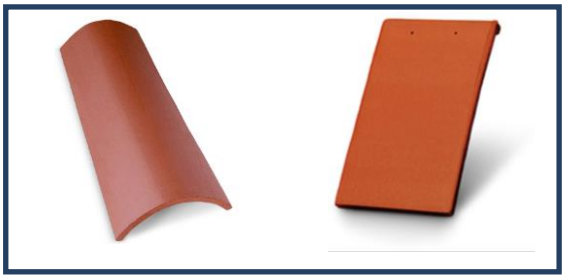
ENVIRONMENTAL AND SANITARY DECLARATION SHEET OF CANAL TERRACOTTA TILES AND FLAT TERRACOTTA TILES

March 2020
April 2022 update

In accordance with the standards NF EN ISO 14025 : 2010, NF EN 15804+A1 : April 2014
And its national complement NF EN 15804/CN : June 2016



REALIZATION :

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Summary

1. Reading Guide

The display of inventory data meets the requirements of the standard NF EN 15804+A1.
In the following tables 2,53E-06 must be read : $2{,}53 \times 10^{-6}$ (scientific writing).

The units used are spécified in front of each flow, they are :
- kilogram « kg »,
- cubic meter « m^3 »,
- kilowatt hour « kWh »,
- mégajoule « MJ »,
- Square meter « m^2 »,
- linear meter « ml ».

Abbreviation :
- LCA : Life cycle analysis
- RLT : Reference Life Time
- FU : Functional Unit
- LCV : Lower Calorific Value

2. Warning

The information contained in this declaration is provided under the responsability of the CTMNC (producer of the Environmental and Health Declaration Sheet (FDES) or Environmental Product Declaration (EPD)) according to NF EN 15804+A1 and the national supplement NF EN 15804/CN.

Any use, total or partial, of the information provided in this document must at leat be accompanied by the complete reference of the original FDES / DEP, namely the « FDES canal tile and flat terracotta tile » or the « DEP canal tile ans flat terracotta tile » which is accessible on the INIES database as well as to its producer who can provide a complete copy. It is recalled that the results of the study are based solely on facts, circumstances and assumptions that were submitted during the study. If these facts, circumstances and assumptions differ, the results may change. In addition, the results of the study should be considered as a whole, with regard to the hypotheses, and not taken in isolation.

Precaution of use of the FDES for the comparison of products :

The EPDs of construction products may not be comparable if they do not comply with standard NF EN 15804+A1.
The NF EN 15804+A1 standard defines in § 5.3 Comparability of EPDs for construction products the conditions under which construction products can be compared, on the basis of the information provided by the EPD:
“A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impacts on the building, and must take into account the entire life cycle (all modules of information). »

This sheet constitutes a suitable framework for presenting the environmental characteristics of construction products in accordance with the requirements of standard NF EN 15804+A1, its national complement NF EN 15804/CN and for providing comments and additional information useful in the compliance with the spirit of this standard in terms of sincerity and transparency.

3. General Informations

Name and adress of declarant : CTMNC 17, rue Letellier 75726 Paris Cedex 15 France	**Product commercial reference :** This FDES covers Roman tiles and flat clay tiles produced in France by CTMNC nationals which meet the functional unit described in §4.2 and fall within the scope of validity defined in §5.5.
Contact Name : Quentin Lebonnois	**Vintage of the FDES :** March 2020, update april 2022
Contact details : @ : lebonnois.q@ctmnc.fr Tél : +33 (0) 1 45 37 77 65	**End of validity of the FDES :** March 2025
A report accompanying the declaration has been drawn up and can be consulted, under confidentiality agreement, at the CTMNC. The information contained in this declaration is provided under the responsibility of the French tile manufacturers and the CTMNC.	Type of FDES: The FDES covers the stages "from the cradle to the grave", it is a collective declaration

Vérification :

The CEN standard NF EN 15804+A1 serves as the Rules for defining product categories (RCP). Independent verification of the declaration, in accordance with EN ISO 14025:2010: ☐ Internal ☒ External	**Vérification program :** Programme FDES-INIES http://www.inies.fr/ Association HQE 4, avenue du Recteur Poincaré 75016 PARIS FRANCE
Auditor's Name : Cécile Beaudard (Solinnen)	

4. Functional unit and product description

4.1 Product description

The product studied is a fictitious medium-sized canal or flat clay tile (then called a tile). The tiles can have a variable dimension (different lengths, heights, thickness), different shapes, so they also have a variable mass per square meter.

The average mass of tiles per square meter (m²) is 65.8 kg/m². The product is delivered on returnable wooden pallets with a PE (Polyethylene) covering and PP strapping as packaging.

The tiles are mounted in accordance with DTU 40.22 (channel tiles), DTU 20.23 (flat tiles) or other technical reference documents (DTA, etc.).

Tiles can be used in all types of buildings.

