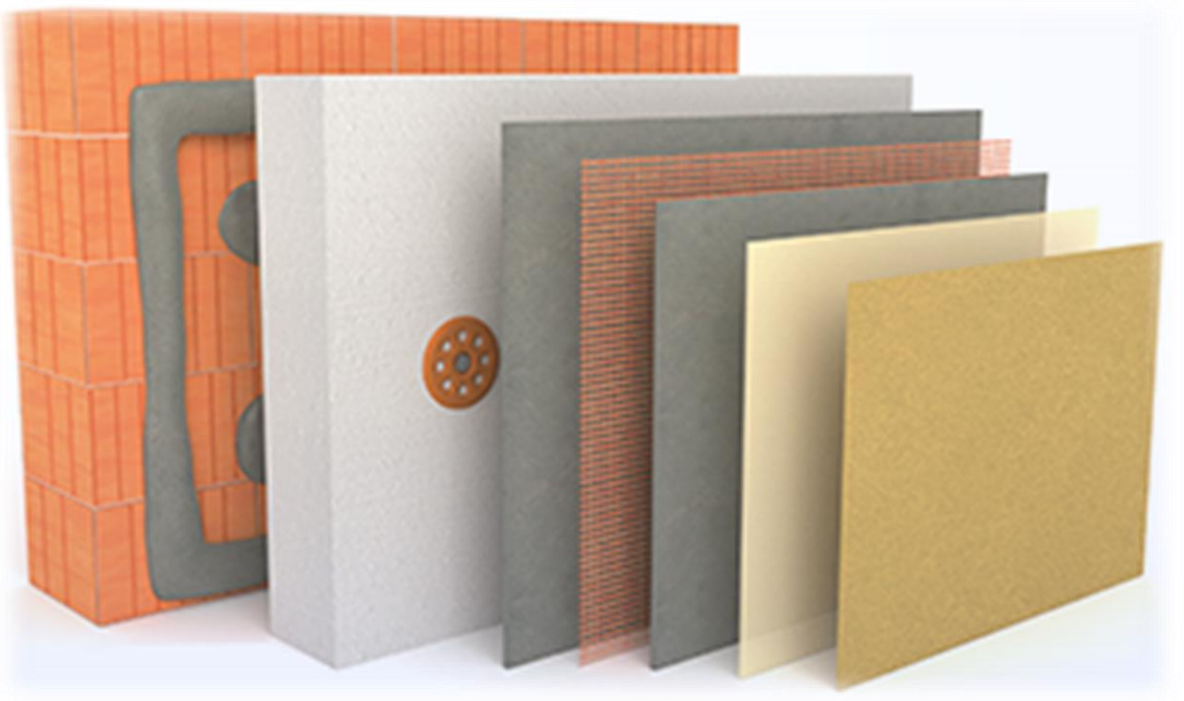
Berger External Thermal Insulation & Composite Systems (ETICS)

Environmental Product Declaration

ISO 14020:2000, IS0 14025:2006, ISO 14040:2006, ISO 14044:2006, EN 15804:2012



EPD registration number:	S-P-01418
Publication date:	2020-08-04
Validity date:	2025-08-03
Geographical scope:	India

EPD®

THE INTERNATIONAL EPD® SYSTEM

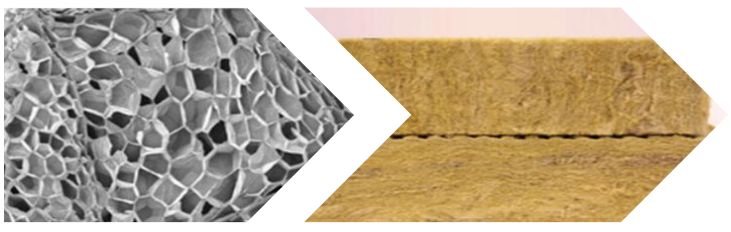
1. Introduction

Berger Paints India Ltd Group (Berger) is an Indian owned Multinational with presence in 8 countries, leader in some and exports to over 25 countries. Berger ranks amongst the top 4 Surface Coatings companies in Asia and Top 10 globally in Architectural Coatings. Backed by extremely strong R&D, Berger produces High-Tech products tailor made for high standards of smart cities. Berger is the oldest Paint company in the world (1760), in India since 100 years and its products have been used in the most prestigious projects in India and internationally including Moscow Olympics 1980 & FIFA World Cup 2018.

Berger produces the entire range of surface coatings systems and is leader in many segments including Heavy Duty Protective Coatings, Architectural Coatings and Special Coatings. The company with its 100% subsidiary company Bolix S.A. Poland is the among top companies globally in the field of ETICS (Exterior Thermal Insulation Composite Systems) since over 27 years, No.1 in Poland and have been executing projects both new and retrofitting, in U.K, as well as export to over 20 countries including Germany, France, Switzerland and Belgium.

Among the tools available to evaluate environmental performance, Life Cycle Assessment (LCA) provides a holistic approach by considering the potential impacts from all stages of manufacture, product use and end-of-life stages.

thinkstep Sustainability- a Sphera Company, has been entrusted to conduct Life Cycle Assessment for Berger Paint's thermal insulation product ETICS as per the ISO 14040/44. The LCA model was created using the GaBi ts Software system for life cycle engineering, developed by thinkstep AG.



2. General Information

2.1 EPD, PCR, LCA Information

Table 1. EPD Information

Programme	The International EPD® System, www.environdec.com
Program operator	EPD International AB Box 210 60, SE-100 31 Stockholm, Sweden.
Declaration holder	Berger Paints India Limited Berger House, 129, Park Street, Kolkata - 700017, India
Product	External Thermal Insulation & Composite Systems (ETICS)
CPC Code	Multiple UN CPC Codes - Construction products and CPC 54 construction services
EPD registration number	S-P-01418
Publication date	2020-08-04
Validity date	2025-08-03
Geographical scope	India
Reference standards	IS0 14020:2001, ISO 14025:2006, ISO 14040/44, EN 15804:2012, EN 16783:2017

Table 2. PCR Information

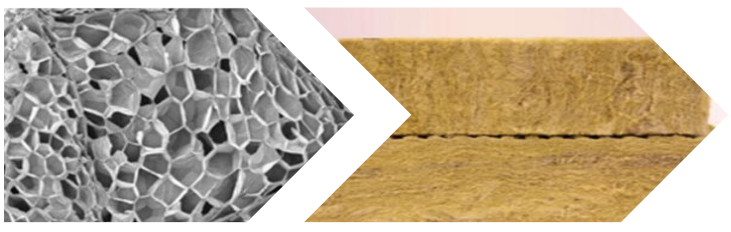
Reference PCR	'Construction Products and Construction Services' Version 2.31, 2012:01 and C-PCR EN 16783:2017
Date of Issue	2019-12-20 (Version 2.31)

Table 3. Verification Information

Demonstration of verification	External, independent verification
Third party verifier	Dr Hüdai Kara, Metsims Sustainability Consulting, 4 Clear Water Place, Oxford OX2 7NL, UK Email: hudai.kara@metsims.com

Table 4. LCA Information

Title	Environmental Product Declaration of Berger ETICS
Preparer	Dr. Rajesh Kumar Singh Thinkstep Sustainability Solutions- a Sphera Company 707, Meadows, Sahar Plaza, Andheri Kurla Road, Andheri East, Mumbai - 400059, India Email: rsingh@sphera.com



2.2 Reference Period of EPD Data

The reference period for the data used within this EPD is the 2018-19 (October 2018 to September 2019)

2.3 Geographical Scope of EPD Application

The geographical scope of this EPD is India.

2.4 Additional Information about EPD

This EPD provides information for the External Thermal Insulation & Composite Systems manufactured at Berger Paints India Limited plant in India. The EPD is in accordance with ISO 14025 and EN 15804. EPD of construction products may not be comparable if they do not comply with EN 15804. The Life Cycle Assessment (LCA) study carried out for developing this EPD for thermal insulation product is done as per ISO 14040 and ISO 14044 requirements for Berger Paints India Limited.

Product Category Rules (PCR) for the assessment of the environmental performance of External Thermal Insulation & Composite Systems is 'Construction Products and Construction Services' 2012:01 Version 2.31, along with its Complementary Product Category Rules (C-PCR) EN 16783:2017 for 'Factory made and in situ thermal insulation products' factory made and in situ thermal insulation products", with areas of application such as ceiling, roof, floor, wall, and perimeter. All EPDs based on this PCR shall be compliant with EN 15804:2012+A1:2013

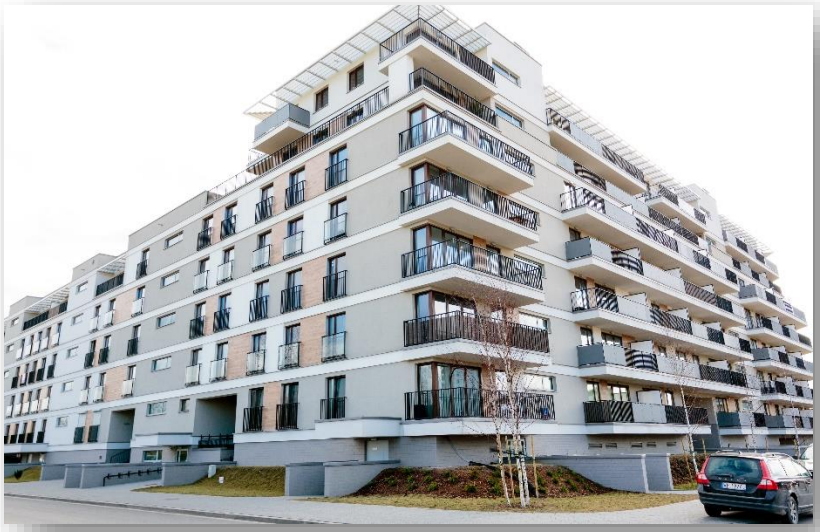
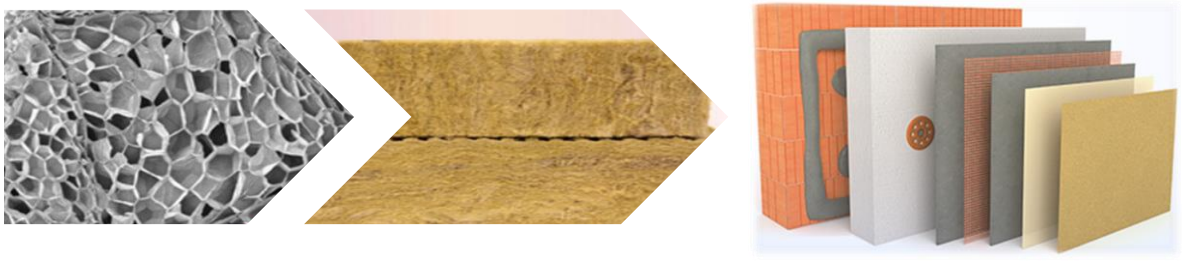


Figure 1. Residential building with installed Berger ETICS

The target audience includes Berger Paints management, operational and marketing departments. Furthermore, it will be made available for many different external applications of the data, for technical and non-technical people, including customers of the industry, policy makers, LCA practitioners and academia as per company's decision to share information as they seem appropriate.



