Environmental Product Declaration

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

Clay roofing tiles and fittings

from

BMI Sverige AB

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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EPD Profile

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	Third party Verifier Vladimír Kočí, LCA studio Approved by: The International EPD® System

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): The International EPD System PCR for Construction 2019:14, version 1.2.5. UN CPC Code: 3731
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Approved by: The international EPD System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Description of the organization

BMI Sverige AB manufactures, sells, and delivers Clay roofing tiles and fittings to professional customers and retailers on the Swedish market. BMI Sverige AB offers an entire roof system with smart solutions, we are your personal and flexible supplier of clay roofing tiles and fittings. Our headquarters and production site are located in Vittinge in Uppsala County.

For more information regarding the products or the organization, see EPD owner's website: www.bmisverige.se

Name and location of production sites

The Clay roofing tiles and fittings covered in this EPD are produced in Vittinge in Sweden, located in Uppsala County.

EPD Product information

Product name: Clay roofing tiles and fittings.

Product identification:

This EPD covers Clay roofing tiles and fittings. All products covered are identified with product names in Appendix A.

Product description:

The only raw material needed for the Clay roofing tiles and fittings is clay.

Figure 1 Illustration of BMI's Clay roofing tiles and fittings

This EPD is valid for all products listed in Appendix A. Specifications for each product can be found at www.bmisverige.se

UN CFC code: 3731

Geographical scope: Sweden

The geographical coverage of this LCA is scenario adapted, i.e. set to Sweden for the manufacturing, raw material extraction and production and packaging material. The geographical coverage for transports is set to Europe.

LCA Information

Functional unit: 1 tonne of average Clay roofing tiles and fittings.

Reference service life: 50 years

Time representativeness: The data and information collected and modelled for refers to the production year of 2021. The general datasets from the used databases are all representative and valid for the year of 2021.

Database(s) and LCA software used: The LCA software SimaPro 9.3.0.3 was used in the assessment and general data from databases Ecoinvent 3.8 and Environmental footprint (EF) database 2.0.

Description of system boundaries: Cradle-to-grave, i.e. life cycle stages A1- A4, B1-B7, C1-C4 and D.

Excluded lifecycle stages: None of the life cycle stages were excluded.

Allocation methodology: The cut-off method has been applied within the product system. For allocations between product systems, the Polluter-pays allocation method has been used.

Cut-off: All raw material according to the product formula, including their respective energy demands during extraction and production have been considered, as well as the main packaging materials used to prepare the final product for distribution. Some packaging materials and production solvents that constitute less than 1% of the product weight have been excluded. This cut-off rule does not apply for hazardous material and substances.

More information:

For more information about the EPD owner, visit www.bmisverige.se

For more information about the EPD producer, visit www.dge.se.
For more information about the underlying LCA study, contact the LCA practitioner Sayali Bhalekar (Sayali.Bhalekar@dge.se).

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System diagram

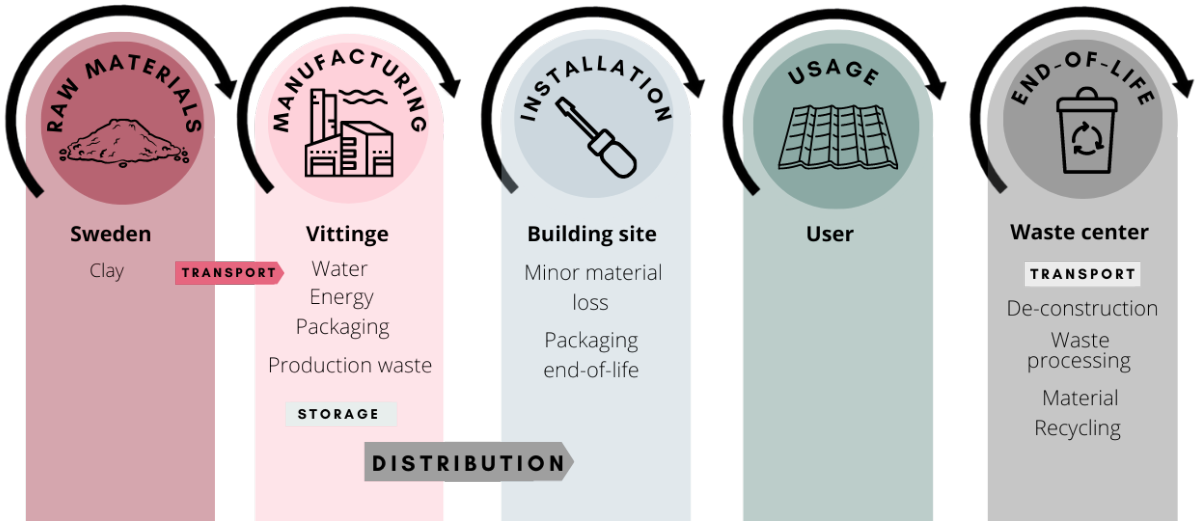

Figure 2 An illustration of the process within the system boundary.