4.2 Functional Unit (FU)

The functional unit (FU) retained for the tile is as follows

« Ensuring the coverage function over 1 m² over a reference lifetime of 100 years. »

The average tile coverage rate was used to calculate the number of tiles per square meter, and therefore the mass of tile per square meter. It takes 65.8 kg of tiles (on average) to achieve one square meter of coverage. Only terracotta tiles are affected by this FDES, terracotta accessories are not within the scope of the study. This FDES is valid for all slopes corresponding to roofing installation.

The Reference LifeTime (RFT) retained for this product is 100 years.

Regarding the justification of the DVR, no test has been carried out specifically to establish the DVR of the tiles. Tile quality and mechanical resistance tests are carried out on the products.

To estimate the lifespan of the tiles, we can consider that they are integrated into buildings with a long lifespan, that they are never replaced, and therefore have a lifespan corresponding to the lifespan of the building..

For France, the average renewal time is around 100 years, the average age of the stock of existing buildings is 51 years, but the median lifespan of existing buildings is over 100 years. In fact, 60% of the buildings existing in 1900 are still in use and this cohort has therefore not yet reached its median lifespan. (Source: Comparative durability of timber frame construction and masonry – M.KORMANN CTMNC Study report June 2008).

Product mass : 65.8 kg/FU

4.3 Product Use / Application

The tile is used to make the roofing of any type of building.

4.4 Technical characteristics

Waterproofing: The tiles ensure the waterproofing of the building.

Reaction to fire: The tiles do not contain organic matter in quantities greater than 1% by mass or volume and are not subject to bonding, as specified in standard NF EN 1304, so they do not have to be tested and has an A1 (incombustible) fire classification.

4.5 Composition / REACH Substances

The product does not contain substances on the candidate list according to the REACH regulation at more than 0.1% by mass

4.6 Fabrication

They are manufactured in France, by the companies Terreal, Wienerberger, BMI, Edilians, Bouyer Leroux and by local VSEs and SMEs.

Data collection covering the year 2018 for 9 sites, i.e. 73% of French production, was carried out for this FDES.

This FDES declares the performance of the average channel or flat tile, modeled using the weighted averages of the collection data according to the tonnages produced.

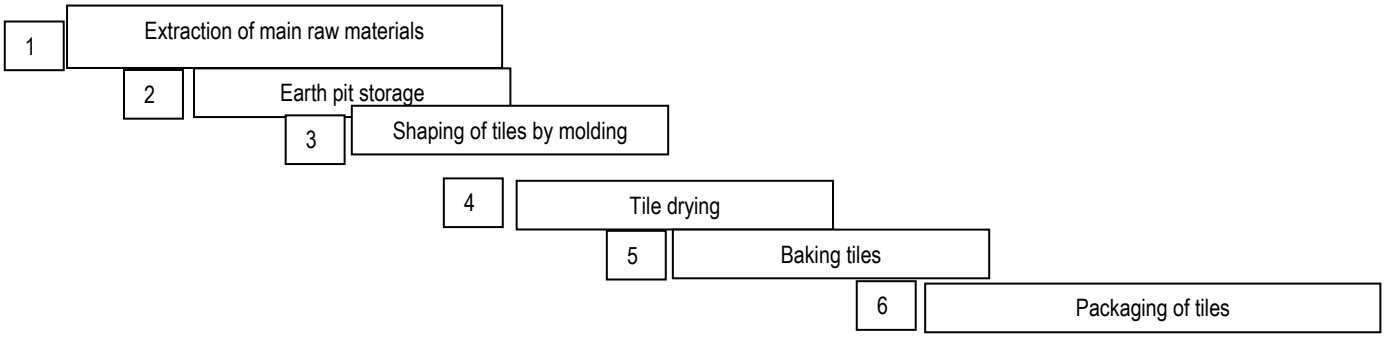


Diagram describing the classic tile manufacturing process

4.7 Main components

The average product declared in this FDES is calculated based on a weighted average based on the tonnages sold of tile models in 2018.
Tuile : 65,8 kg/m²