3. Product Description and System Boundaries

3.1 Product Identification and Usage

Berger ETICS (External Thermal Insulation & Composite Systems) is a thermal insulation system effectively used for the thermal protection of both existing and new buildings, with areas of application such as ceiling, roof, floor, wall, and perimeter.

Berger ETICS is a composite insulation system that is installed on-site with key components manufactured in their VVN plant and few others sourced externally. ETICS system has the following components in the final installation:

- Berger Adhesive
- Insulation Board (Mineral Wool, EPS, XPS)
- PVC Corner bead
- Mechanical Fixing
- Fibre Glass Mesh - for strengthening and crack protection
- Base Coat (Berger Home shield)
- Berger Primer
- Finishing coat - Berger Topcoat

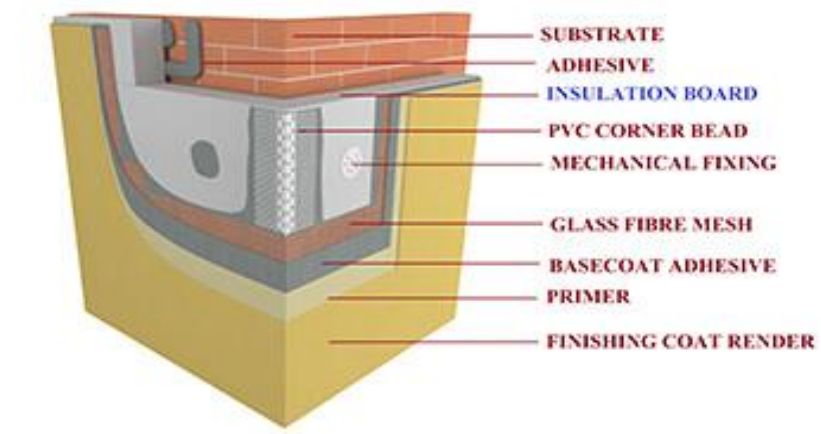
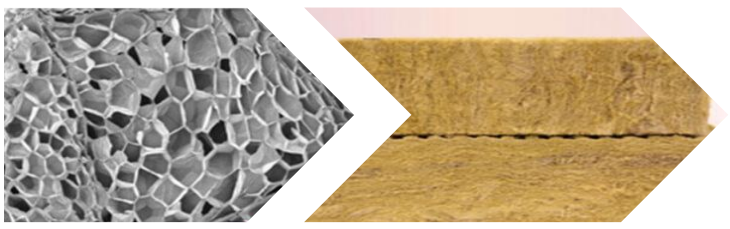


Figure 2. Cross-section of installed Berger ETICS

ETICS system parameters (EPS)

- Water absorption after 24 hours: ≤ 0.5 kg/m^2
- Equivalent air thickness S_d: ≤ 2.0 m
- Bond strength after ageing (hygrothermal cycles): ≥ 0.08 MPa
- Reaction to fire according to EN 13501-1: B-s2, d0

Figure 3. ETICS with Expanded Polystyrene (EPS) insulation board



ETICS system parameters (XPS)

- Water absorption after 24 hours: ≤ 0.50 kg/m^2
- Equivalent air thickness S_d: ≤ 2.0 m
- Bond strength: ≥ 0.08 MPa
- Reaction to fire according to EN 13501-1: C-s1, d0

Figure 4. ETICS with Extruded Polystyrene (XPS) insulation board

ETICS system parameters (Mineral Wool)

- Insulation board: 1200 mm X 600 mm, Thermal conductivity < 0.035 W/m.K
- Water absorption: < 0.50 kg/m^2
- Equivalent air thickness S_d: ≤ 1.0 m
- Bond strength: ≥ 0.10 MPa
- Reaction to fire according to EN 13501-1 2007 A2-s1, d0

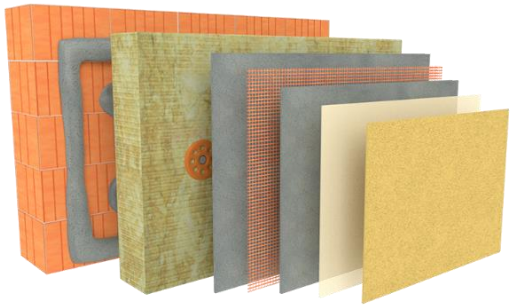
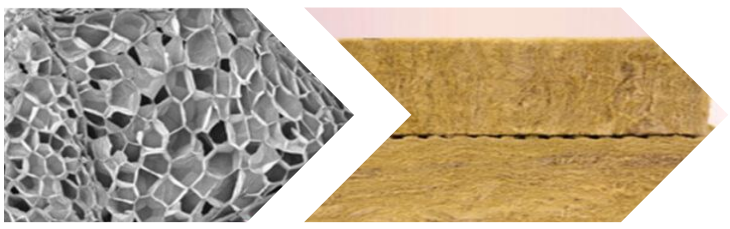


Figure 5. ETICS with Mineral wool insulation board

Materials in ETICS and their properties

1. Adhesive to EPS boards: Powder, cement based, requiring addition of water
   - ➢ Bond strength between adhesive and substrate (concrete):
     - under dry conditions: ≥ 0.25 MPa
     - 48 h immersion in water, 2h drying: ≥ 0.08 MPa
     - 48 h immersion in water, 7 days drying: ≥ 0.25 MPa
   - ➢ Bond strength between base coat and insulation (EPS panels):
     - under dry conditions: ≥ 0.08 MPa
     - 48 h immersion in water, 2h drying: ≥0.03 MPa
     - 48 h immersion in water, 7 days drying: ≥0.08 MPa
   - ➢ Measurement methodology Standard ETAG 004.
2. EPS Panels:
   - ➢ Panels made from Expanded polystyrene according to EN 13163. EPS.
   - ➢ Reaction to fire E class according to EN 13501-1
   - ➢ Thickness: 50 mm, 75 mm, 100 mm, 120 mm
   - ➢ Wideness: 50 cm
   - ➢ Length: 100 cm
   - ➢ Heat conduction coefficient: λ≤ 0.040 W/mK



3. XPS Panels:
   - Panels made from Extruded polystyrene according to ASTM C 578 Type VI
   - Reaction to fire E class according to EN 13501-1
   - Thickness: 50 mm, 75 mm and 100 mm
   - Standard Size: 600 mm x 1250 mm
   - Heat conduction coefficient: λ ≤ 0.0289 W/mK

4. Mineral Wool Panels
   - Panels made from rock fibers processed from the molten state into fibrous form
   - Reaction to fire Class A1, Non-Combustible according to EN 13501-1
   - Thickness: 50mm, 75mm, 100mm & 120mm
   - Standard Size: 600 mm x 1200 mm
   - Heat conduction coefficient: λ ≤ 0.035 W/mK

5. Fiber-glass mesh
   - Fiber-glass mesh covered with alkali-resistant coating
   - Mass per unit area: 145 g/m^2
   - Tensile strength: 1500 N (lab. conditions)
   - Residual strength after ageing: 50 N/mm
   - Mesh size: 3.9x4.0 mm ±10%

6. Base coat adhesive: Powder, cement based, requiring addition of water
   - Powder, cement based, requiring addition of water
   - Bond strength between base coat and insulation (EPS panels):
     - under dry conditions ≥ 0.08 MPa
     - 48 h immersion in water, 2h drying ≥ 0.03 MPa
     - 48 h immersion in water, 7 days drying ≥ 0.08 MPa
   - Measurement methodology Standard ETAG 004.

7. Primer
   Acrylic based primer for primering substrate (base coat) before render application.

8. Texture
   - Ready to use, acrylic binding based decorative facade final coating (Texture).
   - Water absorption according to EN 1062-3: category W3
   - Water vapor permeability according to EN ISO 7783-2: category V2
   - Density: approx. 1.90 kg/dm^3
   - Grain size: approx. 1.5 mm

The introduction of ETICS would help air-conditioned buildings lower energy consumption and reduce their carbon footprint, making them environmentally sustainable and resource efficient. This is also the need of the hour, considering national initiatives such as Smart Cities and Swachh Bharat.

3.2 Content declaration

Following table shows the components of 1 m^2 Berger ETICS with 4 varying thickness of EPS, XPS and Mineral wool ranging from 50 mm to 120 mm.