Table 1 An overview of the life cycle phases declared for in this LCA. The nomenclature A1-C4 refers to life cycle phase categorization used by the standard EN 15804.

	Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
	Raw materials	Transport	Manufacturing	Transport	Construction-Installation	Use stage	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse, recovery recycle potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	SE				SE								SE				
Specific data used	>60%				N/A												
Variation - products	0%				N/A												
Variation - sites	0%				N/A												

**SE Sweden *N/R Not Relevant *N/A Not Applicable MND Module Not Declared*

Description of life cycle stages A1-A5, B1-B7, C1-C4, and D

Raw material extraction and production, transport from supplier, manufacturing on site, distribution, installation at the customer, usage, and end of life.

Table 2 The life cycle stages included in this EPD and a description of each stage.

Stage	Description
A1 Raw materials	Extraction and processing of clay occurring upstream from the manufacturing process, including the waste generated for these processes. The energy generation needed for these processes (extraction, refining and transport of energy from primary energy sources).
A2 Transport	The external transportation of clay from the clay pit and packaging materials from the suppliers to the manufacturing site. The modelling includes transportation on road, with processes for clay and each packaging material.
A3 Manufacturing	The manufacturing of Clay roofing tiles and fittings takes place at the production site in Vittinge. The production of clay tiles starts with clay preparation, where stones are removed, and the fine clay is stored to mature for 30 days. After the maturation period, the clay is mixed with water and prepared for extrusion. The mix is extruded to tiles and placed on pallets. The tiles are dried for 50 hours and then fired for another 50 hours. The tiles are then optical and sound quality controlled. The finished Clay roofing tiles and fittings are packed standing on wooden pallets, 288 pcs in two layers, every 6th tile is strapped with strapping band and finally the label is attached, and the pallet is wrapped with stretch film. The wooden pallet is reused 74% of the times. Electricity, fuel, waste generation, and packaging materials are all included in this stage.
A4 Distribution	When the Clay roofing tiles and fittings are produced and packaged, they are either stored at the storage near the manufacturing site in Vittinge or distributed directly to the end users.
A5 Installation	The installation of Clay roofing tiles and fittings on the roof is mainly manual and requires negligible use of energy and water. A loss of 1% of material during the installation has been considered as input to this life cycle phase. This life cycle phase also includes the impacts from end of life of packaging waste.
B1-B7 Usage	Regarding the maintenance of BMI Vittinge's Clay roofing tiles and fittings, no maintenance is needed for them to function during its lifetime, there is a necessity to change the rooftiles only if there is any fault in the production or any damages due to a storm. If one wants then it can be washed every fifth year after 10 years, but that is only for aesthetics and not for the functioning of rooftiles. Operational energy and water use (B6-B7) are not relevant for clay roofing tiles and thus the impacts are considered to be null.
C1-C4 End of life	The service life for the Clay roofing tiles and fittings is 50 years. After its lifetime, the effete product is assumed to be deconstructed and transported to a waste management centre. The majority of the raw material in the products are made of Clay hence they are assumed to be 100% material recycled.
D Reuse, recovery recycle potential	For Clay roofing tiles and fittings, 100% of the product is assumed to be recycled, hence benefits are gained from the future use of demolished clay roofing tiles to crushed gravel as a primary material in another system. Considering the incineration of packaging material there is gain in form of recovered energy for both the packaging materials wood and plastic.

