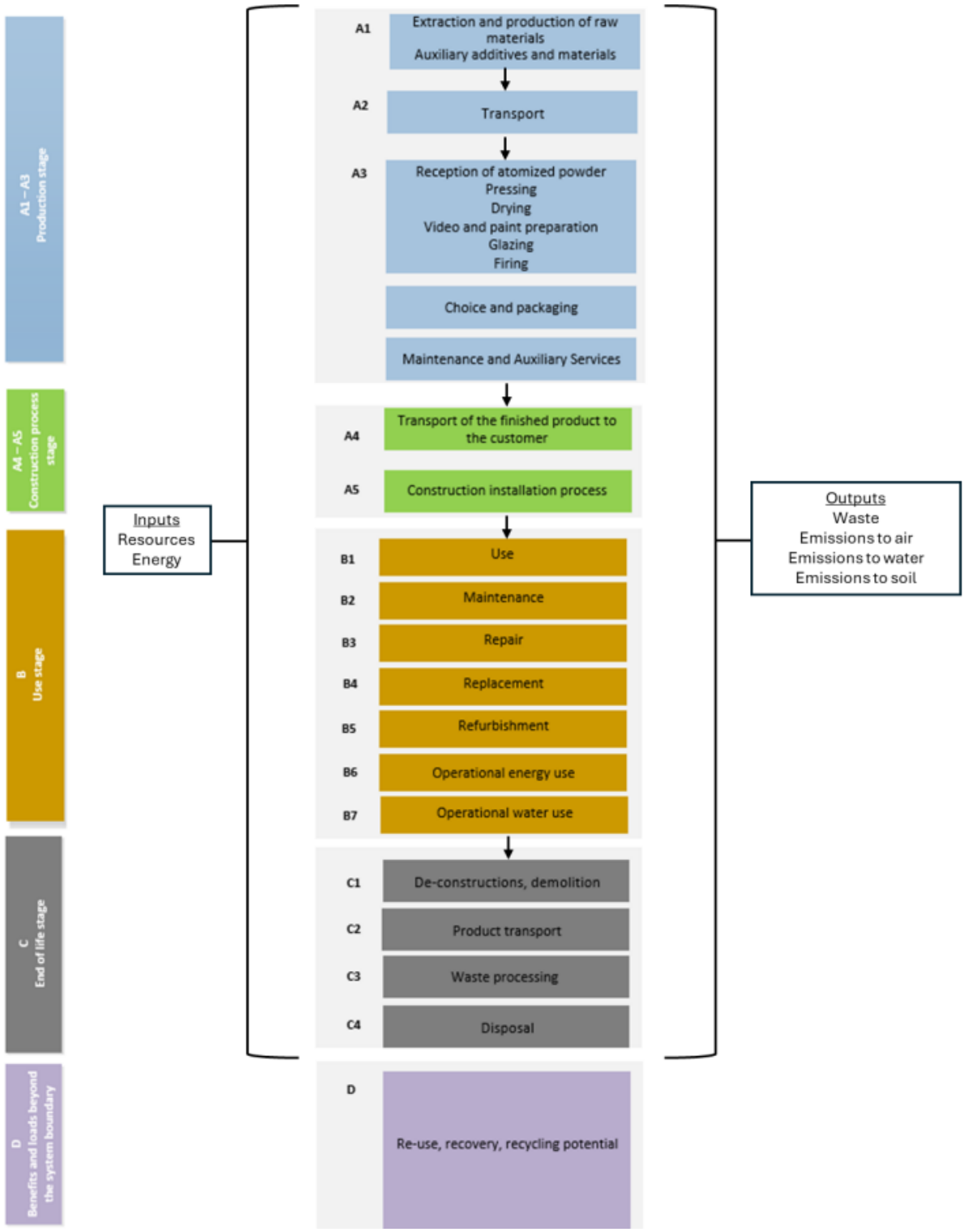

Figure 1: Life cycle stages and unit processes of the product.

2. CORE ENVIRONMENTAL IMPACT INDICATORS

2.1. Description of the system boundaries

(✓= included; ND = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Operational energy use	Operational water use	Deconstruction and demolition	Transport	Waste process	Disposal	Reuse, recovery, potential recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Production stage, A1-A3

The A1 to A3 stages include the extraction of raw materials, their transport to the factory and the manufacturing of the product.