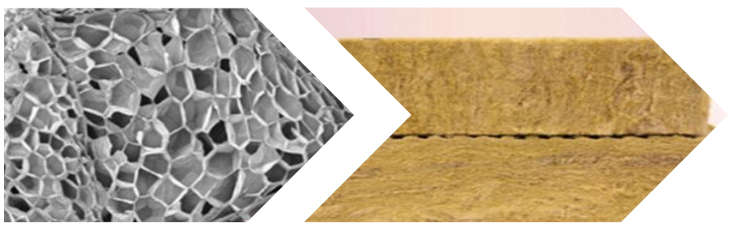


Table 5. System composition of 1 m^2 Berger ETICS with EPS board

Process	Unit	Quantity	Density
EPS (thickness: 50 mm, 75 mm, 100 mm, 120 mm)	kg	1.32 (50 mm), 1.98 (75 mm) 2.64 (100 mm), 3.17 (120 mm)	24 kg/m^3
Cementitious Adhesive (Adhesive-Z)	kg	6.00	-
Cementitious Base Coat (Base Coat-US)	kg	5.00	-
Fibre Glass Mesh	kg	0.16	145 g/m^2
Acrylic Primer	kg	0.14	1.51 kg/lit
Texture	kg	1.80	1.81 kg/Lit
Acrylic Topcoat	kg	0.12	1.23 kg/Lit

Table 6. System composition of 1 m^2 Berger ETICS with XPS board

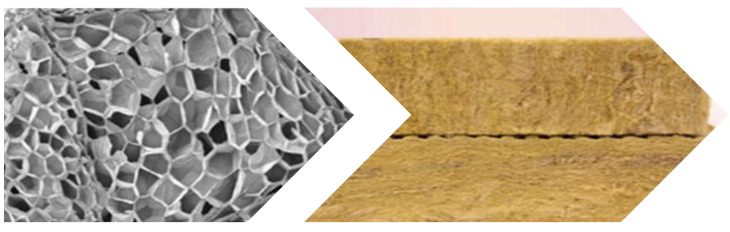
Process	Unit	Quantity	Density
XPS (thickness: 50 mm, 75 mm, 100 mm, 120 mm)	kg	2.06 (50 mm), 3.09(75 mm) 4.12 (100 mm), 4.95 (120 mm)	37.5 kg/m^3
Cementitious Adhesive (Adhesive-Z)	kg	6.00	-
Cementitious Base Coat (Base Coat-US)	kg	5.00	-
Fibre Glass Mesh	kg	0.16	145 g/m^2
Acrylic Primer	kg	0.14	1.51 kg/lit
Texture	kg	1.80	1.81 kg/Lit
Acrylic Topcoat	kg	0.12	1.23 kg/Lit

Table 7. System composition of 1 m^2 Berger ETICS with Mineral wool board

Process	Unit	Quantity	Density
Mineral wool (thickness: 50 mm, 75 mm, 100 mm, 120 mm)	kg	7.26 (50 mm), 10.89 (75 mm) 14.52 (100 mm), 17.42 (120 mm)	132 kg/m^3
Cementitious Adhesive (Adhesive-Z)	kg	6.00	-
Cementitious Base Coat (Base Coat-US)	kg	5.00	-
Fibre Glass Mesh	kg	0.16	145 g/m^2
Acrylic Primer	kg	0.14	1.51 kg/lit
Texture	kg	1.80	1.81 kg/Lit
Acrylic Topcoat	kg	0.12	1.23 kg/Lit

Table 8. System composition of installation for 1 m^2 Berger ETICS

Installation	Unit	Quantity	Remarks
Mechanical Fastener	kg	0.1 to 0.4	Rawlplug (UK) Ejot (Germany)
Electricity	kWh	0.13	
Water	Litres	3.04	



4. LCA

4.1 Information Sources and Data Quality

To ensure that Berger Paints Ltd. can provide the most accurate and representative data for ETICS product, the quality of the data used in the models must be very high. The quality of the LCI data for modelling the life cycle stages have been assessed according to ISO 14044 (2006). Data quality is judged by its precision (measured, calculated or estimated), completeness (e.g. are there unreported emissions?), consistency (degree of uniformity of the methodology applied on an LCA serving as a data source) and representativeness (geographical, time period, technology). To achieve this, industry data collected directly from the producers were used wherever possible. For all other data, primary data were used where possible and finally upstream LCA data from the GaBi 9 professional database. For this latter case, GaBi data were adapted for the data collection part.

4.2 Methodological Details

4.2.1 Declared unit

The declared unit for the EPD is 1 m^2 of thermal insulation system Berger ETICS manufactured at Berger Paints India Limited (India)

4.2.2 Selection of application of LCIA categories

A list of relevant impact categories and category indicators is defined and associated with the inventory data. CML 2001 (January 2016) method developed by Institute of Environmental Sciences, Leiden University, Netherlands have been selected for evaluation of environmental impacts. These indicators are scientifically and technically valid.

The environmental impact per declared unit for the following environmental impact categories were reported in the EPD according with EN15804 (Table 9) and divided into core, upstream (and downstream, if included) module.

Table 9. Environmental impacts indicators

Impact Indicator	LCIA Method	Unit
Acidification Potential	CML	kg SO_2 equivalent
Eutrophication Potential	CML	kg PO_4^{3-} equivalent
Global Warming Potential	CML	kg CO_2 equivalent
Ozone Depletion Potential	CML	kg CFC-11 equivalent
Photochemical Ozone Creation Potential	CML	kg Ethene equivalent
Human Toxicity Potential	CML	kg DCB equivalent
Abiotic Depletion Potential - Elements	CML	kg Sb- equivalent
Abiotic Depletion Potential - Fossil resources		MJ, net calorific value

The consumption of resources per declared or function unit is reported in the EPD. Input parameters, according with EN15804, describing resource use are shown in Table 10.

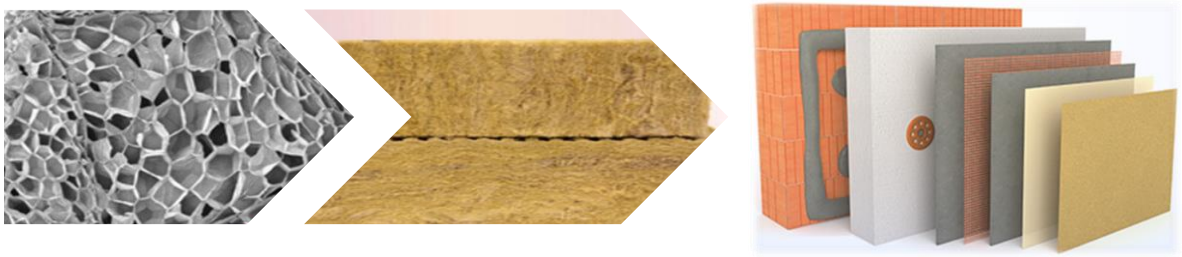


Table 10. Resources use parameters

Parameter	Unit
Renewable primary energy as energy carrier	MJ, net calorific value
Renewable primary energy resources as material utilization	MJ, net calorific value
Total use of renewable primary energy resources	MJ, net calorific value
Non-renewable primary energy as energy carrier	MJ, net calorific value
Non-renewable primary energy as material utilization	MJ, net calorific value
Total use of non-renewable primary energy resources	MJ, net calorific value

Table 11. Other Environmental Indicators

Parameter	Unit
Components for re-use	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported energy	MJ
Hazardous waste disposed	kg
Non-hazardous waste disposed	kg
Radioactive waste disposed/stored	kg

4.3 Cut-off Criteria

Life Cycle Inventory data for a minimum of 99 % of total inflows to the core module shall be included. Inflows not included in the LCA shall be documented in the EPD. Input and output data have been collected through detailed questionnaires which have been developed and refined. In practice, this means that, at least, all material flows going into the production processes (inputs) higher than 1% of the total mass flow (t) or higher than 1% of the total primary energy input (MJ) are part of the system and modelled in order to calculate elementary flows. Inputs with less than 1% of mass flow and less than 1% of the total primary energy input are also considered as all of these were environmentally relevant.

4.4 Allocation

No allocation has been done. As no co-products are produced, the flow of materials and energy and the associated release of substances and energy into the environment is related exclusively to the paint produced. Any allocation performed in the background processes is according to the PCR.

4.5 System Boundaries

The system boundary for Berger ETICS product represents a Cradle-to-Grave with D module which covers production Phase, Installation phase and End-of-Life Phase. The production phase includes the raw material extraction, production of the raw materials, auxiliary material production, upstream transportation, manufacturing process of the final product and its packaging. Installation phase includes the transportation of product from factory/manufacturing unit to the site and installation of that product at site. The End-of-Life phase includes the disposal i.e. landfill and benefits beyond system boundary due to Reuse, recovery, recycling and energy recovery process.

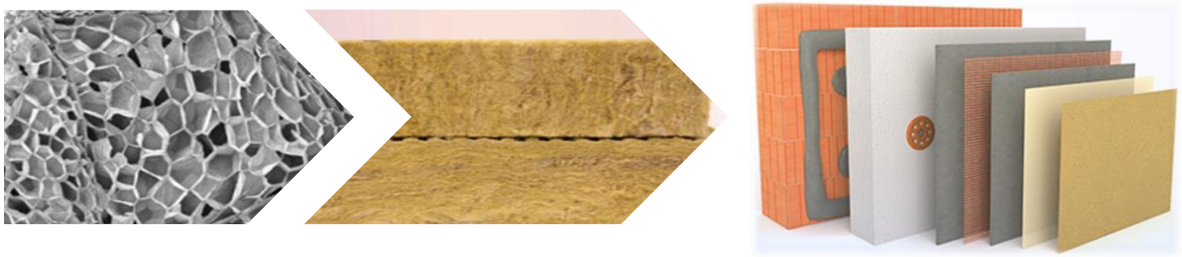


Table 12. Details of system boundary included in the study

Life Cycle Phases	Life Cycle stages	Modules	Life Cycle sub-stages	Definitions
Production Phase	Raw Materials	A1	Primary raw materials production	Extraction and production of raw materials
				Electricity from all sources (import from grid, captive power generation, DG set), water used in Extraction, production of raw materials raw materials and manufacturing.
	Upstream transport	A2	Rail, road and waterways transport	Transport of raw materials to the production plant site.
	Manufacturing	A3	Manufacturing	Manufacturing of construction products and co-products
			Waste treatment during manufacturing	Waste treatment processes (hazardous and non-hazardous waste into landfilling and incineration plant) generated during manufacturing process, Effluent treatment process.
			Product Packaging	Packaging material of final product
Installation Phase	Downstream transport	A4	Rail, road and waterways transport	Transportation from manufacturing unit to average retailer/distribution platform or application site.
	Installation	A5	Installation of product at site	Installation of product using fasteners, also including water and energy consumption at site
End-of-Life Phase	Disposal	C4	Disposal	Waste processing, Landfill, Incineration of packaging waste/materials after use,
Next product System	Benefits beyond system boundary	D	Credits	Reuse, recovery, recycling and energy recovery potentials