Metal clips: 76.2 g/m²

4.8 Complementary products (sold with the product)

/

4.9 Packaging

Pallet : 1,48 kg/m²
Cover PE : 72,7 g/m²
Strapping PP : 16,8 g/m²

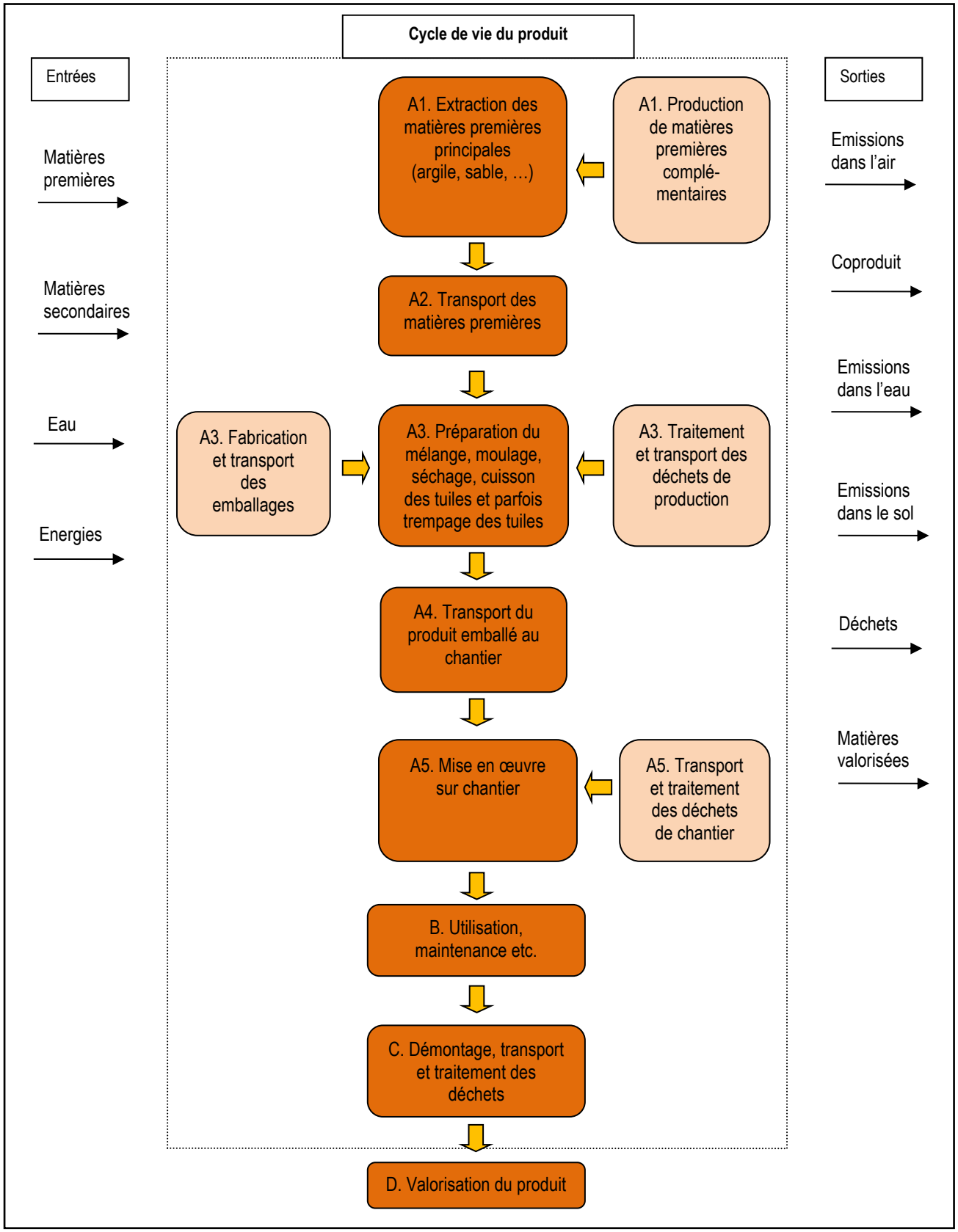
4.10 Référence LifeTime (RLT)

Setting	Units	Values
Reference lifeTime	Years	100
Declared properties of the product when leaving the factory	-	The quality of the tiles refers to appendix ZA of standard NF EN 1304.
Theoretical application parameters	-	The tiles are laid in accordance with DTU 40.22, DTU 40.23 or other technical reference documents (DTA, technical advice, etc.).
Presumed quality of work	-	The work meets the recommendations of the DTU mentioned above or any technical advice in relation to these same tiles if necessary.
External Environment	-	/
Internal Environement	-	/
Terms of use	-	The use of the product is assumed to comply with the recommendations of the product's technical data sheet.
Maintenance	-	No maintenance required

5. General information for the calculation of the life cycle analysis (LCA)

5.1 System boundaries

The boundaries of the system comply with the limits imposed by standard NF EN 15804+A1 and its national complement NF EN 15804/CN.



The following processes are excluded according to standard NF EN 15804/CN: Lighting, heating and cleaning of fab lab

- Administrative department ;
- Employee transportation
- The manufacture and heavy maintenance of the production tool and transport systems (machines, trucks, etc.) for each stage.

In accordance with paragraph 6.2 of standard NF EN 15804+A1, infrastructure assets and energy production facilities have been included in the scope of the study. The Ecoinvent data used in these models consider a share of infrastructure assets.
The packaging of raw materials is not taken into account, those being negligible.
Similarly, the tiles are rarely cut on site, which is why this practice was not considered for the implementation scenario in phase A5.

5.2 Geographical and temporal representativeness of the data

The datasets are based on data averaged over one year (2018) across the various production sites.
This information is provided by the French tile manufacturers.

Generic data from the ECOINVENT V3.5 database (August 2018). No use of modules from older versions.

Dataset version: Method EN 15804_FR_Ev-DEC 1.17 [EI3.5]

5.3 Software Used

SimaPro	SimaPro, life cycle analysis software (V9). (www.simapro.com)
ev/DEC	Ev-DEC, (www.ev-dec.com), developed by the consulting firm EVEA (www.evea-conseil.com), which helps to produce the FDES.