A1 – Extraction and transformation of raw materials: this stage includes the extraction and possible transformation of raw materials. The raw materials used are natural, synthetic and additives and the main ones are clays, feldspars, sands, carbonates, and kaolin. The atomized powder preparation is carried out in an external factory.

A2 – Transport: the raw and auxiliary materials are transported by a cistern truck or by boat followed by a cistern truck.

A3 – Production:
The Aleluia possesses a technically advanced and innovative production process. This porcelain tile manufacturing process is called single-fired, meaning that both the base and the glaze are fired in a single firing.

The floor paste has a high percentage of feldspars which, after firing, results in a product with low water absorption and high mechanical resistance.

The manufacturing unit (Esgueira) purchases porcelain stoneware pastes from a Portuguese company in the form of atomized powder. After receiving the atomized powder, the process continues with pressing, quick drying, and glazing/decoration. All these operations are done continuously. Subsequently, the ceramic tiles are fired (rapid cycle) in roller kilns, and then they are selected and packaged.

In this way, the materials are transformed into new crystalline and glazed compounds that impart specific properties to the fired product: maintaining shape, good mechanical resistance, low porosity, chemical resistance, etc.

The firing is carried out using natural gas for heat propagation inside the roller kiln for ceramic product pastes.

The product that comes out of the Kiln is sorted and identified by quality, shades, and calibers, in the selection and packaging section. Semi-automatic machines are used to perform this task. Subsequently, the product is packed in boxes, wrapped in plastic film (plastification) and placed on wooden pallets (palletization).

Quality control covers the entire production process (from raw material reception to finished product) and aims to ensure product compliance with pre-established standards and norms. This can be done either by the laboratory throughout the production process or at the output of the selection section. The products marketed by Aleluia only enter the final product warehouse after quality control approval.

After the operations described above, the product enters the finished product warehouse. This warehouse is responsible for controlling the flow and storing the finished product, efficiently ensuring the quality of the shipping service to the customer.

Construction process stage, A4-A5

Module A4 includes the transport from the production site to the installation site of the porcelain tiles. The scenario is based on a distance of 1 435 km. This is the average of the distances to the destinations/departments in France, weighted by the quantities transported. This scenario is similar to the one defined in the EN 17160 standard. The transport is carried out by truck with a payload of 25 tons.

Table 3: A4 – Transport to the site

Scenario information	Units (expressed per functional unit)
Type of fuel and vehicle consumption or type of vehicle used for transport, e.g. long-distance truck, boat, etc.	Vehicle type: truck with 25 t payload class EURO 6 Liters of fuel per distance or vehicle type, Commission Directive 2007/37/EC (European Emissions Standard)
Distance	1435 km
Capacity utilization (including empty returns)	36%
Apparent density of the transported products	266.7 kg/m^3
Volume capacity utilization coefficient	Coefficient: <1 for compressed or embedded products

Table 4: A5 – Building installation

Scenario information	Units (expressed per functional unit)
Auxiliary inputs for installation (specified by material)	3.3 kg adhesive mortar for installing **porcelain ceramic tiles - Group BIa**
Water use	0.8 dm^3
Use of other resources	-
Quantitative description of the type of energy (regional mix) and consumption during the installation process	-
Waste generated on the construction site prior to processing of waste generated by product installation (specified by type)	**BIa** Drop Rate: 3% Ceramic scrap: 625g Card: 140g PE film: 31g Pallets: 470g
Materials (specified by type) produced by waste processing on the construction site, e.g. collection for recycling, energy recovery, disposal (specified by method)	**BIa** Recycled product waste: 437g Waste products to landfill: 188g Incinerated card: 11.6g Recycled card: 118.5g Card for landfill: 9.9g Incinerated PE: 9.7g Recycled PE: 11.5g PE for landfill: 9.7g Incinerated wood: 140.9 g Recycled wood: 169.5g Wood for landfill: 159.2g
Direct emissions to ambient air, soil, and water	-

Use stage (exclusion of potential savings), B1-B7

The use stage is divided into seven modules:

Module B1 considers the use of the installed product.