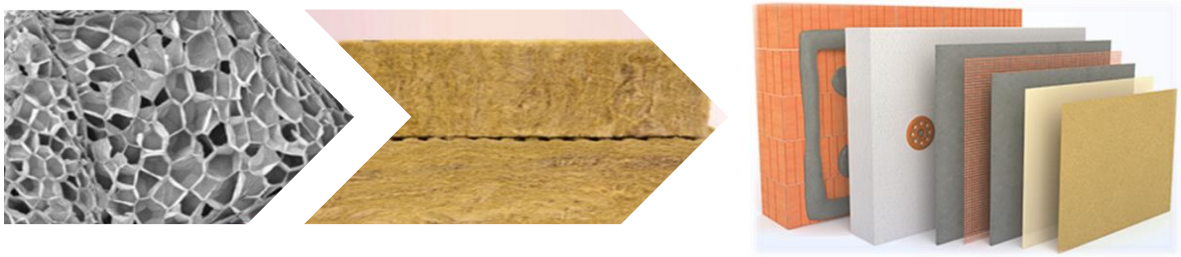
**A1, A2 and A3 have been represented as aggregated result*

4.5.1 Geographic System Boundaries

The geographical coverage of this declaration covers the production of thermal insulation product in India. Wherever possible, the country specific (India) boundaries have been adapted and other datasets were chosen from EU if no India datasets were available.

4.5.2 Temporal System Boundaries

The data collection is related to one year of operation and the year of the data is indicated in the questionnaire for each data point. The majority of data was derived for the year 2018-19 (October 2018 to September 2019) and is believed to be representative of production of thermal insulation product in India during this time frame.



4.5.3 Technology coverage

The exact technological configuration was used for the various process's operation of its plant for efficient performance in production and minimizing environmental impacts. It was assumed that secondary data from databases that were used for this assessment, were temporally and technologically comparable to that of primary data and within the temporal coverage already addressed.

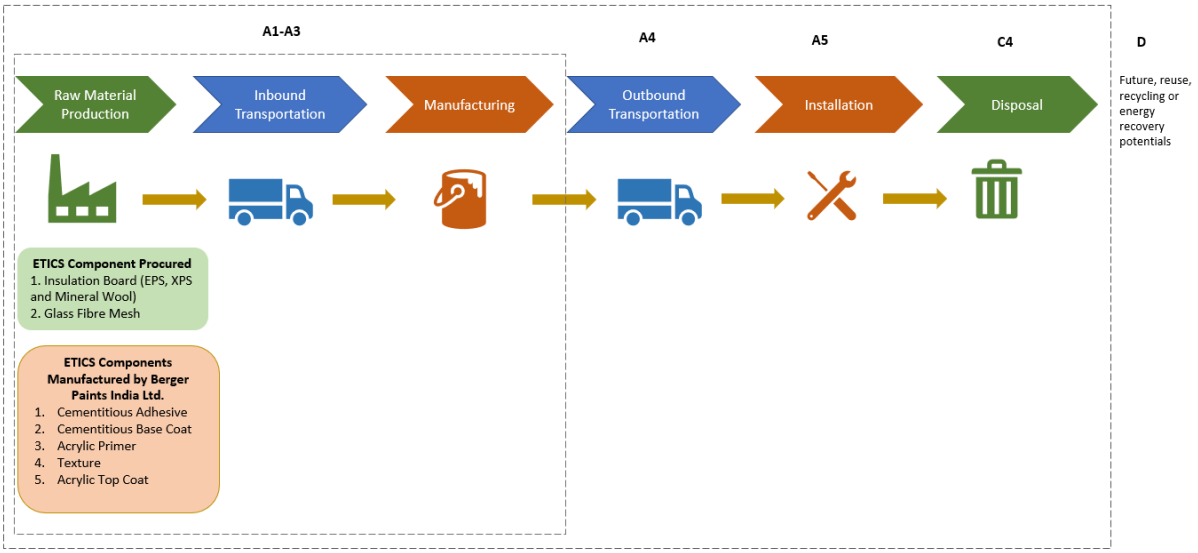


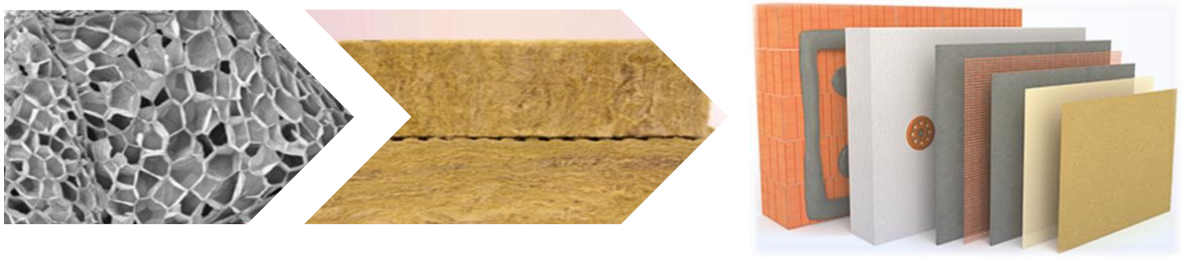
Figure 6. System boundary included in the LCA study.

4.6 Software and database

The LCA model was created using the GaBi 9 Software system for life cycle engineering, developed by thinkstep AG. The GaBi database provides the life cycle inventory data for several of the raw and process materials obtained from the upstream system. Detailed database documentation for GaBi datasets can be accessed at http://www.gabi-software.com/international/support/gabi/gabi-database-2020-lci-documentation.

4.7 Comparability

According to the standards, EPDs do not compare the environmental performance of products in the sector. Any comparison of the declared environmental performance of products lies outside the scope of these standards and is suggested to be feasible only if all compared declarations follow equal standard provisions.



4.8 Results

Modules of the production life cycle included as per PCR is given in Table 13.

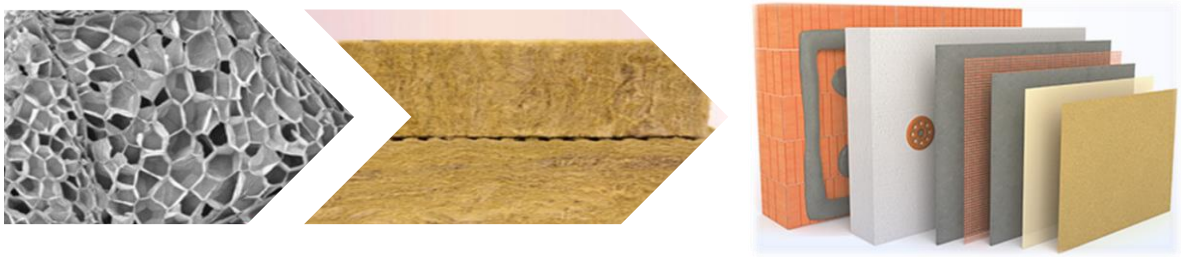
Table 13. Modules of the production life cycle included

Production			Installation		Use stage							End-of-Life				Next product system
Raw material supply (extraction, processing, recycled material)	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X

(X = declared module; MND = Module Not Declared)

**A1, A2 and A3 have been represented as aggregated result*

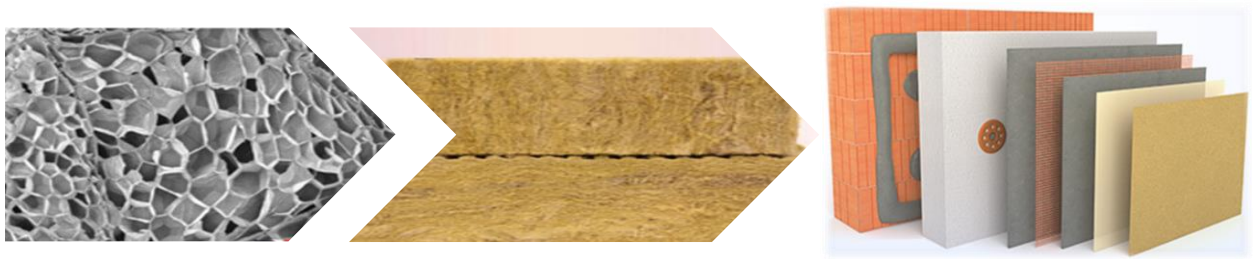
The LCIA result for 1 m^2 Berger ETICS with 4 varying thickness of EPS, XPS and Mineral wool (50 mm, 75 mm, 100 mm and 120 mm) for the system boundary of Cradle to Grave with module D is given in following tables.