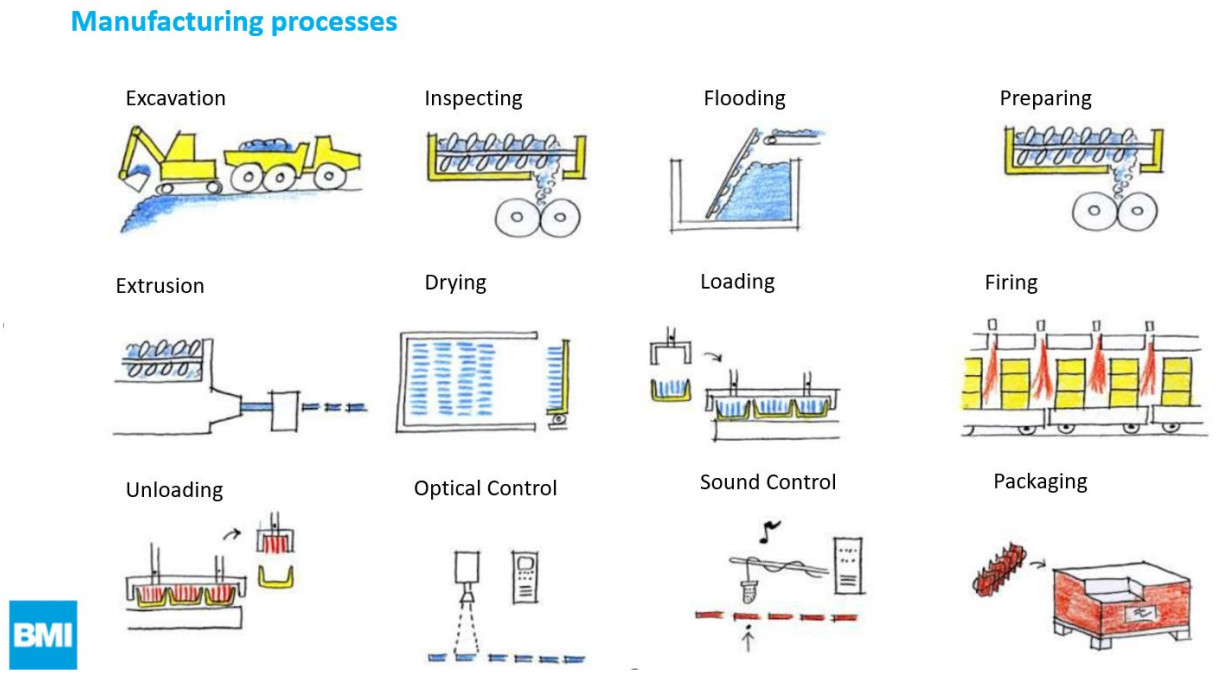

Figure 3 Representation of the manufacturing process of BMI's Clay roofing tiles and fittings in Vittinge.

Content declaration per Functional unit

1 tonne of Clay roofing tiles and fittings

Table 3 Content declaration for the declared unit. None of the substances are regarded as SVHCs (Substances of very high concern) as defined in the REACH legislation.

Raw materials	Weight, kg/FU	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Clay	1000	-	-

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Labelling	0,45	0,045%	1,727
Plastic film	0,40	0,040%	-
Plastic band	0,55	0,055%	-
Wooden pallet	28,2*	0,958%	2,794

**74% is recirculated. Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.*

For construction product EPDs complaint with EN15804, the content declaration shall list substances contained in the products that are listed in the "Candidate List of Substances of Very High Concern for Authorization" when their content exceeds the limits for registration with the European Chemicals Agency: i.e. >0.1 % of the weight of the product. **No such substances are used in the production of the products covered in this EPD.**

Environmental performance

Potential environmental impacts according to EN 15804 results per DU

Table 4 Results for mandatory environmental impact categories for the life cycle stages of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**		A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Impact category	**Unit**										
Global warming (GWP - fossil)	kg CO_2 eq.	2,36E+01	1,44E+00	287,7114	1,24E+01	3,30E+00	3,30E+00	1,74E+00	0,00E+00	0,00E+00	-3,42E+00
Global warming (GWP - Biogenic)	kg CO_2 eq.	7,71E-02	4,81E-03	1,94E+00	1,14E+01	1,34E-01	2,86E-03	4,21E-03	0,00E+00	0,00E+00	-1,93E-01
Global warming (GWP – Land use & land use change)	kg CO_2 eq.	1,66E-02	5,39E-04	1,11E+00	3,75E-03	1,13E-02	3,29E-04	6,53E-04	0,00E+00	0,00E+00	-2,76E-03
Global warming potential - total (GWP-total)	kg CO_2 eq.	2,37E+01	1,45E+00	2,91E+02	2,38E+01	3,45E+00	3,30E+00	1,74E+00	0,00E+00	0,00E+00	-3,61E+00

Table 4 (cont.) Results for mandatory environmental impact categories for the life cycle stages of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**		A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Impact category	**Unit**										
Ozone layer depletion	kg CFC-11 eq	1,86E-05	6,38E-07	1,77E-05	1,99E-06	3,99E-07	5,59E-07	3,44E-07	0,00E+00	0,00E+00	-3,70E-07
Acidification	Mol H^+ eq.	2,60E-01	7,30E-03	5,07E-01	3,45E-02	8,49E-03	3,43E-02	5,54E-03	0,00E+00	0,00E+00	-3,01E-02
Eutrophication (Aquatic freshwater)	kg P eq	4,78E-03	9,64E-05	1,78E-02	6,86E-04	2,36E-04	1,02E-04	1,13E-04	0,00E+00	0,00E+00	-7,84E-04
Eutrophication (Aquatic marine)	kg N eq	4,62E-02	1,14E-03	1,09E-01	8,56E-03	1,81E-03	1,52E-02	1,24E-03	0,00E+00	0,00E+00	-8,62E-03
Eutrophication (Terrestrial)	mol N eq	5,49E-01	1,25E-02	1,16E+00	9,18E-02	2,00E-02	1,66E-01	1,36E-02	0,00E+00	0,00E+00	-1,16E-01
Photochemical oxidation	kg NMVOC	1,75E-01	4,94E-03	3,98E-01	3,46E-02	6,63E-03	4,58E-02	5,34E-03	0,00E+00	0,00E+00	-2,72E-02
Abiotic depletion, minerals and metals	kg Sb eq	5,96E-04	4,22E-06	1,03E-03	2,41E-05	1,66E-05	1,70E-06	4,16E-06	0,00E+00	0,00E+00	-7,24E-05
Abiotic depletion, fossil fuels	MJ	1,49E+03	4,95E+01	3,05E+03	1,61E+02	4,83E+01	4,50E+01	2,78E+01	0,00E+00	0,00E+00	-3,88E+01