When using porcelain tiles, no substances are released into the environment.

Module B2 includes maintenance (cleaning) of the tiles during their service life.

Tiles do not require replacement, repair, or rehabilitation, so modules B3-B4-B5 are exempt from impacts.

Modules B6-B7 are impact exempt.

Table 5: Maintenance (B2)

Scenario information	Units (expressed per functional unit)
B2 Maintenance (if applicable)	
Maintenance process	Cleaning 52 times a year (residential use)
Maintenance cycle	2600 per RSL or 52 per year
Auxiliary inputs for maintenance (e.g. cleaning product, specify materials)	0.134 ml of detergent and 0.1 l of water are used to wash 1 m^2 of porcelain tiles - Group BIa, once a week.
Waste produced during maintenance (specify materials)	Not applicable
Net consumption of freshwater during maintenance	2.60E-01 m^3 per RSL

Energy input during maintenance (e.g. vacuuming), energy carrier type, for example electricity, and quantity, if applicable and relevant	Not applicable

End of life stage, C1-C4

C1. De-constructions/demolition: after the end of its service life, the product will be removed either as part of the building's rehabilitation or during its demolition.

In the context of a building's demolition, the impacts attributable to the removal of the product are insignificant.

C2. Transport for waste treatment: the product's waste is transported by truck (50 km) for waste treatment.

C3. Waste treatment for reuse, recovery and/or recycling: 70% (EN 17160 and NF EN 15804+A2/CN).

C4. Waste disposal: 30% of the product is destined for landfill (in accordance with EN 17160 and NF EN 15804+A2/CN).

Table 6: End of life.

Process	Units (expressed per functional unit of components, Products or materials specified by material type)
Collection process specified by type	Collection with mixed construction waste: 20.82 kg (100%) of product + 3.3 kg of mortar
Recovery system specified by type	0 kg destined for reuse 16.88 kg destined for recycling (70%) 0 kg destined for energy recovery
Disposal specified by type	7.24 kg of product destined for disposal (landfill) (30%)
Assumptions for scenario development (e.g. transportation)	Transport distance: 50km Transport using truck with a payload of 25 t class EURO 6

Re-use/ recovery/ recycling potential, D

Environmental benefits and loads beyond the system boundary.

After de-constructions/demolition stage, ceramic tiles can be rectified and used in various applications according to EN 17160.

In this case, and according to data from the APA (Portuguese Environmental Agency), Portugal has a valorization rate of around 75%. Therefore, 70% porcelain tiles were considered (NF EN 15804+A2).

In this case, the modeling was performed based on the replacement of natural lightweight aggregates (70%) with "crushed ceramic tiles".

Valued materials/matter leaving the system boundary	Recycling processes beyond the system boundary	Saved materials/matter/energy	Associated quantities (expressed per functional unit)
Aggregates of crushed ceramic tiles	Not applicable. The necessary processes are accounted in module C3 and	Natural lightweight aggregates	14.6 kg/m^2

	even in transport		

The packaging materials used for exclusive purposes are analyzed to be below the exclusion criteria used and the cutoff rule.

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

2.2. Core environmental impact indicators

	Global warming potential - total;	Global warming potential fossil;	Global warming potential - biogenic;	Global warming potential land use and land use change;	Depletion potential of the stratospheric ozone layer;	Acidification potential;
	GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP
Unit	kg CO2 eq.	kg CO2 eq.	kg CO2 eq.	kg CO2 eq.	kg CFC 11 eq.	mol H+ eq.
Modules A1-A3	1.45E+01	1.49E+01	-3.45E-01	1.79E-02	2.64E-06	3.72E-02
Module A4	4.03E+00	4.03E+00	3.22E-03	3.06E-05	9.36E-07	7.94E-03
Module A5	1.91E+00	1.15E+00	7.65E-01	6.29E-04	1.07E-07	3.25E-03
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	5.78E-01	5.63E-01	1.48E-02	3.36E-04	6.16E-08	3.84E-03
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	1.40E-01	1.40E-01	1.12E-04	1.06E-06	3.26E-08	2.77E-04
Module C3	5.37E-02	5.37E-02	3.95E-05	7.85E-07	1.21E-08	5.79E-04
Module C4	6.02E-02	6.00E-02	1.75E-04	1.34E-06	1.36E-08	5.40E-04
Module D	-2.99E-02	-2.80E-02	-1.85E-03	-1.65E-05	-5.20E-09	-2.40E-04

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

NOTES: P.C.I. – Net calorific value

Units expressed by functional unit ($1m^2$).