1. Berger ETICS with EPS board (50 mm)

Table 14. Cradle to Grave results of 1 m^2 Berger ETICS with EPS board (50 mm)

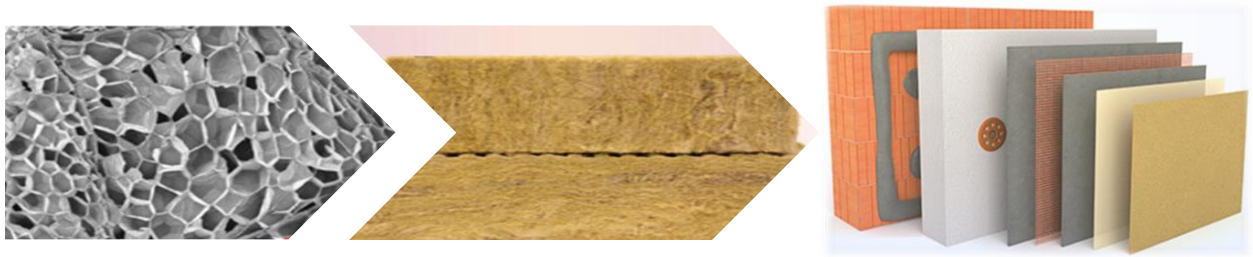
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.10E-05	1.08E-08	6.07E-09	8.64E-08	-5.13E-08
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	2.00E+02	1.22E+01	3.88E+00	2.96E+00	-9.83E+00
Acidification Potential (AP)	kg SO_2-Eq.	3.76E-02	4.10E-03	2.57E-03	1.36E-03	-1.51E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	3.73E-03	8.14E-04	1.25E-04	1.87E-04	-8.75E-05
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.05E+01	9.01E-01	4.35E-01	2.30E-01	-3.19E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.11E-10	4.19E-15	3.42E-14	5.20E-14	-2.57E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	2.56E-03	-1.21E-03	1.31E-04	1.06E-04	-1.24E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	7.75E+00	3.91E-02	2.33E-01	3.81E-01	-9.02E-02
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	7.75E+00	3.91E-02	2.33E-01	3.81E-01	-9.02E-02
Non-Renewable primary energy as energy carrier	MJ	2.03E+02	1.22E+01	3.94E+00	3.08E+00	-9.88E+00
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	2.03E+02	1.22E+01	3.94E+00	3.08E+00	-9.88E+00
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	4.10E-02	1.81E-04	4.51E-03	5.88E-04	-1.66E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.14E-06	7.94E-10	2.25E-09	5.29E-08	-2.08E-09
Non-hazardous waste disposed	kg	1.66E-01	7.24E-05	2.61E-02	1.44E+01	-1.09E-03
Radioactive waste disposed/stored	kg	1.21E-03	2.80E-06	2.28E-05	4.46E-05	-1.93E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	1.32E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



2. Berger ETICS with EPS board (75 mm)

Table 15. Cradle to Grave results of 1 m^2 Berger ETICS with EPS board (75 mm)

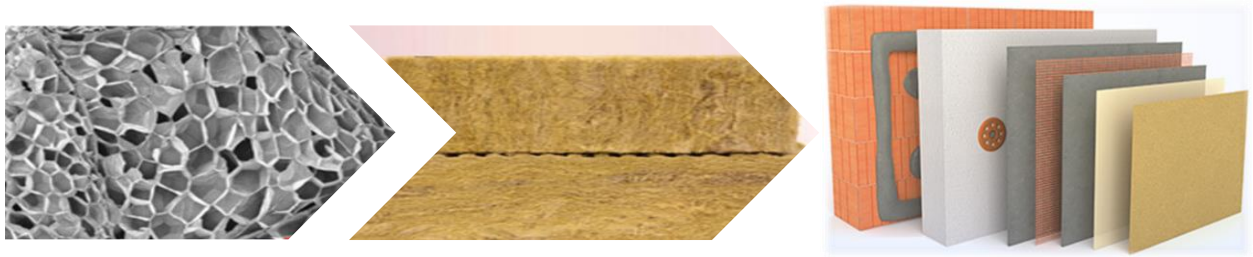
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.15E-05	1.13E-08	1.49E-09	8.99E-08	-7.69E-08
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	2.54E+02	1.27E+01	6.12E+00	3.09E+00	-1.47E+01
Acidification Potential (AP)	kg SO_2-Eq.	4.48E-02	4.29E-03	3.14E-03	1.41E-03	-2.26E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	4.30E-03	8.51E-04	1.64E-04	1.95E-04	-1.31E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.24E+01	9.42E-01	7.07E-01	2.40E-01	-4.78E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.11E-10	4.38E-15	3.98E-14	5.42E-14	-3.86E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	3.20E-03	-1.27E-03	1.69E-04	1.10E-04	-1.87E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	8.65E+00	4.09E-02	2.69E-01	3.97E-01	-1.35E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	8.65E+00	4.09E-02	2.69E-01	3.97E-01	-1.35E-01
Non-Renewable primary energy as energy carrier	MJ	2.57E+02	1.27E+01	6.19E+00	3.20E+00	-1.48E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	2.57E+02	1.27E+01	6.19E+00	3.20E+00	-1.48E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	4.97E-02	1.89E-04	4.87E-03	6.12E-04	-2.49E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.15E-06	8.30E-10	3.24E-09	5.51E-08	-3.12E-09
Non-hazardous waste disposed	kg	2.05E-01	7.57E-05	5.13E-02	1.50E+01	-1.63E-03
Radioactive waste disposed/stored	kg	1.43E-03	2.92E-06	2.66E-05	4.64E-05	-2.89E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	1.98E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



3. Berger ETICS with EPS board (100 mm)

Table 16. Cradle to Grave results of 1 m^2 Berger ETICS with EPS board (100 mm)

Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.20E-05	1.18E-08	-3.08E-09	9.35E-08	-1.03E-07
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	3.08E+02	1.33E+01	8.36E+00	3.21E+00	-1.97E+01
Acidification Potential (AP)	kg SO_2-Eq.	5.20E-02	4.48E-03	3.70E-03	1.47E-03	-3.02E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	4.88E-03	8.88E-04	2.03E-04	2.03E-04	-1.75E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.43E+01	9.83E-01	9.79E-01	2.49E-01	-6.38E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.11E-10	4.57E-15	4.54E-14	5.63E-14	-5.14E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	3.83E-03	-1.33E-03	2.06E-04	1.14E-04	-2.49E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	9.55E+00	4.27E-02	3.06E-01	4.12E-01	-1.80E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	9.55E+00	4.27E-02	3.06E-01	4.12E-01	-1.80E-01
Non-Renewable primary energy as energy carrier	MJ	3.12E+02	1.33E+01	8.44E+00	3.33E+00	-1.98E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	3.12E+02	1.33E+01	8.44E+00	3.33E+00	-1.98E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	5.85E-02	1.97E-04	5.23E-03	6.36E-04	-3.32E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.16E-06	8.66E-10	4.22E-09	5.73E-08	-4.16E-09
Non-hazardous waste disposed	kg	2.45E-01	7.90E-05	7.65E-02	1.56E+01	-2.18E-03
Radioactive waste disposed/stored	kg	1.64E-03	3.05E-06	3.04E-05	4.83E-05	-3.85E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	2.64E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



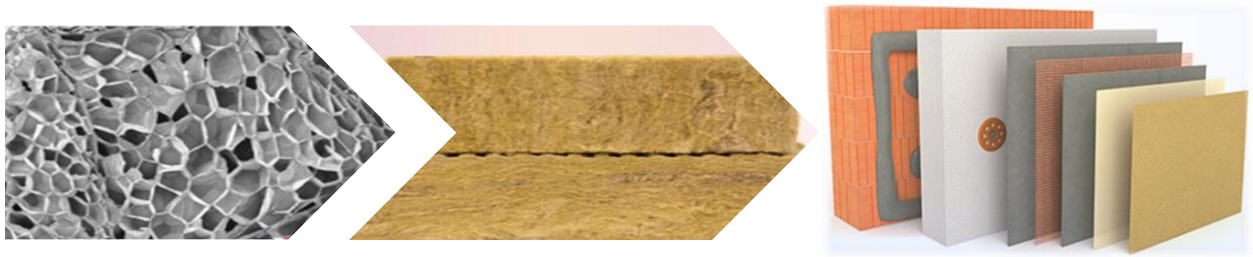
4. Berger ETICS with EPS board (120 mm)

Table 17. Cradle to Grave results of 1 m^2 Berger ETICS with EPS board (120 mm)

Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.24E-05	1.22E-08	-7.66E-09	9.63E-08	-1.23E-07
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	3.52E+02	1.37E+01	1.06E+01	3.31E+00	-2.36E+01
Acidification Potential (AP)	kg SO_2-Eq.	5.78E-02	4.62E-03	4.27E-03	1.51E-03	-3.62E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	5.33E-03	9.17E-04	2.42E-04	2.09E-04	-2.10E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.58E+01	1.02E+00	1.25E+00	2.57E-01	-7.65E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.12E-10	4.72E-15	5.10E-14	5.81E-14	-6.17E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	4.34E-03	-1.37E-03	2.44E-04	1.18E-04	-2.99E-04

Resource Use	Unit	A1-A3	A4	A5	C4	D
Renewable primary energy as energy carrier	MJ	1.03E+01	4.41E-02	3.42E-01	4.25E-01	-2.16E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	1.03E+01	4.41E-02	3.42E-01	4.25E-01	-2.16E-01
Non-Renewable primary energy as energy carrier	MJ	3.56E+02	1.37E+01	1.07E+01	3.43E+00	-2.37E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	3.56E+02	1.37E+01	1.07E+01	3.43E+00	-2.37E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	6.54E-02	2.04E-04	5.59E-03	6.56E-04	-3.99E-03

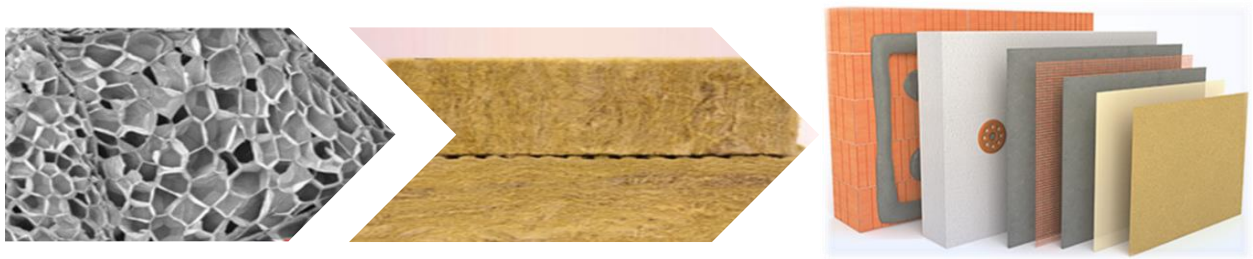
Waste categories	Unit	A1-A3	A4	A5	C4	D
Hazardous waste disposed	kg	5.17E-06	8.95E-10	5.20E-09	5.91E-08	-4.99E-09
Non-hazardous waste disposed	kg	2.76E-01	8.16E-05	1.02E-01	1.61E+01	-2.62E-03
Radioactive waste disposed/stored	kg	1.81E-03	3.15E-06	3.42E-05	4.97E-05	-4.62E-05
Additional Indicators	Unit	A1-A3	A4	A5	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	3.17E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



