EPD - ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

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Mineral insulation materials made of Glasswool

İzocam Ticaret ve Sanayi A.Ş.

General information

Product name İzocam Glasswool insulation in the form of slabs and rolls	**Declared Product / Declared Unit** İzocam insulation materials made of glass wool are used for thermal insulation as well as acoustic and fire protection in building constructions. The products are made of recycled glass and other basic materials, typical for glass industry. A binder on the basis of phenol-formaldehyde resin is used. The EPD represents the average of a selection of Glasswool insulation materials in form of slabs and rolls, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Tarsus (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Glasswool products. The weighted average density is 13 kg/m³, the weighted average thermal conductivity is 0.043 W/mK. One cubic metre of insulation material (m³) was defined as declared unit.
Declaration number EPD-İzocam Ticaret ve Sanayi A.Ş.-2014-2	
Declaration data ☐ Specific data ☒ Average data	
Declaration based on: PCR Mineral insulating products PCR-Code: 2.22.2.1 Version 05 – 2014-04-30 (PCR tested and approved by the independent expert committee = PKR-Gremium)	**Range of validity** The average data published in this EPD are representative for a sample of İzocam Glasswool products, selected by İzocam and produced in the site in Tarsus (Turkey). The EPD report is based on the information from the verified Life Cycle Assessment described in the background report for İzocam Glasswool products (SUSTAiNOVA 2015). The owner of the declaration is liable for the underlying information and evidence; Bau EPD GmbH is not liable with respect to manufacturer information, life cycle assessment data and evidences.
Type of Declaration as per EN 15804 From cradle to gate	**Database, Software, Version** [ecoinvent v.2.2 as main database, ecoinvent v.3.1], SimaPro 8.0.4.
Author of the Life Cycle Assessment Tuba Atabey SUSTAiNOVA Sustainability Consulting Esentepe Mah. Kore Şehitleri Cad. No:26/6 Şişli PK: 34394 İstanbul, Turkey **Project Monitoring:** DI Philipp Boogman IBO Österreichisches Institut für Bauen und Ökologie GmbH Alserbachstraße 5, 1090 Wien Austria	**The CEN standard EN 15804 serves as the core-PCR.** **Independent verification of the declaration according to ISO 14025:2010** ☐ internally ☒ externally **Verifier 1:** DI Dr. sc ETHZ Florian Gschösser, UIBK Innsbruck **Verifier 2:** DI Roman Smutny
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Note: EPDs from similar product groups from different programmes might not be comparable.

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1 Product / System description

1.1 General product description

İzocam insulation materials made from glass wool are used for thermal insulation as well as acoustic and fire protection in building constructions and industry. Glass wool belongs to the group of artificial mineral wools which consists of undirected vitreous (silicate) fibres with more than 18 % oxides of sodium, potassium, calcium, magnesium and barium (EU-directive 97/69/EG).
The products are made from recycled glass and other basic materials typical for glass industry. A binder on the basis of phenol-formaldehyde resin is used.
The EPD represents the average of a selection of Glasswool insulation materials in form of slabs and rolls, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Tarsus (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Glasswool products (see Table 2 and products catalogue available on http://www.izocam.com.tr/).

The weighted average density is 13 kg/m³, the weighted average thermal conductivity 0.043 W/mK.

1.2 Placing and making available on the market

For placing İzocam Glasswool insulation materials on the market of construction products the following rules are applied:

- EN 13162 "Thermal insulation products for buildings - Factory made mineral wool (MW) products – Specification"
- CE-mark (EC certificate of conformity, see www.izocam.com.tr in the section "Products")
- Declaration of performance

Up-to-date declarations of performance for all products of İzocam Ticaret ve Sanayi A.Ş. are available upon request.
Mineral insulating products produced in Turkey are not ruled by any regulations regarding formaldehyde emission. As a consequence, as measurement is not required, no specific data on formaldehyde emitted by İzocam's Glasswool products are available.

