Statement of Verification

BREG EN EPD No.: 000507 Issue 02

This is to verify that the

Environmental Product Declaration

provided by:

Cupa Pizarras

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1 m2 of Natural Cupa 50 Roofing slate

Company Address

Cupa Pizarras
Grosvenor Gardens
London
SW1W 0AU
T: +44 20 3318 4455
E: UK@cupapizarras.com
W: www.cupapizarras.com/uk

Signed for BRE Global Ltd	Emma Baker Operator	20 June 2023 Date of this Issue
09 June 2023 Date of First Issue		08 June 2028 Expiry Date

Environmental Product Declaration

EPD Number: 000507

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A2:2020 And BRE Global Scheme Document SD207
Commissioner of LCA study	**LCA consultant/Tool**
Cupa Pizarras Grosvenor Gardens, London London, SW1W 0AU T: +44 20 3318 4455 E: UK@cupapizarras.com W: www.cupapizarras.com/uk	José Manuel Sánchez Rodríguez (NOSOS) Manuel Piñeiro Pose, nº2.1ºb 15006 A Coruña (Spain) Tool: Simapro 9.3
Declared/Functional Unit	**Applicability/Coverage**
1 m^2 of surface of discontinuous roof covering during a reference life service of 60 years. This functional unit corresponds to 33.483 kg of roofing slate	Product Average.
EPD Type	**Background database**
Cradle to Grave	Ecoinvent 3.8

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b]) Third party verifier: Roger Connick
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2020. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2020 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

The manufacturing site locates within the quarry where the slate is extracted.

CUPA 50: Quarry in San Vicente Villamartín de Valdeorras 32348 Orense Spain	Cupa Pizarras Grosvenor Gardens, London London, SW1W 0AU T: +44 20 3318 4455 E: UK@cupapizarras.com W: www.cupapizarras.com/uk

Construction Product:

Product Description

The products covered in this study are **natural roofing slate** extracted from slate quarries located in Orense, a province in the north-western region of Spain. Moulded by nature for over 500 million years, natural slate is a metamorphic rock that, unlike artificial products, maintains its colour and properties unalterable through time, are capable of enduring extreme temperatures, difficult snow formation, fire-resistance as well as being fully waterproof.

Each slate is handcrafted by skilled splitting craftsmen and requires no chemical treatments. With a durability of over 100 years, slate is the most resistant material used for roofing without the need of maintenance. By being 100% natural, slate is the roofing material with less environmental impact, which guarantees a perfect performance in any weather condition. Its unparalleled character and durability make this material ideal to preserve the aesthetics appearance and personality of any architectural project.

CUPA 50 is extracted from San Vicente quarry, are deep grey slate with thin laminations and very uniform smooth surface and comes from San Vicente Quarry in, Villamartín de Valdeorras.

Technical Information

Property	Applied standard	Value, Unit
Water absorption	UNE EN 12326-1 Spanish version	0.11% Code: W1 (< 0.6%)
Contents of carbonate non-carbonated		0.40% Fulfill (< 2%)
Mor characteristic		Longitudinal 58.9 MPA Transverse 60.5 MPA
Thickness		5 mm
SO_2 exposure test		S1
Thermal cycle test		T1
Freeze thaw test		Fulfill < 0.6%
Size	BS EN-12326 -1	500x250 400x250 600x300 400x200 500x300
Weight		33.483 kg/m2

Main Product Contents

The product is 100% natural slate.

Material/Chemical Input	%
Slate, from ground	100

Manufacturing Process

The manufacturing consisted of various steps:

1. GEOLOGICAL STUDIES
Before initiating the extraction, sounding studies are carried out to identify the potential of the deposit reserves and the quality of the slate.

2. EXTRACTION
Slate is extracted in huge blocks which are later diamond wire sawn into smaller blocks. These smaller blocks are transported by trucks to the transformation factory located within the quarry.