5. Berger ETICS with XPS board (50 mm)

Table 18. Cradle to Grave results of 1 m^2 Berger ETICS with XPS board (50 mm)

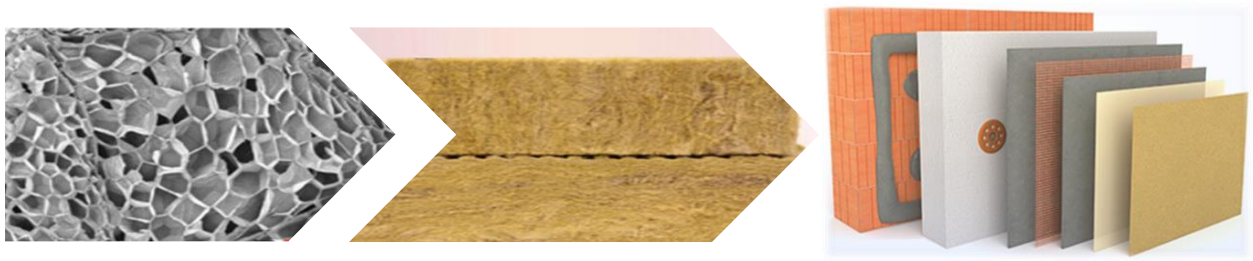
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.11E-05	1.14E-08	6.07E-09	9.04E-08	-8.01E-08
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	2.60E+02	1.28E+01	3.88E+00	3.10E+00	-1.54E+01
Acidification Potential (AP)	kg SO_2-Eq.	5.23E-02	4.31E-03	2.57E-03	1.42E-03	-2.36E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	4.39E-03	8.55E-04	1.25E-04	1.96E-04	-1.37E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.32E+01	9.47E-01	4.35E-01	2.41E-01	-4.98E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.11E-10	4.40E-15	3.42E-14	5.45E-14	-4.02E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	5.24E-03	-1.28E-03	1.31E-04	1.10E-04	-1.94E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	9.80E+00	4.11E-02	2.33E-01	3.99E-01	-1.41E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	9.80E+00	4.11E-02	2.33E-01	3.99E-01	-1.41E-01
Non-Renewable primary energy as energy carrier	MJ	2.63E+02	1.28E+01	3.94E+00	3.22E+00	-1.54E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	2.63E+02	1.28E+01	3.94E+00	3.22E+00	-1.54E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	6.12E-02	1.90E-04	4.51E-03	6.15E-04	-2.60E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.17E-06	8.34E-10	2.25E-09	5.54E-08	-3.25E-09
Non-hazardous waste disposed	kg	1.11E-01	7.61E-05	2.61E-02	1.51E+01	-1.70E-03
Radioactive waste disposed/stored	kg	1.26E-03	2.94E-06	2.28E-05	4.67E-05	-3.01E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	2.06E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



6. Berger ETICS with XPS board (75 mm)

Table 19. Cradle to Grave results of 1 m^2 Berger ETICS with XPS board (75 mm)

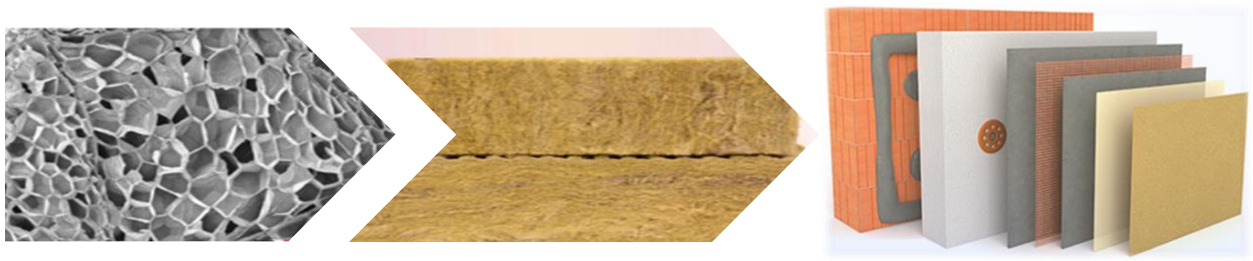
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.17E-05	1.21E-08	1.49E-09	9.59E-08	-1.20E-07
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	3.45E+02	1.37E+01	6.12E+00	3.29E+00	-2.30E+01
Acidification Potential (AP)	kg SO_2-Eq.	6.68E-02	4.60E-03	3.14E-03	1.51E-03	-3.54E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	5.30E-03	9.13E-04	1.64E-04	2.08E-04	-2.05E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.64E+01	1.01E+00	7.07E-01	2.56E-01	-7.47E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.11E-10	4.70E-15	3.98E-14	5.78E-14	-6.03E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	7.22E-03	-1.36E-03	1.69E-04	1.17E-04	-2.92E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	1.17E+01	4.39E-02	2.69E-01	4.23E-01	-2.11E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	1.17E+01	4.39E-02	2.69E-01	4.23E-01	-2.11E-01
Non-Renewable primary energy as energy carrier	MJ	3.48E+02	1.37E+01	6.19E+00	3.42E+00	-2.32E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	3.48E+02	1.37E+01	6.19E+00	3.42E+00	-2.32E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	8.01E-02	2.03E-04	4.87E-03	6.53E-04	-3.90E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.19E-06	8.91E-10	3.24E-09	5.88E-08	-4.88E-09
Non-hazardous waste disposed	kg	1.22E-01	8.13E-05	5.13E-02	1.60E+01	-2.55E-03
Radioactive waste disposed/stored	kg	1.50E-03	3.14E-06	2.66E-05	4.95E-05	-4.51E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	3.09E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



7. Berger ETICS with XPS board (100 mm)

Table 20. Cradle to Grave results of 1 m^2 Berger ETICS with XPS board (100 mm)

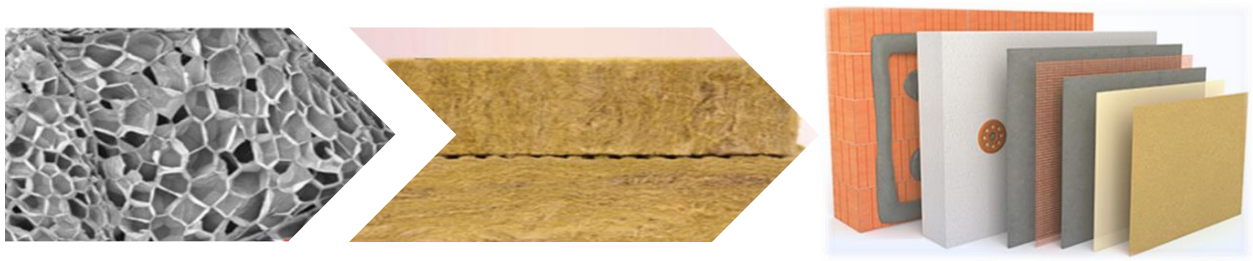
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.23E-05	1.29E-08	-3.08E-09	1.02E-07	-1.60E-07
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	4.29E+02	1.45E+01	8.36E+00	3.48E+00	-3.07E+01
Acidification Potential (AP)	kg SO_2-Eq.	8.14E-02	4.89E-03	3.70E-03	1.60E-03	-4.72E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	6.21E-03	9.71E-04	2.03E-04	2.20E-04	-2.73E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.97E+01	1.08E+00	9.79E-01	2.71E-01	-9.97E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.12E-10	5.00E-15	4.54E-14	6.12E-14	-8.04E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	9.19E-03	-1.45E-03	2.06E-04	1.24E-04	-3.89E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	1.36E+01	4.67E-02	3.06E-01	4.48E-01	-2.82E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	1.36E+01	4.67E-02	3.06E-01	4.48E-01	-2.82E-01
Non-Renewable primary energy as energy carrier	MJ	4.33E+02	1.45E+01	8.44E+00	3.62E+00	-3.09E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	4.33E+02	1.45E+01	8.44E+00	3.62E+00	-3.09E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	9.89E-02	2.16E-04	5.23E-03	6.91E-04	-5.19E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.21E-06	9.47E-10	4.22E-09	6.22E-08	-6.50E-09
Non-hazardous waste disposed	kg	1.33E-01	8.64E-05	7.65E-02	1.70E+01	-3.41E-03
Radioactive waste disposed/stored	kg	1.74E-03	3.34E-06	3.04E-05	5.24E-05	-6.02E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	4.13E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



8. Berger ETICS with XPS board (120 mm)

Table 21. Cradle to Grave results of 1 m^2 Berger ETICS with XPS board (120 mm)