Potential environmental impact – additional mandatory and voluntary indicators

Table 5 Results for additional mandatory and voluntary environmental impact indicators for the life cycle phases of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**		A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Impact category	**Unit**										
GWP - GHG	kg CO_2 eq.	2,36E+01	1,44E+00	2,89E+02	1,24E+01	3,31E+00	3,30E+00	1,74E+00	0	0	-3,42E+00
Human toxicity Cancer	CTUh	3,92E-08	5,66E-10	6,78E-08	3,88E-09	1,13E-09	1,02E-09	6,03E-10	0	0	-6,96 E-09
Human toxicity Non-cancer	CTUh	6,19E-07	1,73E-08	1,18E-06	1,53E-07	2,01E-08	1,93E-08	2,33E-08	0	0	-7,59 E-08
Ecotoxicity freshwater	CTUh	1,06E+03	3,07E+01	2,00E+03	1,34E+02	3,27E+01	2,65E+01	2,21E+01	0	0	-7,53E+01

Use of resources

1 tonne of Clay roofing tiles and fittings

Table 6 Result for resource use for all the life cycle phases of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**			A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Parameter		**Unit**										
Primary energy resources - Renewable	Use as energy carrier	MJ*	1,19E+01	3,29E-01	5,80E+02	2,10E+00	5,95E+00	2,55E-01	3,60E-01	0	0	-1,66E+01
	Used as raw materials	MJ*	0	0	2,19E+02	0	2,19E+00	0	0	0	0	0
	TOTAL	MJ*	1,19E+01	3,29E-01	7,99E+02	2,10E+00	8,14E+00	2,55E-01	3,60E-01	0	0	-1,66E+01
Primary energy resources - Non-renewable	Use as energy carrier	MJ*	1,50E+03	4,99E+01	3,12E+03	1,64E+02	4,91E+01	4,53E+01	2,83E+01	0	0	-5,21E+01
	Used as raw materials	MJ*	0	0	3,33E+01	0	3,33E-01	0	0	0	0	0
	TOTAL	MJ*	1,50E+03	4,99E+01	3,15E+03	1,64E+02	3,33E-01	4,53E+01	2,83E+01	0	0	-5,21E+01
Secondary material		kg	0	0	0	0	0	0	0	0	0	0
Renewable secondary fuels		MJ*	0	0	0	0	0	0	0	0	0	0
Non-renewable secondary fuels		MJ*	0	0	0	0	0	0	0	0	0	0
Net use fresh water		m^3	1,62E-01	5,07E-03	5,22E-01	3,91E-02	7,38E-03	4,06E-03	5,85E-03	0	0	-1,15E+00

*Net calorific value

Waste production and output flows

1 tonne of Clay roofing tiles and fittings

Waste production

Table 7 Results for waste production for all the life cycle phases of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**		A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Impact category	**Unit**										
Hazardous waste disposed	kg	0	0	8,61E-01	0	8,61E-03	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	1,08E+00	2,12E-02	1,10E-02	0	0	0	0	0
Radioactive waste disposed	kg	0	0	4,08E-04	0	4,08E-06	0	0	0	0	0

Output flows

Table 8 Outflows from all the life cycle phases of BMI's Clay roofing tiles and fittings.

1 tonne of **Clay roofing tiles and fittings**		A1 Raw material extraction and production	A2 Transport from supplier	A3 Manufacturing	A4 Distribution	A5 Installation	C1 Deconstruction	C2 Transport	C3 Waste processing	C4 Disposal	D Beyond system boundary
Impact category	**Unit**										
Materials for reuse	kg	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	-7,92E-03	0	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	7,90E-01	0	7,90E-03	0	0	0	0	0
Energy recovery	MJ	0	0	0	0	0	0	0	0	0	1,19E+02

References

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Appendix A

Products	Specification
Vittinge T11	Natural red
Vittinge E13	Natural red

EPD®

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