	Eutrophication potential aquatic freshwater;	Eutrophication potential aquatic marine;	Eutrophication potential terrestrial;	Formation potential of tropospheric ozone;	Abiotic depletion potential for non-fossil resources;	Abiotic depletion potential for fossil resources potential;	Water (user) deprivation potential;
	EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals&metals	ADP-fossil	WDP
Unit	kg Peq.	kg N eq.	mol N eq.	Kg COVNM eq.	kg Sb eq.	MJ, P.C.I	m^3 eq. of globally unavailable water
Modules A1-A3	1.59E-04	1.02E-02	1.04E-01	4.06E-02	5.79E-05	1.93E+02	3.26E+00
Module A4	2.20E-06	1.33E-03	1.48E-02	5.22E-03	1.71E-07	5.72E+01	-1.21E-02
Module A5	1.56E-05	9.74E-04	9.66E-03	2.98E-03	1.76E-06	9.53E+00	1.26E-01
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	2.24E-05	5.18E-04	5.68E-03	2.50E-03	2.51E-07	1.94E+01	1.15E+01
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	7.66E-08	4.62E-05	5.14E-04	1.82E-04	5.96E-09	1.99E+00	-4.22E-04
Module C3	4.01E-08	2.60E-04	2.85E-03	7.79E-04	2.67E-09	7.42E-01	1.53E-04
Module C4	6.30E-08	2.36E-04	2.58E-03	7.01E-04	2.88E-09	8.38E-01	1.33E-04
Module D	-6.61E-07	-9.55E-05	-1.05E-03	-2.91E-04	-8.03E-09	-5.74E-01	-8.61E-03

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

NOTES: P.C.I. – Net calorific value. Units expressed by functional unit ($1m^2$). "The results obtained for the indicators "Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)", "Abiotic depletion potential for fossil resources potential (ADP-fossil)" and "Water (user) deprivation potential (WDP)" should be used with caution since the uncertainties associated with them are high or there is little experience with the indicator."

2.3. Additional environmental impact indicators

	Potential incidence of disease due to PM emissions	Potential Human exposure efficiency relative to U235	Potential Comparative Toxic Unit for ecosystems	Potential Comparative Toxic Unit for humans, cancer effects	Potential Comparative Toxic Unit for humans, not cancer effects	Potential soil quality index
	PM	IRP	ETP-fw	HTP-c	HTP-nc	SQP
Unit	Disease incidence	kBq U 235 eq.	CTUe	CTUh	CTUh	-
Modules A1-A3	6.00E-07	2.75E-01	9.99E+01	2.32E-09	4.96E-08	9.83E+01
Module A4	2.32E-07	2.52E-01	2.28E+01	3.01E-10	3.58E-08	1.82E-01
Module A5	4.29E-08	3.33E-02	9.19E+00	2.06E-10	6.92E-09	1.06E+01
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	3.52E-08	1.67E-02	8.65E+00	1.86E-09	1.87E-08	9.60E-01
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	8.10E-09	8.77E-03	7.96E-01	1.05E-11	1.25E-09	6.34E-03
Module C3	8.24E-08	3.24E-03	2.49E-01	3.26E-12	2.59E-10	2.72E-03
Module C4	4.21E-08	3.70E-03	3.18E-01	6.53E-12	4.39E-10	3.08E-01
Module D	-6.35E-09	-6.65E-03	-2.81E-01	-2.16E-11	-2.33E-10	-9.77E-01

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

The results of the indicators "POTENTIAL COMPARATIVE TOXIC UNIT FOR ECOSYSTEMS (ETP-FW)", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, CANCER EFFECTS", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, NOT CANCER EFFECTS" and "POTENTIAL SOIL QUALITY INDEX" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

NOTES: Units expressed by functional unit ($1m^2$).