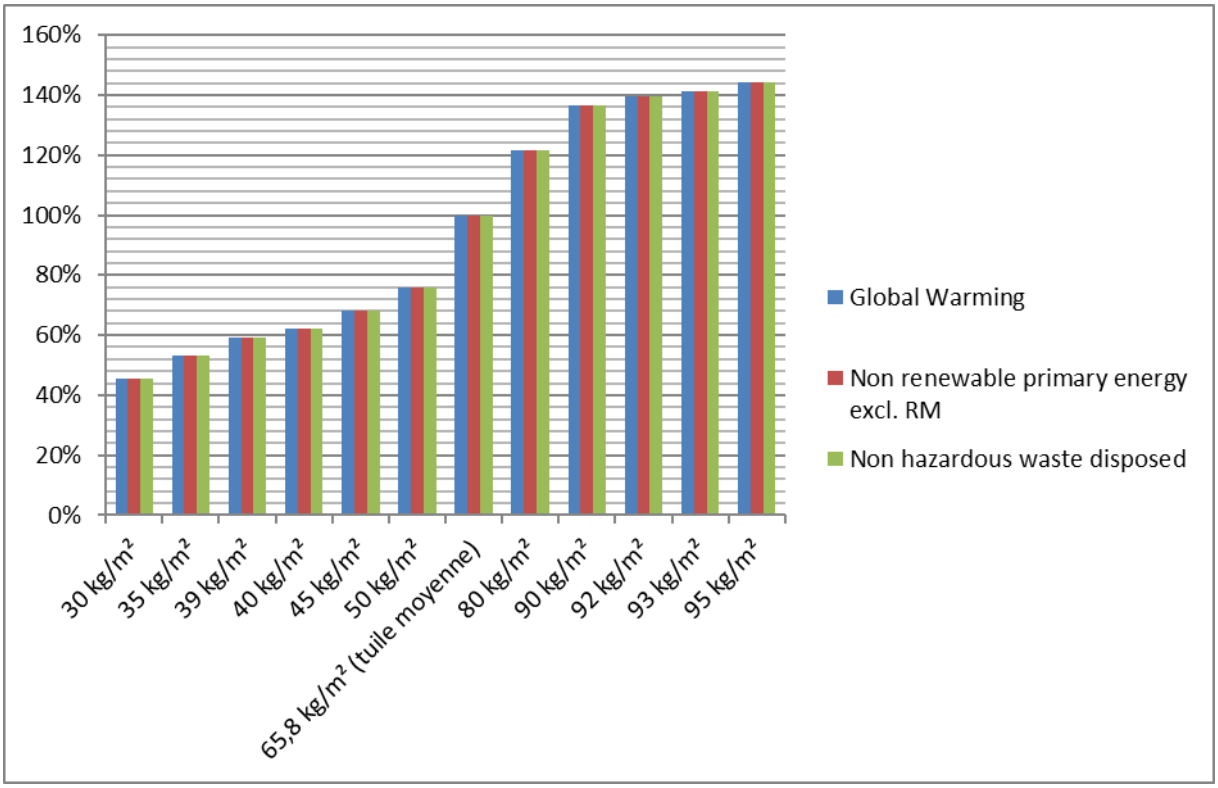
5.4 Allocation

No allowances used.

5.5 Variability of results / validity framework

The impact results presented in this FDES are those of a tile with an average mass of 65.8 kg/m². This mass of 65.8 kg/m² is the mass weighted according to the production of the year 2018 (year of the collection of information) of the tiles manufactured by the French manufacturers of these products.

This FDES is valid for tiles produced in France by CTMNC nationals : tiles which meet the functional unit defined in 4.2 of this FDES and which fall within the scope of validity, i.e. **tiles whose mass per m² is between 40 kg/m² and 92 kg/m².**



Graph illustrating the variability of environmental impact results on 3 indicators according to the variation in the mass of tiles per square meter

6. LCA calculation : scenario and technical information specific to the product

6.1 A1-A3 Fabrication :

- *Module A1 :*

All the raw materials are taken into account at this stage. For each, the most representative generic data are chosen.
The composition of the tile is an average composition weighted by the 2018 annual productions of these products, average of the compositions observed on each site where the information collection took place.
Clay extraction is modeled using generic and/or specific data because for some quarries, the activity is done throughout the year, and for others, the activity is partially sub-divided. processed or the quarry operates only a few months a year, and was not in operation at the time the information was collected.

- *Module A2 :*

All transport of raw materials is taken into account with the average distances from suppliers to the various product manufacturing plants. A 100% loading of trucks from clay and sand quarries was taken into account.

- *Module A3 :*

It integrates the tile manufacturing phase with energy consumption, as well as the production of waste and the treatment or recovery of the latter. It also includes fuels and their transport to the factory as well as the manufacture of the various packaging used for the delivery of products to the worksite.