3. TRANSFORMATION
Once in the transformation warehouse factory, each slate block is examined and classified. Then the following processing procedures take place:

- SAWN OFF: These blocks will be sawn into different sizes depending on the dimensions of the slate which will be produced.
- HAND CUT: The skilled “splitters” exfoliate the slate into thin layers. This handcrafted and meticulous technique allows the finished product to be of great quality.
- BEVELLED: The edges of each piece are bevelled by a machine in order to make them into the exact desired size and give it a characteristic finish.

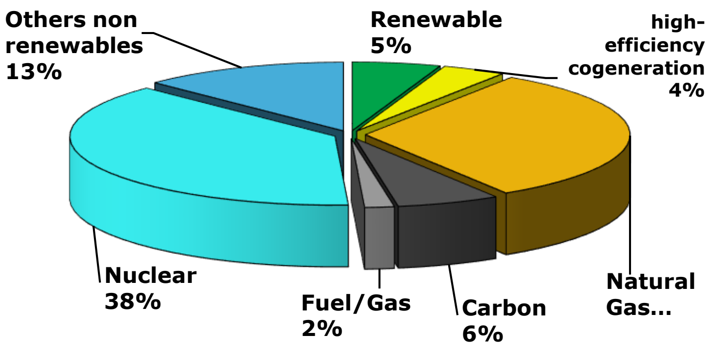
Manufacturing involves direct consumption of energy (electricity and diesel), water and ancillary materials (explosives used in blasting, diamond wire, sawing discs, lubricating oils). The emissions from blasting, as well as from burning diesel are adapted from assumptions made in corresponding processes in Ecoinvent 3.8.

4. SELECTION
Each slate is inspected by a manual selection process by the quality control department. Both technical and aesthetic control criteria are taken into account.

5. PACKAGING
The finished slate pieces are then packaged onto wooden crates and labelled with its technical information. All materials and processes upstream to the obtainment of packaging materials are assigned in this module.

Electricity:

The electricity used in the processing unit is purchased from a supplier. In reference to the residual electricity mix, the data are taken from the AGREEMENT ON ELECTRICITY LABELLING RELATING TO THE ENERGY PRODUCED IN 2021, of the Comisión Nacional del Mercado de la Competencia (National Competition Market Commission). The figure below shows the residual electricity mix corresponding to the "generic without GdO's"



Waste:

Wastes generated in manufacturing include slate slag, which is deposited in the quarry; waste mineral oil and sawing disc waste which are sent to a local waste manager located within 150 km radios from the quarries.

Water consumption:

Consumption has been calculated on the basis of the number of equivalent inhabitants (workers) in the mines and production plants.

The number of warker to calculation: 50

In Gallega de Pizarras, we have filter press purification at Villamarín, which results in 90% purification, and decantation purification at the mine, which results in 80% purification. We have assumed that 80% of the water is recirculated.

Construction Installation

A4 Distribution

This module includes the transportation of the product from the manufacturing sites in Orense, Spain to the customers in the UK, including two means: the first one being lorry, from manufacturing site to ports and ports to final clients; the second one being container ships between ports. The average milage and weight transported have been calculated based on 2021's sales.

The main parameters that affect the result of this stage are:

Specifications of the different types of transport used

PARAMETER	VALUE per FUNCTIONAL UNIT
Average distance	• Lorry : 517.19 km • Boat : 1259.64 km
Fuel type and vehicle consumption or type of vehicle used for transportation.	• Lorry >32 tn EURO5. Diesel consumption: 0.019 kg/tkm • Container ship. Heavy fuel oil consumption: 0.0025 kg/tkm
Use of truck capacity (including empty returns)	% assumption from in Ecoinvent database
Coefficient of use of the volume capacity	< 1
Density of the product transported	< 2.800 kg/m^3 Including packaging

A5 Construction-Installation

This module includes all materials and energy used for the installation of the product. At the same time, the transport and management of the waste produced are taken into account.