Additional European requirements:
All glass wool products manufactured by İzocam Ticaret ve Sanayi A.Ş. are not classified under the European Regulation directive 97/69/EG as well as the regulation (EG) 1272/2008 with reference to bio-persistent fibres.
All İzocam Glasswool products are certified by EUCEB.

1.3 Application field

İzocam Glasswool insulation materials are used for all purposes in thermal, acoustic insulation and fire safety. Examples can be listed as follows: thermal insulation in walls (cavity walls, lightweighted partition wall, ventilated façade), in floors (floating floors, suspended ceilings), in prefabricated houses, in pitched roofs (loft, attics floors), between rafter or wooden frames, in wooden walls or wooden floor construction, non-walkable insulation of top storey ceilings, acoustic insulation in metal stud systems.

Glasswool insulation boards are also used in roofs and claddings of metallic buildings, in industrial applications such as HVAC and OEM applications (marine, transport and household applications, fire doors and others).

Table 1: Scope of application as per EN 13162

Wall – Pillars – Columns – Floor slabs							Ceiling – Roof – Terrace									
Exterior insulation				Core insulation		Interior insulation	Exterior insulation						Interior insulation			
With ventilation	External thermal insulation compound systems (ETICS)	Laid into formwork, i.e. thermal bridges	With plaster or cladding	In cavity constructions	In lightweight elements	Masonry or concrete walls with or without rendering (coating)	Warm roof	Cold roof, loft conversion	attics, walkable or non-walkable insulation	In case of increased compressive loads, e.g. parking decks	Ceiling soffit (undersides) with plaster	Ceiling soffit (undersides) with ETICS	Under screed without requirements on impact noise protection	Under screed with requirements on impact noise protection	Suspended ceilings	Ceiling soffit, sound absorption
X		X	X	X	X	X	X	X	X		X				X	X

1.4 Technical data

The collection of technical data was done according to the standards required in EN 13162.

Table 2: Product designation codes of Glasswool products declared by İzocam

Short name	Product designation code
	MW - EN 13162 - …
Building Blanket-300, unfaced	T1
Building Blanket-350, unfaced	T1
Building Blanket-400, unfaced	T1
Rulopan	T1
Industrial Building Board	T3
Cephepan	T3
Wall Board	T3
Yali Glass wool	T3
Dupan	T3
Glass wool partition wall board	T3
Comfort	T1
Suspended ceiling board, faced with glass tissue	T3
Taşır, unfaced or faced with glass tissue	T3

Table 3: Technical data of the declared construction product

Characterisation	Value	Unit
Thermal conductivity [1]: For products as per EN 13162: Declared thermal conductivity λ_D resp. λ_D–range	0.043 [3] 0.031 - 0.043	W/(mK)
Nominal density [2] resp. range of nominal density for Glasswool materials	13 (10 - 100)	kg/m³
Classification of fire behaviour as per EN 13501-1	A1	-

1) For mineral wool no correction factors for humidity are designed.

2) Average nominal density

3) İzocam Glasswool products with a density of 13 kg/m³ have a thermal conductivity valued at 0.043 W/(mK).
Please refer to the products “Building Blanket”, “Rulopan” (Rollpan) and ”Comfort” in the Declaration of Performance N°: 1-CPR-2013/07/01.

Specific product data sheets can be downloaded from the website of İzocam Ticaret ve Sanayi A.Ş. (www.izocam.com.tr).

1.5 Conditions of delivery

Forms of delivery can be rolls (e.g. thermal insulation felts) and boards (e.g. thermal and sound insulation boards). Units of delivery and dimensions can be taken from the current price list of İzocam Ticaret ve Sanayi A.Ş. The products must be stored in a weatherproof location.