6.2 A4 Transport to the construction site :

Setting	Units	Values
Fuel type and consumption of the vehicle or type of vehicle	-	Truck with a capacity of 24t, fuel: diesel, consumption of 38L/100km when fully loaded.
Distance to site	km	2,75E+2
Loading capacity	%	The truck is 100% loaded on the outward journey and the empty return is considered.
Density of the transported product	kg/m^3	2,6E+3
Volume capacity utilization coefficient	%	/ NA the factor limiting the load of the trucks is the mass and not the volume in the case of the studied products.

6.3 A5 Product installation:

setting	Values
Slump rate during implementation	1,00E+0 % (assumption of 1% of tiles that are broken during implementation)
Auxiliary inputs for installation (specify by material)	/
Water consumption	/
Use of other resources	/
Consumption and type of energy	/
Waste generated at the construction site prior to the treatment of waste generated by the installation of the product (specify by type)	0,66 kg of inert waste
Materials (specified by type) generated by the treatment of waste at the construction site, e.g. collection for recycling, energy recovery, disposal (specified by route)	Pallet : 0,85 kg/m² (36.4% new pallet per m²) Cover PE : 72,7,4 g/m² Strapping PP : 13,4 g/m² Wooden (pallet) and plastic packaging waste related to the implementation stage is discarded and not recovered. They are cremated.
Direct emissions to ambient air, soil and water	Emissions (excluding waste already accounted for) that may occur during installation of the product are considered negligible. Indeed, the use of cutting is only necessary sporadically (see note below).

Note regarding the omission of the cutout: It was considered the use of a cut-off grinder for cutting tiles (a cut-off grinder has a power of approximately 1100 W or 1100 Wh per hour) considering that there is 1% waste at the implementation, this makes 0.66 kg of tiles or about 0.4 tiles, considering 20 seconds for cutting a tile, we obtain a consumption of 2.4 Wh/m² for cutting 0.4 tiles. A comparison of a life cycle of one m² of tiles VS 0.61 Wh was made using the SimaPro software the 2.4 Wh histogram bar is not visible on the graphs. This consumption of 2.4 Wh has therefore been neglected.

6.4 B1– B7 Product Use

The use of facing tiles does not require any water or energy consumption, nor any maintenance for the entire lifespan. The environmental impacts are therefore nil for this phase of the life cycle.

B1 Use :

The use of the tiles once installed does not involve any input or output.	
Setting	**Values / description**
Emissions (air, water)	/

B2 Maintenance (if applicable) :

Under normal conditions of use, no maintenance is required for the tiles.	
Setting	**Values / description**
Maintenance frequency	/
Auxiliary inputs for maintenance	/
Waste generated during maintenance (specify materials)	/
Net consumption of fresh water	0,00E+0 m^3/m^2
Energy input during maintenance	/

B3 Repair (if applicable) :

Under normal conditions of use, the tiles do not require repairs during their phase of use.	
Setting	**Values / description**
Inspection process	/
Repair frequency	/
Auxiliary inputs (specify materials)	/
Waste generated during repair (specify materials)	/
Net consumption of fresh water	0,00E+0 m^3/m^2
Consumption and type of energy	/

B4 Replacement (if applicable) :

Under normal conditions of use, the tiles do not require replacement during their use phase.	
Setting	**Values**
Replacement frequency	/
Consumption and type of energy	/
Quantity of worn part replaced	/

B5 Rehabilitation (if applicable) :

Under normal conditions of use, the tiles do not require rehabilitation during their phase of use.	
Setting	**Values / description**
Rehabilitation frequency	/
Quantity of material needed	/
Waste generated during rehabilitation	/
Consumption and type of energy	/
Other assumptions for scenario building	/

B6 – B7 Use of energy and water (if applicable) :

Not concerned	
Setting	**Values**
Auxiliary inputs specified by material	Not concerned
Net consumption of fresh water	0,00E+0 m^3/m^2
type of energy	/
Equipment output power	/
Characteristic performance	/
Other assumptions for scenario building	/

6.5 C1 – C4 End of product Life :

End-of-life scenario taken from "Study of recycling channels for clay tiles and bricks, January 2012, BIOIS".
The tiled roof is dismantled manually.
The tiles are recovered at 95% (20% reuse, 75% recycling in the form of aggregates). The remaining 5% is landfilled.

Setting	Unit	Value
Quantity collected separately	kg/UF	65,8
Quantity collected with mixed construction waste	kg/UF	0
Quantity intended for reuse	kg/UF	13,2
Quantity destined for recycling	kg/UF	49,3
Quantity intended for energy recovery	kg/UF	0
Quantity of product eliminated	kg/UF	3,3

6.6 D Potential for recycling / reuse / recovery

Module D counts :

- impacts related to waste recovery, i.e. electricity and diesel used for crushing terracotta waste and water consumption to treat rubble,
- the avoidance of producing new tiles for the 20% of reused tiles,
- and the avoidance of producing virgin aggregate for the 75% of recovered tiles.

The benefits of module D are counted and displayed as negative in the FDES (impact avoidance) and the loads of module D are counted and displayed as positive in the FDES (additional impacts).