The installation is manual and considers an average consumption of slate nails of 150 gr/m2 of installed roof. These nails are transported directly from a supplier 30 km away from the construction site.

The installation also takes into account 5% of slate rejection due to breakage and defects that occur during distribution. This rejected slate is sent to landfill being an inert material.

The packaging waste including wooden pallet and wrapping plastic are sent to a local waste manager. The packaging waste treatment scenario is assumed to be the most recent UK's, including open burning, municipal incineration and sanitary landfill.

Main parameters / hypothesis applied in the Construction / Installation stage

Parameter	Value per functional unit
Auxiliary inputs for installation	Slate nails
Water use	None
Use of other resources	None
Quantitative description of the type of energy consumption during the installation process	No energy is used
Materials produced by waste treatment atthe construction site, for example collection for recycling, energy recovery, disposal (specified by route)	• Wooden pallet: 0.0347 kg • PP plastic: 0.00016 kg • Product loss: 5%
Materials produced by waste treatment at the construction site, for example collection for recycling, energy recovery, disposal (specified by route)	• Packaging materials sent to waste treatment facility • Rejected slate is sent to landfill
Direct emissions to air, water and soil	No direct emissions

Use Information

This stage is made up of B1 Use, B2 Maintenance, B3 Repair, B4 Substitution, B5 Rehabilitation, B6 Use of energy in service and B7 Use of water in service.

- Use of the products in building: the environmental impacts in this module are negligible since the use of roof slate as covering materials does not require any energy nor material consumption.
- Waste management during use: no waste derives from the slate during the use phase.
- Maintenance: under normal conditions of use, roofing slates may require occasional inspections, replacement of plates due to damage, for example, due to extreme weather events. The impacts due to natural catastrophes are considered negligible.
- Repair: under normal conditions of use (except extreme weather events), the slates do not require repairs during the use phase.
- Replacement: the products have a comparable long service life in building and do not require material replacement. The environmental impacts of this module are considered irrelevant.
- Rehabilitation: the products have a comparable long service life in building and do not require material replacement. Therefore, the environmental impacts of this module are not contemplated.

Once the installation is completed, no technical actions nor operations are required during the use stages until end of life. Therefore, CUPA roofing slates have no impact at this stage.

End of Life

This stage includes the following modules: C1 Deconstruction/ demolition; C2 Transport; C3 Waste processing and C4 Final disposal.

Being a valuable and durable material, the dismantling process is advised to be manual and mechanical to facilitate material recovery. According to the company's experience, up to 90% of the slate at its end of life is collected for reuse. The other 10% is presumed to be landfilled. The distance to the recovery facility is assumed to be 100 km (round trip with empty return).

All the information regarding the end-of-life stage of the products is resumed in the table below:

End of life scenario specifications

Module	Parameter	Unit	Value per functional unit
C1 Dismantling	Process of collection specified by type	kg collected manually and separately	33.483 kg
		kg collected mixed with construction waste	0
C2 Transportation	Fuel type and consumption, type of ve hicles used for the transport	Truck 16 t EURO5	Diesel consumption: 0.037 kg/tkm
	Distance	km	100 km
	Capacity use	% assumption by Ecoinvent	100% volume outbound, empty return trip
	Useful capacity factor		< 1
		kg for recycling (47%)	0 kg
		kg for energy recovery	0 kg
		kg to incineration (7%)	0 kg
C4 Final disposal	Type of disposal	kg to landfill (45%)	3.348 kg
		Kg for reuse	30.135 kg

Benefits and loads beyond the system boundary

This module D includes the benefits of the potential of reuse, recovery and recycle.

This study claims the environmental benefits of recovered materials for reuse.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

The functional unit defines the way in which the functions or the identified behavioural characteristics of the product are quantified. The main purpose of the functional unit is to obtain a reference that allows normalizing the results of the LCA related to the material flows (input and output data) of the construction product and other information, with the aim of producing data expressed through a common base.