2 Description of life cycle

2.1 Base materials (main components and auxiliary materials)

Table 4: Base materials and auxiliary materials

Components	Function	Mass fraction in percent
Recycled glass [1)]	Glass raw material	ca. 60 %
Borax pentahydrate [2)]	Glass raw material	ca. 6 %
Quartz sand [3)]	Glass raw material	ca. 2 %
Soad ash [4)]	Glass raw material	ca. 4 %
Colemanite [5)]	Glass raw material	ca. 2 %
Magnesite [6)]	Glass raw material	< 1 %
Feldspar [7)]	Glass raw material	ca. 6 %
Manganese dioxide [8)]	Glass raw material	< 1 %
Sodium nitrate [9)]	Glass raw material	< 1 %
Phenol formaldehyde resin [10)]	Binder	ca. 6 %
Additives [10)]	Binder	ca. 3 %
Auxiliary materials [11)]	- Hydrophobing agents - Adhesion agents - Auxiliary materials for coloring	Total < 1 %
Glass tissue [12)]	Facing	ca. 6 %
Non-woven textile [12)]	Facing	ca. 2 %

1) Recycled glass represents the greatest share in the raw materials. Its origin is from waste glass produced by an automotive glass industry in the region of Kırklareli (Turkey). Crushed to granulates, it can be directly injected with mineral raw material before introduction in the furnace. Using recycled glass allows resource conservation (reduction of minerals extraction).

2) The Turkish borate deposits (Bigadiç, Sultançayırı, Kestelek, Emet and Kırka), used to win borax pentahydrate, are approximately 75 % - 85 % of the world reserves that contain some borate minerals such as colemanite and borax. The Kırka (Eskişehir, Turkey) deposit is the largest boron deposit in the world. Kırka site is an open-pit mine and minerals are processed on-site to result in borax pentahydrate and other products. Borax pentahydrate chemical formula is $Na_2B_4O_7 \cdot 5H_2O$.

3) Quartz sand, also known as silica sand, has SiO_2 as chemical formula. Silica is widely spread in nature and one of the most important minerals for setting up rock in deep layers or volcanic flow rock. At the same point, silica belongs to the minerals showing the highest resistance to weathering. Sands are end products of different weathering processes and have been formed in nearly all formations of earth's geological history. The extraction of silica sands is operated at Feke (Adana, Turkey) open-pit mine with shovel excavators.

4) Even though many natural sources exist in Turkey, the soda ash produced in the region of Mersin is artificial and made from the Solvay process (use of sodium chloride and limestone).

5) Colemanite ($CaB_3O_4(OH)_3 \cdot H_2O$) is the predominate borate in the Kestelek deposit and is 80 % pure. No additional refining process is required after extraction at the surface mining site of Kestelek.

6) Magnesite, $MgCO_3$, is a mineral raw material extracted in the province of Kütahya, at an open-pit mine with shovel excavators. After being processed (washing, milling, concentration), magnesite has the aspect of a powder.

7) Feldspar ($(Na,K,Ca)AlSi_3O_8;SiO_2$) is a by-product in open surface mining of silica sand. It is extracted in Muğla province (Turkey).

8) Manganese dioxide (MnO_2) is naturally available on earth as pyrolusite. Manganese mines are operated in an open-pit mining method extracting deposits at southwest of Kilis (Turkey).

9) Sodium nitrate ($NaNO_3$) is supplied from Bulgaria and is obtained via a chemical process.

10) Among others additives and chemicals to process the binder for the glass wool, phenolic resin is required. İzocam is producing it in its site of Dilovası.

11) Auxiliary materials are added in the smallest amounts compared to other raw materials. They play a role in binding and in the hydrophobic power.

12) Some of the declared products in this EPD are coated with a glass tissue facing or with non-woven textile

The delivery of raw materials is carried out by lorry. For the ones supplied from overseas, transoceanic transport is considered and calculated.

All Glasswool products manufactured by İzocam Ticaret ve Sanayi A.Ş. are excluded from classification as per EU directive 97/69/EG as well as regulation (EG) 1272/2008 with reference to bio-persistent fibres.
They are certified by EUCEB since 2009.

2.2 Production

For the production raw materials like borate, quartz and soda ash are used, but recycled materials of an automotive glass industry constitute the main part of the product. In İzocam glass wool products, the percentage of recycled glass is ca. 60 %.

These raw materials are melted in an industrial furnace fed by natural gas, which is the main source of energy at the Tarsus production site.