7. LCA results

Category of environmental impact / flows	Unit	Total Manufacturing	Total implementation	Total working life	Total end of life	Module D	Total life cycle (excluding module D)
Global Warming	kg CO_2 eq/UF	1,84E+01	2,35E+00	0,00E+00	3,36E-01	-3,57E+00	2,11E+01
Ozone Depletion	kg CFC 11 eq/UF	3,63E-06	3,47E-07	0,00E+00	6,58E-08	-5,42E-07	4,04E-06
Acidification for soil and water	kg SO_2 eq/UF	3,86E-02	8,32E-03	0,00E+00	1,37E-03	-6,54E-03	4,83E-02
Eutrophication	kg $(PO_4)^{3-}$ eq/UF	7,54E-03	1,47E-03	0,00E+00	2,48E-04	-1,16E-03	9,26E-03
Photochemical ozone creation	Ethene eq/UF	5,57E-03	1,50E-03	0,00E+00	1,98E-04	-8,78E-04	7,26E-03
Depletion of abiotic resources - elements	kg Sb eq/UF	9,82E-05	1,70E-05	0,00E+00	1,01E-06	-3,50E-05	1,16E-04
Depletion of abiotic resources - fossil	MJ PCI/UF	2,71E+02	3,15E+01	0,00E+00	5,40E+00	-5,10E+01	3,08E+02
Water pollution	m^3/UF	4,12E+00	1,35E+00	0,00E+00	1,27E-01	-8,41E-01	5,60E+00
Air pollution	m^3/UF	5,50E+03	6,79E+02	0,00E+00	3,72E+01	-1,07E+03	6,22E+03
Renewable primary energy excl.RM	MJ PCI/UF	2,46E+01	1,04E+00	0,00E+00	5,90E-02	-2,75E+00	2,57E+01
Renewable primary energy used as RM	MJ PCI/UF	2,55E+01	2,55E-01	0,00E+00	0,00E+00	0,00E+00	2,58E+01
Total renewable primary energy	MJ PCI/UF	5,01E+01	1,29E+00	0,00E+00	5,90E-02	-2,75E+00	5,15E+01
Non Renewable primary energy excl.RM	MJ PCI/UF	3,82E+02	3,37E+01	0,00E+00	5,49E+00	-7,21E+01	4,21E+02
Non Renewable primary energy used as RM	MJ PCI/UF	3,76E+00	3,76E-02	0,00E+00	0,00E+00	0,00E+00	3,80E+00
Total non renewable primary energy	MJ PCI/UF	3,85E+02	3,37E+01	0,00E+00	5,49E+00	-7,21E+01	4,25E+02
Use of secondary material	kg/UF	8,51E-01	8,51E-03	0,00E+00	0,00E+00	0,00E+00	8,60E-01
Use of renewable secondary fuels	MJ PCI/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels	MJ PCI/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m^3/UF	8,90E-02	9,51E-03	0,00E+00	1,47E-03	-3,14E-02	9,99E-02
Hazardous waste disposed	kg/UF	1,59E-01	1,40E-01	0,00E+00	3,27E-03	-4,50E-02	3,02E-01
Non Hazardous waste disposed	kg/UF	6,63E+00	3,24E+00	0,00E+00	3,63E+00	-1,46E+00	1,35E+01
Radioactive waste disposed	kg/UF	1,84E-03	2,04E-04	0,00E+00	3,71E-05	-3,30E-04	2,08E-03
Component for re-use	kg/UF	0,00E+00	0,00E+00	0,00E+00	1,32E+01	0,00E+00	1,32E+01
Materials for recycling	kg/UF	3,42E+00	4,96E-04	0,00E+00	4,94E+01	-6,84E-01	5,28E+01
Materials for energy recovery	kg/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy - electricity	MJ/UF	1,21E-02	1,15E-04	0,00E+00	0,00E+00	-2,42E-03	1,22E-02
Exported energy - thermal	MJ/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy - gas	MJ/UF	2,50E-02	2,38E-04	0,00E+00	0,00E+00	-5,00E-03	2,52E-02