The impact indicator "POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235" focuses mainly on the possible impact of a low dose of ionising radiation on human health resulting from the nuclear fuel cycle. It does not consider effects arising from possible nuclear accidents, occupational exposure or the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

2.4. Indicators describing resource use

	Primary energy					
	EPR	RR	TRR	EPNR	RNR	TRNR
Unit	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.
Modules A1-A3	2.42E+01	4.64E-01	2.47E+01	2.12E+02	4.07E-03	2.12E+02
Module A4	8.41E-02	0.00E+00	8.41E-02	6.07E+01	0.00E+00	6.07E+01
Module A5	1.51E+00	2.19E-01	1.72E+00	1.03E+01	0.00E+00	1.03E+01
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	4.37E-01	0.00E+00	4.37E-01	2.06E+01	0.00E+00	2.06E+01
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	2.93E-03	0.00E+00	2.93E-03	2.11E+00	0.00E+00	2.11E+00
Module C3	1.18E-03	0.00E+00	1.18E-03	7.88E-01	0.00E+00	7.88E-01
Module C4	1.53E-02	0.00E+00	1.53E-02	8.95E-01	0.00E+00	8.95E-01
Module D	-2.09E-01	0.00E+00	-2.09E-01	-5.99E-01	0.00E+00	-5.99E-01

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials; RR = use of renewable primary energy resources used as raw materials; TRR = total use of renewable primary energy resources (EPR + RR); EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; RNR = use of non-renewable primary energy resources used as raw materials; TRNR = total use of non-renewable primary energy resources (EPRN + RNR);

NOTA: Units expressed by functional unit ($1m^2$).

	Secondary materials and fuels, and use of water			
	MS	CSR	CSNR	Use of net freshwater value
Unit	kg	MJ, P.C.I.	MJ, P.C.I.	m^3
Modules A1-A3	6.81E-01	0.00E+00	0.00E+00	8.62E-02
Module A4	0.00E+00	0.00E+00	0.00E+00	1.13E-03
Module A5	0.00E+00	0.00E+00	0.00E+00	5.83E-03
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	0.00E+00	0.00E+00	0.00E+00	2.69E-01
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00	3.95E-05
Module C3	0.00E+00	0.00E+00	0.00E+00	1.87E-05
Module C4	0.00E+00	0.00E+00	0.00E+00	4.96E-05
Module D	0.00E+00	0.00E+00	0.00E+00	-5.05E-03

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

MS = use of secondary material; CSR = use of renewable secondary fuels; CSNR = use of non-renewable secondary fuels.

NOTA: Units expressed by functional unit ($1m^2$).

2.5. Other environmental information describing different waste categories

	Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Unit	kg	kg	kg
Modules A1-A3	8.15E-04	1.86E+00	3.03E-04
Module A4	1.51E-04	2.39E-03	4.15E-04
Module A5	2.88E-05	3.06E-01	3.10E-05
Module B1	0.00E+00	0.00E+00	0.00E+00
Module B2	9.78E-06	1.78E-02	1.54E-05
Module B3	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00
Module C2	5.28E-06	8.33E-05	1.44E-05
Module C3	1.94E-06	4.64E-05	5.34E-06
Module C4	2.20E-06	7.23E+00	6.11E-06
Module D	-8.32E-07	-6.83E-04	-5.26E-06

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

NOTE: Units expressed by functional units ($1m^2$).

The characteristics that make the waste hazardous are described in the applicable legislation in force, such as the European Waste Framework Directive.

2.6. Environmental information describing output flows

	Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
Unit	kg	kg	kg	MJ
Modules A1-A3	0.00E+00	3.04E-01	6.98E-03	1.50E+00
Module A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module A5	0.00E+00	7.28E-01	1.58E-01	3.16E+01
Module B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	1.69E+01	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LEGEND:

- Product stage
- Construction process stage
- Use stage
- End of life stage
- Benefits and loads beyond the system boundary

NOTE: Units expressed by functional units (1 m^2).

The characteristics that make the waste hazardous are described in the applicable legislation in force, such as the European Waste Framework Directive.