Cut scraps from the edges of the production line are brought back into the production process. The energy demand for Glass wool production is reduced significantly due to the high proportion of recycled glass.

2.3 Packaging

Products are wrapped in polyethylene film (PE film) and loaded in metal containers.

2.4 Transport

Non applicable as module not declared.

2.5 Processing and installation

Non applicable as module not declared.

2.6 Phase of utilisation

Non applicable as module not declared.

2.7 End-of-life stage

Non applicable as module not declared.

3 Life cycle assessment

3.1 Methodical assumptions

3.1.1 Type of EPD, system boundary

From cradle to gate.

3.1.2 Declared unit

The declared unit is 1 cubic metre (1 m^3) of insulation material.

Table 5: Declared unit

Characterisation	Value	Unit
Declared unit	1	m^3
Average density of Glasswool insulation materials for conversion into kg	13	kg/m^3

3.1.3 Functional unit:

1 m^2 of Glasswool with a thickness of 0.043 m that provides a thermal resistance of R = 1 m^2K/W.
Conversion factor from functional unit into kg is 0.56.

3.1.4 Calculation of averages

The EPD represents the average of a selection of Glasswool insulation materials in form of slabs and rolls, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Tarsus (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Glasswool products (see Table 2 and products catalogue available on http://www.izocam.com.tr/).

All input masses from 01/12/2013 to 01/12/2014 were divided by the production volume from the same period.

Output data and packaging masses are related to the whole Tarsus factory. Thus, the related figures were multiplied by the rate representing the declared products volume over the total production volume.

In general, it can be pointed out that the used scenarios correspond in the best way with the actual situation on the production site and can be considered as representative.

A variance cannot be documented in this case for the input data is already an average of data.

3.1.5 Estimations and assumptions

For infrastructure or machine parks, no specific data was collected. Missing data was completed with the ecoinvent dataset [Rock wool plant].

The CO_2 emissions were calculated on the basis of the energy input.

3.1.6 Cut-off criteria

The application of cut-off criteria was considered in the production stage according to PCR Part A "General Rules for LCA assessment and requirements on the project report".

For production all used raw materials were considered.

3.1.7 Data

The used data fulfil the following quality requirements:

- The data sets correspond with the production year "01/12/2013 – 01/12/2014"
- The criteria of Bau EPD GmbH for data collection, generic data and cut-off of material and energy flows were complied with.
- A data validation as per EN ISO 14044:2006 was carried out.
- The used data correspond with the yearly average of the basic year
- All essential data like energy and raw material demand, emissions, transports, packages, waste and by-products within the system boundary were provided by the manufacturer.
- The data are plausible, meaning that deviations from comparable results (other manufacturers, literature, similar products) are comprehensible.

For background data, the database ecoinvent version 2.2 (2010) was chosen with reference to the PCR guidelines Part A.

In accordance with this PCR, the electricity mix module [Electricity, high voltage {TR}] taken from ecoinvent 3.1., and some adjustments of ecoinvent 2.2 modules have been made with elements of ecoinvent 3.1.

3.1.8 Allocation

The General Guidelines of Bau-EPD GmbH were considered.

For instance, İzocam is using recycled glass from an automotive glass industry in the region of Kırklareli. The used glass taken over by the company is treated as waste, meaning that no loads from the previous product systems are considered.
The processing steps and the efforts for transport from the supplier to the İzocam production site were calculated without allocation, meaning they were assigned to the recycled glass.

In the production process of İzocam Glasswool materials (module A3), no by-products are produced except from the packaging waste. Indeed, this waste is used to produce İzocam Peflex, a polyethylene foam material that has a closed cell structure. Nevertheless, the exact amount of plastic waste generated by the Glasswool packaging operation, and reused in the Peflex process could not be made out. In addition, the plastic treatment phase is negligible in the final results of the LCA (less than 0.02 %).
Therefore, packaging waste generated in production (module A3) is treated as waste (no allocation) in the LCA.

For the generic data sets (all considered modules), the allocation rules of the database ecoinvent are applied.