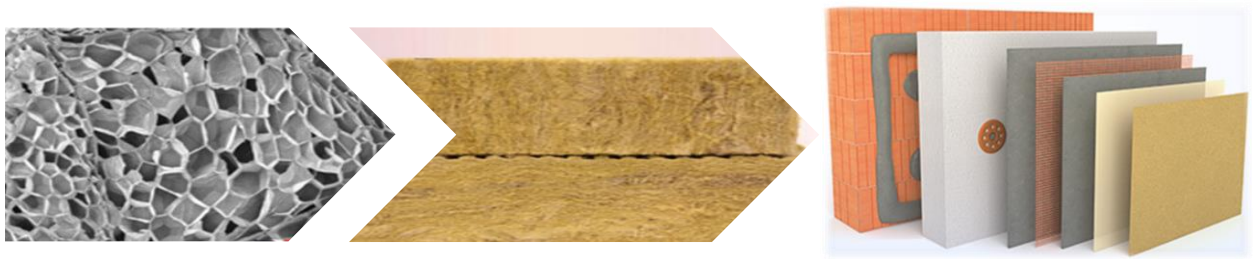
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.27E-05	1.35E-08	-7.66E-09	1.06E-07	-1.92E-07
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	4.97E+02	1.52E+01	1.06E+01	3.64E+00	-3.69E+01
Acidification Potential (AP)	kg SO_2-Eq.	9.31E-02	5.13E-03	4.27E-03	1.67E-03	-5.66E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	6.93E-03	1.02E-03	2.42E-04	2.30E-04	-3.28E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	2.22E+01	1.13E+00	1.25E+00	2.83E-01	-1.20E+00
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.12E-10	5.23E-15	5.10E-14	6.38E-14	-9.64E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	1.08E-02	-1.52E-03	2.44E-04	1.29E-04	-4.67E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	1.52E+01	4.89E-02	3.42E-01	4.67E-01	-3.38E-01
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	1.52E+01	4.89E-02	3.42E-01	4.67E-01	-3.38E-01
Non-Renewable primary energy as energy carrier	MJ	5.02E+02	1.52E+01	1.07E+01	3.77E+00	-3.70E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	5.02E+02	1.52E+01	1.07E+01	3.77E+00	-3.70E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	1.14E-01	2.26E-04	5.59E-03	7.21E-04	-6.23E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.23E-06	9.92E-10	5.20E-09	6.49E-08	-7.80E-09
Non-hazardous waste disposed	kg	1.42E-01	9.05E-05	1.02E-01	1.77E+01	-4.09E-03
Radioactive waste disposed/stored	kg	1.93E-03	3.50E-06	3.42E-05	5.47E-05	-7.22E-05
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	4.95E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



9. Berger ETICS with Mineral-wool board (50 mm)

Table 22. Cradle to Grave results of 1 m^2 Berger ETICS with Mineral wool board (50 mm)

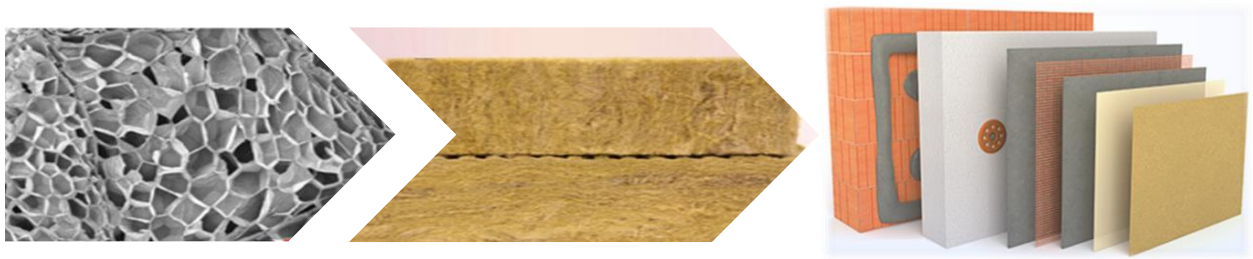
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.26E-05	1.52E-08	6.07E-09	1.18E-07	-1.42E-05
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	2.07E+02	1.71E+01	3.88E+00	4.06E+00	-1.13E+01
Acidification Potential (AP)	kg SO_2-Eq.	5.51E-02	5.78E-03	2.57E-03	1.86E-03	-4.88E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	9.22E-03	1.15E-03	1.25E-04	2.57E-04	-6.73E-04
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	1.65E+01	1.27E+00	4.35E-01	3.16E-01	-9.79E-01
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.15E-10	5.90E-15	3.42E-14	7.14E-14	-6.69E-13
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	2.23E-03	-1.71E-03	1.31E-04	1.45E-04	-2.69E-04
Resource Use	**Unit**					
Renewable primary energy as energy carrier	MJ	2.40E+01	5.51E-02	2.33E-01	5.22E-01	-1.38E+00
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	2.40E+01	5.51E-02	2.33E-01	5.22E-01	-1.38E+00
Non-Renewable primary energy as energy carrier	MJ	2.19E+02	1.72E+01	3.94E+00	4.22E+00	-1.25E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	2.19E+02	1.72E+01	3.94E+00	4.22E+00	-1.25E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	5.83E-02	2.55E-04	4.51E-03	8.06E-04	-3.31E-03
Waste categories	**Unit**					
Hazardous waste disposed	kg	5.21E-06	1.12E-09	2.25E-09	7.26E-08	-1.89E-08
Non-hazardous waste disposed	kg	1.15E+00	1.02E-04	2.61E-02	1.98E+01	-1.88E-01
Radioactive waste disposed/stored	kg	4.57E-03	3.94E-06	2.28E-05	6.11E-05	-4.62E-04
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	7.26E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



10. Berger ETICS with Mineral-wool board (75 mm)

Table 23. Cradle to Grave results of 1 m^2 Berger ETICS with Mineral-wool board (75 mm)

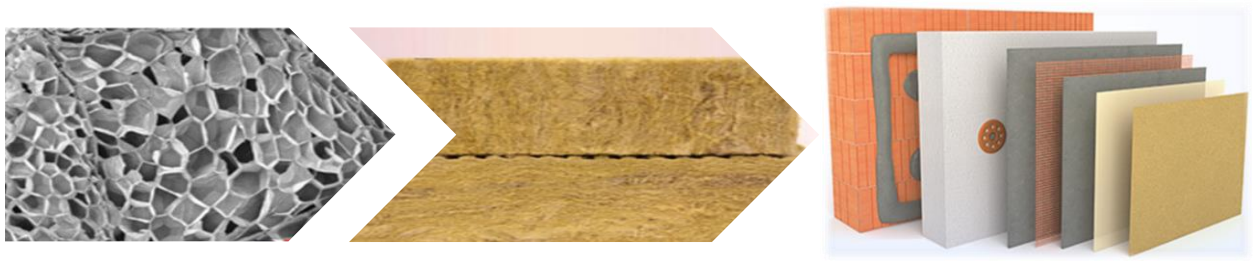
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.39E-05	1.79E-08	1.49E-09	1.38E-07	-2.13E-05
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	2.66E+02	2.02E+01	6.12E+00	4.74E+00	-1.70E+01
Acidification Potential (AP)	kg SO_2-Eq.	7.11E-02	6.80E-03	3.14E-03	2.17E-03	-7.31E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	1.25E-02	1.35E-03	1.64E-04	2.99E-04	-1.01E-03
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	2.13E+01	1.49E+00	7.07E-01	3.68E-01	-1.47E+00
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.17E-10	6.95E-15	3.98E-14	8.32E-14	-1.00E-12
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	2.69E-03	-2.01E-03	1.69E-04	1.69E-04	-4.03E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	3.30E+01	6.49E-02	2.69E-01	6.09E-01	-2.08E+00
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	3.30E+01	6.49E-02	2.69E-01	6.09E-01	-2.08E+00
Non-Renewable primary energy as energy carrier	MJ	2.82E+02	2.02E+01	6.19E+00	4.92E+00	-1.87E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	2.82E+02	2.02E+01	6.19E+00	4.92E+00	-1.87E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	7.57E-02	3.00E-04	4.87E-03	9.39E-04	-4.96E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.26E-06	1.32E-09	3.24E-09	8.46E-08	-2.84E-08
Non-hazardous waste disposed	kg	1.68E+00	1.20E-04	5.13E-02	2.31E+01	-2.83E-01
Radioactive waste disposed/stored	kg	6.46E-03	4.64E-06	2.66E-05	7.12E-05	-6.94E-04
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	10.9E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



11. Berger ETICS with Mineral-wool board (100 mm)

Table 24. Cradle to Grave results of 1 m^2 Berger ETICS with Mineral-wool board (100 mm)

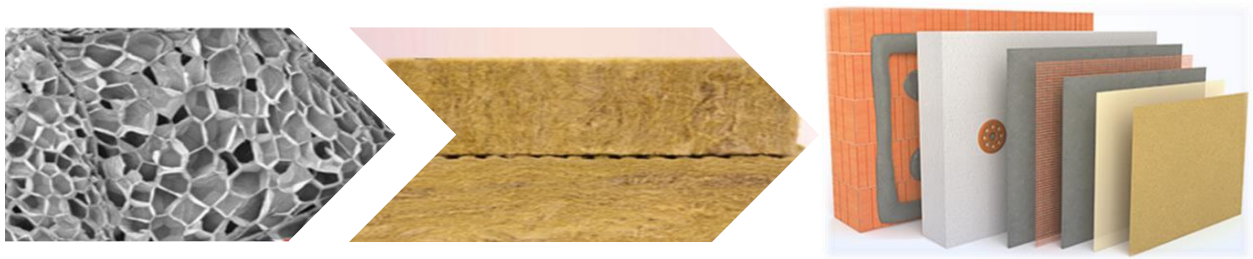
Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.52E-05	2.06E-08	-3.08E-09	1.58E-07	-2.84E-05
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	3.24E+02	2.32E+01	8.36E+00	5.41E+00	-2.26E+01
Acidification Potential (AP)	kg SO_2-Eq.	8.72E-02	7.83E-03	3.70E-03	2.48E-03	-9.75E-03
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	1.59E-02	1.55E-03	2.03E-04	3.42E-04	-1.35E-03
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	2.61E+01	1.72E+00	9.79E-01	4.20E-01	-1.96E+00
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.19E-10	7.99E-15	4.54E-14	9.50E-14	-1.34E-12
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	3.16E-03	-2.32E-03	2.06E-04	1.93E-04	-5.38E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	4.20E+01	7.47E-02	3.06E-01	6.95E-01	-2.77E+00
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	4.20E+01	7.47E-02	3.06E-01	6.95E-01	-2.77E+00
Non-Renewable primary energy as energy carrier	MJ	3.45E+02	2.32E+01	8.44E+00	5.61E+00	-2.50E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	3.45E+02	2.32E+01	8.44E+00	5.61E+00	-2.50E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	9.31E-02	3.45E-04	5.23E-03	1.07E-03	-6.61E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.30E-06	1.51E-09	4.22E-09	9.66E-08	-3.79E-08
Non-hazardous waste disposed	kg	2.22E+00	1.38E-04	7.65E-02	2.63E+01	-3.77E-01
Radioactive waste disposed/stored	kg	8.35E-03	5.34E-06	3.04E-05	8.14E-05	-9.25E-04
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	14.5E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