In this case, the functional unit is chosen to be 1 m^2 of surface of discontinuous roof covering during a reference life service of 60 years. This functional unit corresponds to 33.483 kg of roofing slate.

Although according to the company's experience, the service life of roofing slate can last up to 100 years, the chosen reference life service was taken as BRE's ''The Green Guide Explained''.

The concrete function of the slate is roof covering, thanks to the material's natural properties of impermeability, resistance to frost, resistance to bending and durability. Natural roofing slate also offers insulating properties and provides aesthetic values; however, these functions are out of scope of this study.

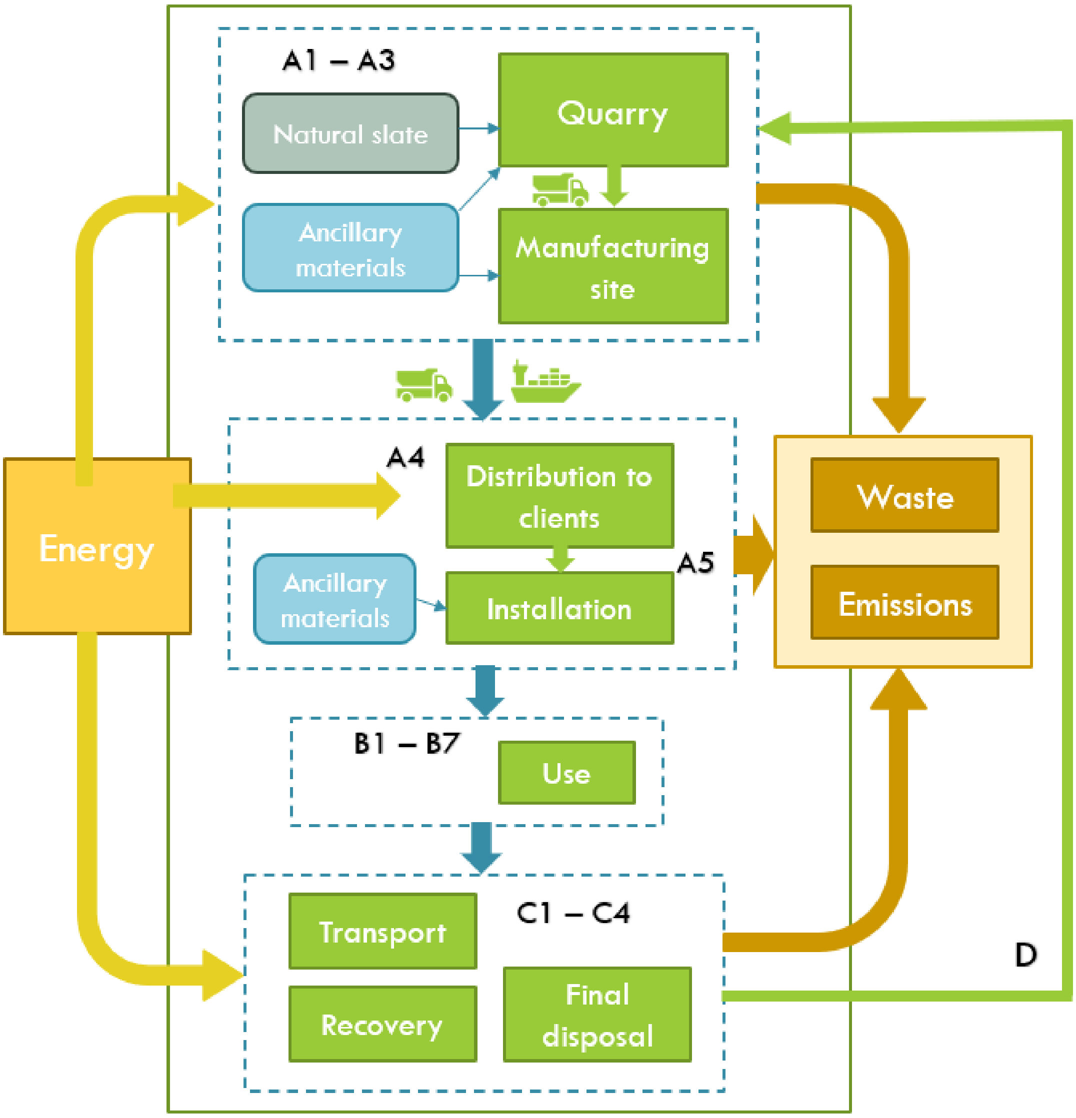
The functional unit is declared for a group of similar products, namely roofing slate in different formats (dimensions and weight), colour and surface rugosity. The calculations that result in this functional unit are based on the information in the following table provided by the manufacturer:

References used for the calculation of the average product for CUPA 50

Kg/m² of Cupa50				
Thickness (mm)	**Size (cm)**	**Pieces/m²**	**Unit weight (kg)**	**Weight (kg/m²)**
5	50*25	20	1.289	25.78
5	40*25	25	1.289	32.225
5	60*30	13	2.554	33.202
5	40*20	32	1	35.136
5	50*30	17	2.416	41.072
Average				**33.483**

The calculation has taken into account the amount of product needed to cover 1 m^2 of roof, meaning the size of the slate (thickness x width x length), the weight of each reference and the number of slates necessary to cover 1 m^2 of roof **including** the recommended overlapping spaces. This average results in **33.483 kg of product necessary to cover 1 m^2 of roof**.

System boundary



Data sources, quality and allocation

Specific data has been taken on the amounts of matter and energy used during the life cycle of the products. These data have been supplied by CUPA PIZARRA, referring to the year 2021, and come from direct factory data. The results presented in this document are valid until there are no substantial modifications that affect the impact produced. Substantial modifications are considered to be any increase of over 10% in the environmental impact per functional unit.

Generic data has been taken on the impact per unit of matter or energy. These data have been obtained from Ecoinvent database, of recognized international prestige, in its version 3.8. Said database has been selected as the reference database because it coincides with the input flows of matter and energy on the following aspects:

- Technological equivalence: the data derive from the same physical and chemical processes, or at least the same technological coverage.
- Limits to nature: the data contains all the quantitative information necessary for LCA analysis
- Limits towards technical systems: the considered stages of the life cycle are equivalent.

In terms of calculation methodologies, CML-IA v3.07 impact method has been used, together with EDIP v1.07 for waste production indicators and Cumulative Energy Demand v 1.11 for resource consumption indicators.

The LCA carried out by CUPA PIZARRA has been done following the requirements regarding data quality set by EN 15804:2012+A2:2020. This ensures that the evaluation of the results is reliable, consistent and transparent. All generic data comes from reliable sources and thus has been checked for plausibility.

- **Geographical relevance -** The data we have collected is based as close as possible to manufacturing site. All data refers to European technology.

- **Technological relevance -** All the technological data gathered is current and for most materials it is generally industry averages.

- **Temporal relevance -** Our datasets are updated as often as possible to ensure they are at least within the last 10 years for generic data and within the last 5 years for producer specific data. The databases Ecoinvent v.3.8 has been updated earlier of the same year that this study took place.

Furthermore, the data collected for the LCA is based on a full year of production in 2021. Data for the factory are obtained from direct measurements, calculations or from invoices.

Regarding the allocation process, whenever possible, allocation has been avoided, but for energy consumption, waste production and distribution, an allocation has been made based on physical considerations of mass.

Cut-off criteria

Regarding cut-off rules, 95% of all inputs and outputs of mass and energy per module have been included, and at least 99% for the total life cycle.

The polluter payer as well as the modularity principle have been followed.