2.7. Information describing the biogenic carbon content at the factory gate

Biogenic carbon content*	Units**	Modules A1-A3 (results)
Biogenic carbon content in product	Kg C	-
Biogenic carbon content in accompanying packaging	Kg C	2.47E-01
* 1 kg biogenic carbon is equivalent to 44/12 kg of C02. ** This information can be omitted whenever the content of biogenic carbon in the product, or in the respective packaging, is less than 5% of the mass of the product, or the respective packaging.		

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. Module A4 Transport to the building site – Construction process stage

Parameter	Results expressed per functional unit
Scenario	The scenario is based on a distance of 1 435 km.
Related scenario	N/A
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long-distance truck, boat, etc.	Vehicle type: truck with 25 t payload class EURO 6 Liters of fuel per distance or vehicle type, Commission Directive 2007/37/EC (European Emissions Standard)
Distance	1435 km
Capacity utilization (including empty returns)	36%
Bulk density of transported products	266.7 kg/m³
Volume capacity utilization factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products)	Coefficient: <1 for compressed or embedded products
* Expressed per functional unit ** Directive 2007/37/EC (European Emission Standard) N/A – Not applicable	

3.2. Module A5 Installation of the product in the building – Construction process stage

Parameter	Results expressed per functional unit
Scenario	N/A
Related scenario	N/A
Ancillary materials for installation (specified by material)	3.3 kg of adhesive mortar for installing porcelain ceramic tiles - Group Bla
Water use	0.8 dm^3

Other resource use	N/A
Quantitative description of energy type (regional mix) and consumption during the installation process	N/A
Waste of materials on the building site before waste processing, generated by the product's installation (specified by type)	<table><tr><th></th><th>Bla</th></tr><tr><td>Drop Rate:</td><td>3%</td></tr><tr><td>Ceramic scrap:</td><td>625g</td></tr><tr><td>Card:</td><td>140g</td></tr><tr><td>PE film:</td><td>31g</td></tr><tr><td>Pallets:</td><td>470g</td></tr></table>
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	<table><tr><th></th><th>Bla</th></tr><tr><td>Recycled product waste:</td><td>437g</td></tr><tr><td>Waste products to landfill:</td><td>188g</td></tr><tr><td>Incinerated card:</td><td>11.6g</td></tr><tr><td>Recycled card:</td><td>118.5g</td></tr><tr><td>Card for landfill:</td><td>9.9g</td></tr><tr><td>Incinerated PE:</td><td>9.7g</td></tr><tr><td>Recycled PE:</td><td>11.5g</td></tr><tr><td>PE for landfill:</td><td>9.7g</td></tr><tr><td>Incinerated wood:</td><td>140.9 g</td></tr><tr><td>Recycled wood:</td><td>169.5g</td></tr><tr><td>Wood for landfill:</td><td>159.2g</td></tr></table>
Direct emissions to ambient air, soil and water	N/A
N/A – Not applicable	

3.3. Module B1 - Use stage

According to the specific PCR for rules regarding the category of products for ceramic tiles – EN 17160, the environmental impacts generated during the use phase are very low and can therefore be disregarded. Ceramic floor tiles are robust and have a hard, abrasion-resistant surface.

No environmental impacts are expected during the use phase.

3.4. Module B2 - Maintenance

Parameter	Results expressed per functional unit
Scenario	N/A
Related scenario	N/A
Maintenance process	Cleaning 52 times a year (residential use)
Maintenance cycle	2600 per RSL or 52 per year
Ancillary materials for maintenance e.g. cleaning agent, specify materials	0.134 ml of detergent and 0.1 l of water are used to wash 1 m2 of porcelain tiles - Group Bla, once a week.
Waste material resulting from maintenance (specify materials)	N/A
Net fresh water consumption during maintenance	2.60E-01 m³ per RSL
Energy input during maintenance e.g. vacuum cleaning, energy carrier type, e.g. electricity, and amount, if applicable and relevant	N/A
Transport	N/A
N/A – Not applicable	

3.5. Module B3 - Repair

In general, the service life of ceramic tiles (floor tiles) is equal to the service life of the building. Repair, replacement, and rehabilitation are not necessary for ceramic floor tiles.