Environmental impact	Manufacturing Step				Implementation stage			Stage of working life								Stage of end of life					Total life cycle (excluding module D)	D Benefits and burdens beyond system boundaries
	A1 Raw material supply	A2 Transportation	A3 Manufacturing	**A1+A2+A3**	A4 Transportation	A5 Installation	**A4+A5**	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 Energy Use	B7 Water Use	**B1+B2+B3+B4 +B5+B6+B7**	C1 Deconstruction/ demolition	C2 Transportation	C3 Waste treatment	C4 Elimination	**C1+C2+C3+C4**		
Global Warming kg CO_2 eq/UF	1,63E+00	5,44E-01	1,63E+01	1,84E+01	1,57E+00	7,82E-01	2,35E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	3,22E-01	0,00E+00	1,42E-02	3,36E-01	2,11E+01	-3,57E+00
Ozone Depletion kg CFC 11 eq/UF	1,65E-07	9,92E-08	3,37E-06	3,63E-06	2,86E-07	6,11E-08	3,47E-07	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	6,00E-08	0,00E+00	5,74E-09	6,58E-08	4,04E-06	-5,42E-07
Acidification for soil and water kg SO_2 eq/UF	1,12E-02	2,23E-03	2,52E-02	3,86E-02	6,52E-03	1,80E-03	8,32E-03	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	1,26E-03	0,00E+00	1,06E-04	1,37E-03	4,83E-02	-6,54E-03
Eutrophication kg $(PO_4)^{3-}$ eq/UF	2,06E-03	3,85E-04	5,10E-03	7,54E-03	1,12E-03	3,58E-04	1,47E-03	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	2,27E-04	0,00E+00	2,05E-05	2,48E-04	9,26E-03	-1,16E-03
Photochemical ozone creation Ethene eq/UF	1,08E-03	3,89E-04	4,10E-03	5,57E-03	1,16E-03	3,36E-04	1,50E-03	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	1,81E-04	0,00E+00	1,71E-05	1,98E-04	7,26E-03	-8,78E-04
Depletion of abiotic resources - elements kg Sb eq/UF	3,30E-05	4,07E-06	6,11E-05	9,82E-05	1,25E-05	4,52E-06	1,70E-05	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	9,96E-07	0,00E+00	1,75E-08	1,01E-06	1,16E-04	-3,50E-05
Depletion of abiotic resources - fossil MJ PCI/UF	3,36E+01	8,53E+00	2,28E+02	2,71E+02	2,48E+01	6,70E+00	3,15E+01	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	4,93E+00	0,00E+00	4,69E-01	5,40E+00	3,08E+02	-5,10E+01
Water pollution m^3/UF	5,10E-01	2,66E-01	3,35E+00	4,12E+00	7,93E-01	5,56E-01	1,35E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	1,16E-01	0,00E+00	1,02E-02	1,27E-01	5,60E+00	-8,41E-01
Air pollution m^3/UF	3,88E+03	1,75E+02	1,45E+03	5,50E+03	5,56E+02	1,23E+02	6,79E+02	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	3,54E+01	0,00E+00	1,75E+00	3,72E+01	6,22E+03	-1,07E+03

Resource Usage	Manufacturing Step				Implementation stage			Stage of working life								Stage of end of life					Total life cycle (excluding module D)	D Benefits and burdens beyond system boundaries
	A1 Raw material supply	A2 Transportation	A3 Manufacturing	**A1+A2+A3**	A4 Transportation	A5 Installation	**A4+A5**	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 Energy Use	B7 Water Use	**B1+B2+B3+B4 +B5+B6+B7**	C1 Deconstruction/ demolition	C2 Transportation	C3 Waste treatment	C4 Elimination	**C1+C2+C3+C4**		
Renewable primary energy excl.RM MJ PCI/UF	1,92E+00	1,89E-01	2,25E+01	2,46E+01	5,78E-01	4,61E-01	1,04E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	5,27E-02	0,00E+00	6,30E-03	5,90E-02	2,57E+01	-2,75E+00
Renewable primary energy used as .RM MJ PCI/UF	0,00E+00	0,00E+00	2,55E+01	2,55E+01	0,00E+00	2,55E-01	2,55E-01	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,58E+01	0,00E+00
Total Renewable primary energy MJ PCI/UF	1,92E+00	1,89E-01	4,80E+01	5,01E+01	5,78E-01	7,16E-01	1,29E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	5,27E-02	0,00E+00	6,30E-03	5,90E-02	5,15E+01	-2,75E+00
Non Renewable primary energy excl.RM MJ PCI/UF	3,88E+01	8,84E+00	3,34E+02	3,82E+02	2,57E+01	7,97E+00	3,37E+01	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	5,01E+00	0,00E+00	4,80E-01	5,49E+00	4,21E+02	-7,21E+01
Non Renewable primary energy used as .RM MJ PCI/UF	0,00E+00	0,00E+00	3,76E+00	3,76E+00	0,00E+00	3,76E-02	3,76E-02	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,80E+00	0,00E+00
Total Non Renewable primary energy MJ PCI/UF	3,88E+01	8,84E+00	3,38E+02	3,85E+02	2,57E+01	8,00E+00	3,37E+01	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	5,01E+00	0,00E+00	4,80E-01	5,49E+00	4,25E+02	-7,21E+01
Use of secondary material kg/UF	0,00E+00	0,00E+00	8,51E-01	8,51E-01	0,00E+00	8,51E-03	8,51E-03	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,60E-01	0,00E+00
Use of renewable secondary fuels MJ PCI/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels MJ PCI/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water m^3/UF	3,72E-02	1,43E-03	5,03E-02	8,90E-02	4,39E-03	5,12E-03	9,51E-03	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	9,07E-04	0,00E+00	5,65E-04	1,47E-03	9,99E-02	-3,14E-02