The following processes have been excluded:

- Manufacture of equipment used in production, buildings or any other capital goods
- Transportation of personnel from, to and within the production site
- Research and development activities
- Long-term emissions

LCA Results

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			GWP Total	GWP Fossil	GWP Biogenic	GWP Luluc	ODP	AP	EP Freshwater
			kg CO_2 equiv.	kg CO_2 equiv.	kg CO_2 equiv.	kg CO_2 equiv.	kg CFC11 eq	mol H+ eq	kg $(PO4)^{3-}$ eq
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	6.07E-02	1.02E-01	-4.20E-02	3.21E-04	1.63E-08	1.53E-03	2.10E-06
Construction process stage	Transport	A4	5.11E-02	5.11E-02	1.57E-05	5.03E-07	1.16E-08	5.36E-04	2.64E-08
	Construction	A5	6.88E-02	1.25E-02	5.62E-02	1.95E-05	1.95E-09	1.29E-04	2.57E-07
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	7.18E-03	7.18E-03	2.32E-06	5.71E-08	1.68E-09	2.41E-05	3.62E-09
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	5.35E-04	5.27E-04	7.97E-06	1.91E-07	9.36E-11	4.91E-06	6.33E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.46E-02	-9.21E-02	3.78E-02	-2.88E-04	-1.47E-08	-1.37E-03	-1.89E-06

GWP-total = Global Warming Potential, total;
GWP-fossil = Global Warming Potential, fossil;
GWP-biogenic = Global Warming Potential, biogenic;
GWP-luluc = Global Warming Potential, land use and land use change

ODP = Depletion Potential of the stratospheric ozone layel;
AP = Acidification Potential, accumulated exceedance;
EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater and compartment

LCA Results

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			EP Marine	EP Terrestrial	POCP	ADP[1] Mineral & metals	ADP[1] Fossil	WDP[1]	PM
			kg N equiv.	Mol N eq	Kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq. deprived	Disease incidence
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	5.01E-04	6.58E-03	1.53E-03	2.35E-08	1.79E+00	4.16E-02	2.13E-08
Construction process stage	Transport	A4	1.41E-04	1.56E-03	4.07E-04	1.81E-09	7.00E-01	-1.19E-04	4.23E-09
	Construction	A5	4.13E-05	5.01E-04	1.22E-04	3.22E-09	1.86E-01	2.89E-03	1.78E-09
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	7.64E-06	8.39E-05	2.30E-05	3.07E-10	1.00E-01	-1.67E-05	7.16E-10
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.03E-06	2.23E-05	6.16E-06	2.40E-11	7.01E-03	1.75E-05	1.23E-10
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-4.51E-04	-5.92E-03	-1.38E-03	-2.11E-08	-1.61E+00	-3.74E-02	-1.92E-08

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral & metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Abiotic depletion potential for fossil resources;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption;
PM = Particulate matter.

LCA Results

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			IRP[2]	ETP-fw[1]	HTP-c[1]	HTP-nc[1]	SQP[1]
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	1.25E-02	4.12E+01	7.22E-11	9.30E-10	3.81E+00
Construction process stage	Transport	A4	3.04E-03	2.89E-01	5.28E-12	5.11E-10	1.87E-03
	Construction	A5	1.12E-03	2.13E+00	1.35E-10	2.41E-10	2.08E-01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	4.35E-04	4.41E-02	6.16E-13	8.61E-11	2.69E-04
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	3.04E-05	4.13E-03	5.10E-14	4.34E-12	1.75E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.12E-02	-3.71E+01	-6.50E-11	-8.37E-10	-3.42E+00

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans, carcinogenic effects;
HTP-nc = Potential comparative toxic unit for humans, non-carcinogenic effects;
SQP = Potential soil quality index;.