According to EN 17160, ceramic floor tiles do not require repairs during the use phase, and therefore, no impact should be reported in the repair phase.

3.6. Module B4 – Replacement

In general, the service life of ceramic floor tiles is equal to the service life of the building. Repair, replacement, and rehabilitation are not necessary for ceramic floor tiles.

3.7. Module B5 - Refurbishment

This module is not relevant for ceramic coverings, according to EN 17160.

3.8. Module B6 - Utilização de energia (operacional)

This module is not relevant for ceramic coverings, according to EN 17160.

3.9. Module B7 - Water usage (operational)

This module is not relevant for ceramic coverings, according to EN 17160.

3.10. Module C1 Demolition – End-of-Life Stage

This module, according to the PCR developed in EN 17160, is not relevant for ceramic coverings.

3.11. Module C2 Transportation – End-of-Life Stage

The demolition waste of ceramic coverings is transported from the construction site to a container or treatment station by truck, and an average distance of 50 km is considered.

3.12. C3 Waste processing for reuse, recovery, and recycling – End-of-Life Stage

Destination	Result	Unit of measurement
Recycling (C3)	70	%

3.13. C4 Waste disposal – End-of-Life Stage

Destination	Result	Unit of measurement
Landfill disposal (C3)	30	%

3.14. Scenarios and technical information for module D

Module D includes recycling credits for ceramic materials and packaging, as well as energy credits from the thermal recovery of packaging.

According to EN 17160, after the demolition/deconstruction stage, ceramic tiles can be crushed and used in a variety of different applications:

- ✓ As aggregates, as a base for road construction;
- ✓ Concrete aggregates;
- ✓ When ceramic floor tiles are crushed, it forms recycled ceramic aggregates that can be integrated as a partial substitute for natural aggregates in hot mix asphalt [8];
- ✓ Recycled ceramic aggregates can be used in the construction of sanitary landfills [8];
- ✓ Recycled ceramic aggregates can be used in the construction of base courses in secondary roads [8].

In this case, EN 17160 refers to a default value of 70%, and according to the Portuguese Environment Agency (APA, 2020), the recovery rate of ceramic materials in construction and demolition waste in Portugal is approximately 75%. Therefore, a more conservative value aligned with the specific ceramic PCR (EN 17160) was assumed.

3.15. Additional environmental information regarding the release of hazardous substances into air, soil, and water during the use stage

The correct use of the described products does not pose a danger to water, air or soil. It is inert when used properly.

The product is classified as A+. Source: ALELUIA self-declaration and Cerame-Unie guide.

4. REFERENCES

- ✓ General Instructions of the DAPHabitat System, Version 3.0, june 2024 (in www.daphabitat.pt);
- ✓ PCR – Baseline model for construction products and services. DAPHabitat System. Version 3.0, june 2024 (in www.daphabitat.pt);
- ✓ ISO 14025:2010 declarations – Environment Type III declarations – Principles and procedures;
- ✓ EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;
- ✓ EN 15942:2021 Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ Ecoinvent database v3.7 (2021). (www.ecoinvent.org)
- ✓ EN 17160:2019 – "Product category rules for ceramic tiles"
- ✓ Entidade Reguladora dos Serviços Energéticos (ERSE) – Renewable Special Regime Production (PRE) (2021) (in http://www.erse.pt/pt/desempenhoambiental/prodregesp/2021/Paginas/2021.aspx)
- ✓ Redes Energéticas Nacionais (REN) – Information Centre – Monthly Statistics (2021). (in http://www.centrodeinformacao.ren.pt/PT/InformacaoExploracao/Paginas/EstatisticaMensal.aspx)
- ✓ Product Category Rules (PCR) – Floor Covering. RCP001:2014. DAPHabitat System. Version 1.2, june 2022 (in www.daphabitat.pt).
- ✓ EN 14411:2012. Ceramic tiles. Definitions, classification, characteristics, conformity assessment and marking. Brussels Belgium
- ✓ ISO 13006:012. Ceramic tiles - Definitions, classification, characteristics and marking, 2nd ed. International Organization for Standardization, USA
- ✓ Almeida. M. (2019). Environmental performance of products in the ceramic sector in Portugal. Doctoral thesis. Aveiro University