12. Berger ETICS with Mineral-wool board (120 mm)

Table 25. Cradle to Grave results of 1 m^2 Berger ETICS with Mineral-wool board (120 mm)

Environmental Impacts	Unit	A1-A3	A4	A5	C4	D
Abiotic Depletion Potential (ADP elements)	kg Sb-Eq.	3.62E-05	2.28E-08	-7.66E-09	1.73E-07	-3.41E-05
Abiotic Depletion Potential (ADP-fossil fuels)	MJ	3.70E+02	2.57E+01	1.06E+01	5.95E+00	-2.71E+01
Acidification Potential (AP)	kg SO_2-Eq.	1.00E-01	8.65E-03	4.27E-03	2.72E-03	-1.17E-02
Eutrophication Potential (EP)	kg PO_4^{3-}Eq.	1.85E-02	1.72E-03	2.42E-04	3.76E-04	-1.62E-03
Global Warming Potential (GWP 100 years)	kg CO_2-Eq.	2.99E+01	1.90E+00	1.25E+00	4.62E-01	-2.35E+00
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	5.21E-10	8.83E-15	5.10E-14	1.04E-13	-1.61E-12
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	3.53E-03	-2.56E-03	2.44E-04	2.12E-04	-6.45E-04
Resource Use	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Renewable primary energy as energy carrier	MJ	4.93E+01	8.25E-02	3.42E-01	7.64E-01	-3.32E+00
Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ	4.93E+01	8.25E-02	3.42E-01	7.64E-01	-3.32E+00
Non-Renewable primary energy as energy carrier	MJ	3.95E+02	2.57E+01	1.07E+01	6.17E+00	-2.99E+01
Non-Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of Non-Renewable primary energy resources	MJ	3.95E+02	2.57E+01	1.07E+01	6.17E+00	-2.99E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	1.07E-01	3.81E-04	5.59E-03	1.18E-03	-7.93E-03
Waste categories	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Hazardous waste disposed	kg	5.34E-06	1.67E-09	5.20E-09	1.06E-07	-4.55E-08
Non-hazardous waste disposed	kg	2.64E+00	1.53E-04	1.02E-01	2.90E+01	-4.52E-01
Radioactive waste disposed/stored	kg	9.86E-03	5.89E-06	3.42E-05	8.94E-05	-1.11E-03
Additional Indicators	**Unit**	**A1-A3**	**A4**	**A5**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	17.4E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

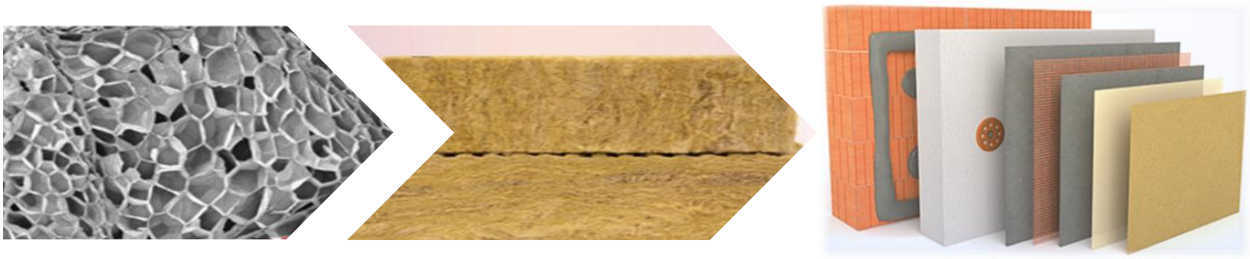


4.9 Interpretation

The interpretation of the results for 1 m^2 Berger ETICS is given in Table 26.

Table 26. Interpretation of most significant contributors to life cycle parameters

Parameter	Most significant contributor
Abiotic Depletion Potential (ADP) - Elements	ADP-Elements is mainly contributed by production phase of components by 99.8%, with highest contribution by fibre glass (40%), cementitious adhesives & base coat (28%) and texture (24%). Installation phase contributes 0.0195% and End of Life contributes 0.113%.
Abiotic depletion potential (ADP) - Fossil	ADP-Fossil is contributed highest by production phase by 95.6%, with highest contribution by insulation board (52%), cementitious adhesives & base coat (25%) and texture (10%). Installation phase contributes 1.86% and End of Life contributes -3.29% (negative due to recycling credit)
Acidification Potential (AP)	The highest contributor to acidification is production phase (85.2%), with highest contribution by insulation board (32.9%), cementitious adhesives & base coat (32%). Installation phase contributes 5.84% and End of Life contributes -0.35% (negative due to recycling credit)
Eutrophication Potential (EP)	Eutrophication is highly contributed by production phase by 78.20%, with highest contribution from insulation board (24.1%), cementitious adhesives & base coat (36.5%) and texture (11.10%). Installation phase contributes 2.62% and End of Life contributes 2.10%.
Global Warming Potential (GWP)	Highest contributor to GWP is production phase by 89.4%, with highest contribution from insulation board (31.6%), cementitious adhesives & base coat (42%) and texture (8.46%). Installation phase contributes 3.69% and End of Life contributes -0.75%. (negative due to recycling credit)
Ozone Layer Depletion Potential (ODP)	Almost 100% of ODP is contributed by production phase, with highest contribution by Acrylic Primer (98.70%) and remaining 1.30% by other components of product.
Photochemical Ozone Creation Potential (POCP)	The highest contributor to Photochemical Ozone Creation Potential or smog potential is production phase. The installation phase contributes 8.97% mostly contributed by electricity consumption and the End of Life contributes -1.3% (negative due to recycling credit)
Primary Energy Demand	The primary energy demand is contributed highest by production phase (95.6%), with high contribution from insulation product (52%) and cementitious adhesives & base coat (26%). Installation phase contributes 1.86% and End of Life contributes -3.21%. (negative due to recycling credit)
Net freshwater use	91.9% freshwater use is contributed by production phase (91.9%) with 40% of it contributed by insulation product. Installation contributes 10.5% and End of Life contributes -2.43%. (negative due to recycling credit)



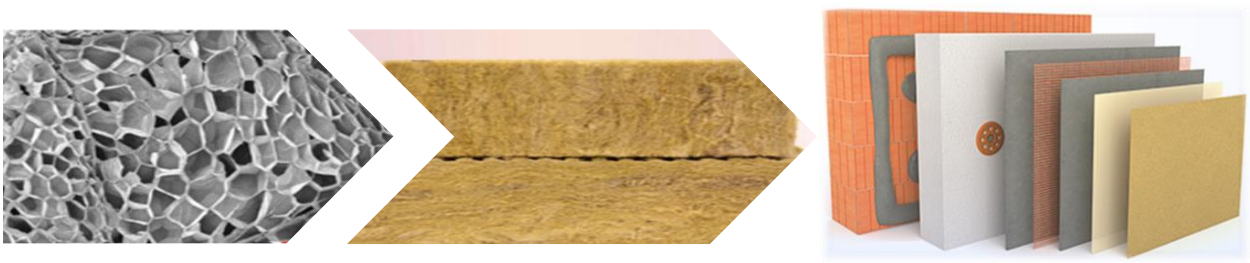
Concluding, the study provides fair understanding of environmental impacts during the various life cycle stages of the product. It also identifies the hotspots in the value chain where improvement activities can be prioritised and accordingly investment can be planned. The scope covers the ecological information to be divided into raw material production, transportation, installation as well as the end of life stage considerations.

5. LCA Terminology

Cradle to Gate	Scope of study extends from mining of natural resources to the completed product ready for shipping from the manufacturing dispatch “gate”, known as Modules A1-A3.
Cradle to Grave	Scope of study extends from mining of natural resources to manufacture, use and disposal of products at End of Life.
End of life (including module D)	Post-use phase life cycle stages involving collection and processing of materials (e.g. scrap) and recycling or disposal, known as Modules C and D.

6. Glossary of Terms

Impact Category	Units	Description	Characterisation Method
Global Warming (Climate Change) Potential	kg CO_2 equiv	Contribution to the greenhouse effect, referred to as carbon dioxide equivalent)	CML
Stratospheric Ozone Depletion Potential	kg CFC-11 equiv	Impact on the ozone layer	CML
Acidification Potential of Land and Water	kg SO_2 equiv	Emissions which increase the acidity of the environment	CML
Eutrophication Potential	kg PO_4^{3-} equiv	Addition of nutrients to a water system resulting in reduction of the oxygen available to support aquatic life	CML
Photochemical Ozone Creation Potential	kg C_2H_2 equiv	Contribution to air pollution in the form of smog	CML
Depletion of Abiotic Resources (Elements/Minerals)	kg Sb equiv	Impact of consuming non- renewable metal resources	CML
Depletion of Abiotic Resources (Fossil)	MJ	Impact of consuming non- renewable fossil fuel resources	CML



7. Other Environmental Information

The constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development and of Environmental Stewardship as a standard business practice in our operations. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business.

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

8. References

- EN 15804: 2012, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EN 16783:2017, Complementary Product Category Rules (PCR) to PCR 2012:01 for ‘Thermal Insulation Products’, Multiple UN CPC Codes, dated 2019-12-20.
- GaBi 9_2020: Dokumentation der GaBi-Datensätze der Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012
- GaBi 9_2020: Software und Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und PE International, 2012
- ISO 14020:2000 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040:2006 Environmental management- Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.
- PCR 2012:01, Product Category Rules (PCR) for Construction Products, Version 2.31, dated 2019-12-20