LCA Results

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	8.77E-01	2.02E+01	2.10E+01	1.88E+00	2.22E-01	2.11E+00
Construction process stage	Transport	A4	1.04E-03	0.00E+00	1.04E-03	7.43E-01	0.00E+00	7.43E-01
	Construction	A5	4.88E-02	0.00E+00	4.88E-02	1.97E-01	0.00E+00	1.97E-01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.54E-04	0.00E+00	1.54E-04	1.06E-01	0.00E+00	1.06E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.65E-04	0.00E+00	1.65E-04	7.45E-03	0.00E+00	7.45E-03
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.89E-01	0.00E+00	-7.89E-01	-1.69E+00	0.00E+00	-1.69E+00

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued)

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	7.06E-04
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	2.09E-06
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	7.08E-05
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.75E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	8.42E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-6.35E-04

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG
	Total (of product stage)	A1-3	2.71E-06	2.08E-03	1.25E-05
Construction process stage	Transport	A4	1.53E-06	2.98E-05	5.01E-06
	Construction	A5	2.94E-07	7.27E-02	1.26E-06
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.63E-07	4.13E-06	7.16E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.50E-08	1.00E-01	4.42E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.44E-06	-1.87E-03	-1.12E-05

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

(MND = module not declared; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing output flows – at end of life			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.00E+00	1.00E-02	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	3.01E+01	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

[1] The results of these environmental impact indicators will be used with care as the uncertainties of the results are high and there is limited experience with these indicators.

[2] This impact category deals mainly with the 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 the disposal of radioactive waste in underground facilities. The ionising radiation potential of soil, due to radon or some building materials is also not measured by this parameter.

bre

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Description of scenario		
	Fuel type / Vehicle type 1: Lorry >32 tn EURO5	Diesel	0.019 kg/tkm
	Fuel type / Vehicle type 2: Container ships	Heavy fuel oil	0.0025 kg/tkm
	Distance:	km	• Lorry: 517.19 km • Boat: 1259.64 km
	Capacity utilisation (incl. empty returns)	%	% assumption from Ecoinvent database
	Bulk density of transported products	kg/m^3	< 1
A5 – Installation in the building	The most common installation scenario is manual. The slate plates are joint together by nails.		
	Nails consumption	kg	0.15
	Packaging waste: wooden pallet	kg	0.0347
	Packaging waste: packaging film	kg	0.00016
B2 – Maintenance	Under normal conditions of use, roofing slates may require occasional inspections, replacement of plates due to damage, for example, due to extreme weather events. The impacts due to natural catastrophes are considered negligible.		
B3 – Repair	Under normal conditions of use (except extreme weather events), the slates do not require repairs during the use phase.		
B4 – Replacement	The product has a comparable long service life in building and do not require material replacement. The environmental impacts of this module are considered irrelevant.		
B5 – Refurbishment	The product has a comparable long service life in building and do not require material replacement. Therefore, the environmental impacts of this module are not contemplated.		
Reference service life	Although according to the company's experience, the service life of roofing slate can last up to 100 years, the chosen reference life service was taken as BRE's ''The Green Guide Explained'' of 60 years.		
B6 – Use of energy; B7 – Use of water	The environmental impacts in this module are negligible since the use of roof slate as covering materials does not require any energy nor material consumption.		
C1 to C4 End of life,	Being a valuable and durable material, the dismantling process is advised to be manual and mechanical to facilitate material recovery. According to the company's experience, up to 90% of the slate at its end of life is collected for reuse. The other 10% is presumed to be landfilled. The distance to the recovery facility is assumed to be 100 km (round trip with empty return).		
	Recovery system specified by type	kg for reuse	30.135 kg
	Type of final disposal	kg to landfill	3.348 kg
Module D	This study claims the environmental benefits of recovered materials for reuse.		