Waste category	Manufacturing Step				Implementation stage			Stage of working life								Stage of end of life					Total life cycle (excluding module D)	D Benefits and burdens beyond system boundaries
	A1 Raw material supply	A2 Transportation	A3 Manufacturing	**A1+A2+A3**	A4 Transportation	A5 Installation	**A4+A5**	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 Energy Use	B7 Water Use	**B1+B2+B3+B4 +B5+B6+B7**	C1 Deconstruction/ demolition	C2 Transportation	C3 Waste treatment	C4 Elimination	**C1+C2+C3+C4**		
Hazardous waste disposed kg/UF	7,19E-02	9,38E-03	7,79E-02	1,59E-01	2,86E-02	1,11E-01	1,40E-01	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	3,10E-03	0,00E+00	1,75E-04	3,27E-03	3,02E-01	-4,50E-02
Non Hazardous waste disposed kg/UF	4,04E+00	8,48E-01	1,75E+00	6,63E+00	2,61E+00	6,31E-01	3,24E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	2,60E-01	0,00E+00	3,37E+00	3,63E+00	1,35E+01	-1,46E+00
Radioactive waste disposed kg/UF	1,27E-04	5,83E-05	1,65E-03	1,84E-03	1,69E-04	3,58E-05	2,04E-04	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	3,39E-05	0,00E+00	3,29E-06	3,71E-05	2,08E-03	-3,30E-04

Flux sortants	Manufacturing Step				Implementation stage			Stage of working life								Stage of end of life					Total life cycle (excluding module D)	D Benefits and burdens beyond system boundaries
	A1 Raw material supply	A2 Transportation	A3 Manufacturing	**A1+A2+A3**	A4 Transportation	A5 Installation	**A4+A5**	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Rehabilitation	B6 Energy Use	B7 Water Use	**B1+B2+B3+B4 +B5+B6+B7**	C1 Deconstruction/ demolition	C2 Transportation	C3 Waste treatment	C4 Elimination	**C1+C2+C3+C4**		
Components for re-use kg/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	1,32E+01	0,00E+00	1,32E+01	1,32E+01	0,00E+00
Materials for recycling kg/UF	0,00E+00	0,00E+00	3,42E+00	3,42E+00	0,00E+00	4,96E-04	4,96E-04	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	4,94E+01	0,00E+00	4,94E+01	5,28E+01	-6,84E-01
Materials for energy recovery kg/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy - electricity MJ/UF	0,00E+00	0,00E+00	1,21E-02	1,21E-02	0,00E+00	1,15E-04	1,15E-04	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E-02	-2,42E-03
Exported energy - Thermal MJ/UF	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy - gas MJ/UF	0,00E+00	0,00E+00	2,50E-02	2,50E-02	0,00E+00	2,38E-04	2,38E-04	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,52E-02	-5,00E-03

8. Health and comfort information

8.1 Additional information on the release of hazardous substance into indoor air, soil and water during its period of use.

		Test results	Test report
Emission into indoor air	Emission of VOCs and formaldehyde	No test carried out on the tile	
	Behavior in the face of fungal and bacterial growth	No test carried out on the tile	
	Natural radioactive emissions from construction products	No test carried out on the tile	
Emission into soil and water	Fiber and particulate emissions	No test carried out on the tile	
	Emissions into water	No test carried out on the tile	
	Emissions into water	No test carried out on the tile	

1) Emissions to indoor air, soil and water according to the horizontal standards relating to the measurement of emissions of regulated dangerous substances, originating from construction products, by means of harmonized test methods in accordance with the provisions of the respective Technical Committees of the Standards European products, when available.
For more information refer to the EeB Guide: http://www.eebguide.eu/?p=1991
2) In France, the technical committee INIES Base (CTIB) gives recommendations on the declaration of health and comfort characteristics - Guide to writing health and comfort summaries (CTIB N94, 2009)

8.2 Contribution of the product to the quality of life inside building

Characteristics of the product participating in the creation of hygrothermal comfort conditions in the building:

The tile does not claim any contribution to hygrothermal comfort.

Characteristics of the product contributing to the creation of acoustic comfort conditions in the building :

The terracotta tile can contribute to sound insulation, with

- Rw+Ctr = 13 dB

Rw : sound reduction index of the tile
Ctr : road noise

This value comes from the CSTB's Acoubat Sound software.

Characteristics of the product contributing to the creation of visual comfort conditions in the building:

The tile, in its normal conditions of use, is a visible product, however no visual test has been carried out.

Characteristics of the product participating in the creation of olfactory comfort conditions in the building:

The tiles are not affected by the creation of olfactory comfort conditions in the building.

9. Additional information

Quarries and factories manufacturing Roman tiles and flat tiles are making efforts from an environmental point of view, in particular via

- The use of recycled materials, which saves raw materials and fuels,
- The recovery of waste into energy, at the origin of the energy flows supplied to the outside,
- Deposit of wooden pallets,
- The management of quarries taking into account the species present and the restoration of clay quarries following their exploitation.

The clay quarries are in the open. Work by Unicem and the Natural History Museum has shown the role of open-air quarries in preserving the connectivity of certain species: http://www.unicem.fr/2014/03/31/carrieres- and-ecological-connectivity/
After their exploitation, the clay quarries are redeveloped according to the rules of the art and in compliance with the regulations.