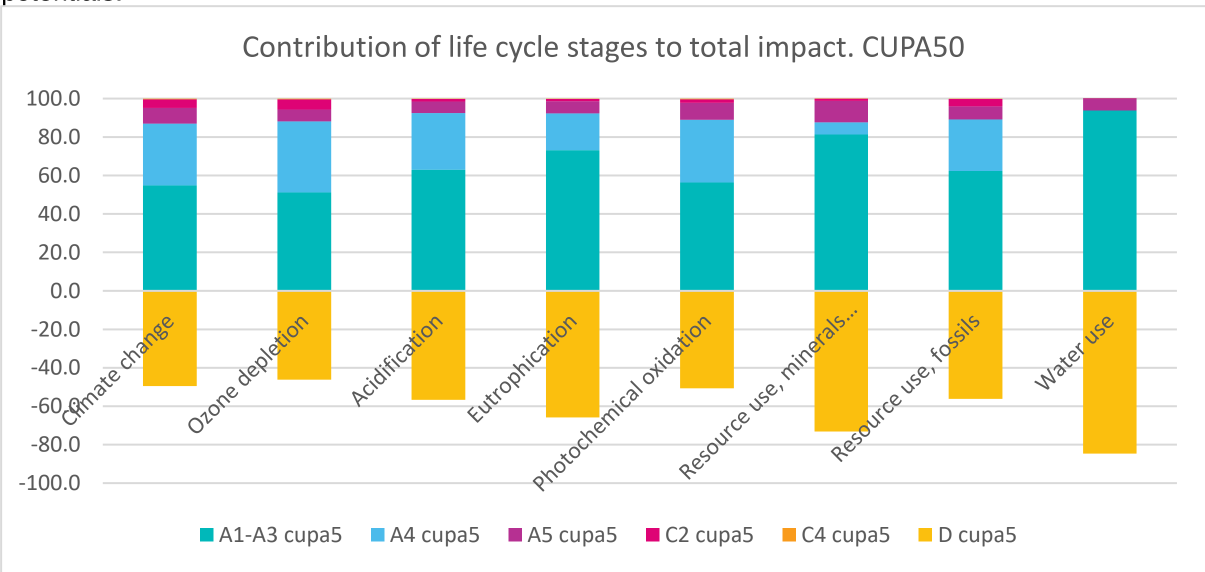
Summary, comments and additional information

Results interpretation

As can be seen in bar chart below, the impacts on the life cycle of CUPA 50 is dominated by A1-A3 Product stage. In concrete, this stage represents between 51% (Ozone depletion potential) and 94% (Water footprint) of the total impact of the product's life cycle. On the other hand, the benefits beyond the system boundary, module D shows that the environmental impacts regarding the 9 mandatory studied categories are mayorly cancelled out by the recovering-reutilisation efforts. The impact-cancelling effects of module D are between 46% (Ozone depletion potential), up to 84% in Water footprint.

A4 Transport is the second most impactful stage, presenting its maximum of up to 37% in Photochemical oxidation. A5 Installation stage follows with an average of 7.5% in all impact categories. The remaining stages C2 and C4 have relatively low impact potentials.

Respecting the Production Stage, most impacts come from diesel usage – for instance, 60% in Global warming potentials.



Potential environmental impacts of one m² of CUPA 50, in percentage

References

EN 15804:2012+A2:2020 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures.

BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework.
BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines.
BS EN ISO 14044:2006. London, BSI, 2006.

UNE EN 12326-1:2015: Slate and stone for discontinuous roofing and external cladding - Part 1: Specification for slate and carbonated slate

PRé Consultants bv, SimaPro 8 LCA Software 2013. http://www.pre-sustainability.com/

Ecoinvent Centre. Swiss Centre for Life Cycle Inventories. http://www.ecoinvent.org/
https://www.cupapizarras.com/uk/rainscreen-cladding/systems/#sistemas_101

https://www.bbacerts.co.uk/search/?doc=%2F1AsZ8k8K9A3jKX4Fa8EC7M%3D

https://www.cupapizarras.com/uk/rainscreen-cladding/downloads/