3.1.9 Justification for exclusion of modules (not declared)

İzocam chooses to declare the A1 to A3 modules (cradle-to-gate EPD) due to the difficulty of gathering data for the rest of modules.

First, İzocam is not able to provide information on their customers regarding their location and their way of handling İzocam's products. Once İzocam's products reach a distribution centre, the final destination of them is difficult to predict.

The contractors have technical manuals but each contractor can have its own proceeding manners which makes it very difficult to track.

Thus, in this study, later stages than the product one are not considered.

3.2 Information on the life cycle for the assessment

Table 6: Declared life cycle stages, description of the system boundaries

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Construction, installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = included in LCA; MND = Module not declared

3.2.1 A1-A3: Product stage

3.2.1.1 A1: Raw material supply

Recycled glass represents the biggest share in the raw materials. Its origin is from an automotive glass industry in the region of Kırklareli. Crushed to granulates, it can be directly injected with mineral raw materials before introduction in the furnace. Using recycled glass allows resource conservation (reduction of mineral extraction and of energy demand).

Mineral raw materials used in the Glasswool production process have mostly Turkish origins:

- Borax pentahydrate is the result of processed borate ore extracted from the Kırka open-pit mine (Turkey).
- Silica extraction is realised with shovel excavators at an open-pit mine in the region of Adana (Turkey).
- Soda ash is made from the Solvay process (use of sodium chloride and limestone).
- Colemanite is extracted from the surface mining site of Kestelek (Turkey) and is 80 % pure.
- Magnesite is extracted in the province of Kütahya (Turkey), at an open-pit mine with shovel excavators.
- Feldspar is a by-product in open surface mining of silica sand, extracted in Muğla province (Turkey).
- Manganese dioxide is from an open-pit mine at southwest of Kilis (Turkey).
- Sodium nitrate ($NaNO_3$) is supplied from Bulgaria and is obtained via a chemical process.

Phenolic resin is produced in İzocam production site of Dilovası by processing phenol and formaline. It is the main component of the binder. Its polymerisation is ending at the curing stage, during which the glass wool mat is in contact with air at a temperature of 250 °C to allow this action.

Some of the declared products in this EPD are coated with a glass tissue facing, which is supplied from Poland.
Some others are coated with a non-woven textile produced in the region of Gaziantep (Turkey).

3.2.1.2 A2: Transport of raw materials

Transports in the upstream processes are included in the applied background datasets. The transport distances of raw materials to the production site in Tarsus were documented by the manufacturer and verified with a route planner.

3.2.1.3 A3: Manufacturing

Glasswool is a mineral fibre mainly obtained from borosilicate glass. It is produced at İzocam Tarsus factory with the TEL process, under the licensing of Isover Saint-Gobain. This process making up the 85 % of the world glass wool production is employed at 40 factories in 24 countries on 4 continents.
The Glasswool production is made of the following stages:

- **Blend preparation and manipulation:** Mineral raw materials are taken from the main stocking areas to the daily usage bunkers via conveyors. Then, ingredients are blended at the appropriate ratios to form the fibrous glass compound by mixing in the automatic blend preparation system. The prepared blend is fed into the glass furnace bunkers through the conveyors and elevators.

- **Melting, curing and conditioning**: The blend is fed into the glass furnace via automatic feeders and at the fusing section of the furnace melted at 1200 °C to 1250 °C. The formed glass is homogenised by purifying it from the air bubbles at the curing section of the furnace. The cured glass coming out of the furnace at around 1300 °C is gradually cooled down to 1050 °C – 1060 °C at the forehearth in order to attain the fiberising conditions.

- **Fiberising**: The conditioned glass is poured into the fiberising machinery via the platinum nozzle. The glass, falling onto the fiberising machine's basket and the disk revolving at high speed, turns into fibres due to the centrifugal force. Phenol-formaline based binder is sprayed onto the glass fibres formed via the aid of the spraying chamber. The fibrous glass is shaped on the forming section with the aid of dispersing airlet.

- **Curing**: The glass wool blanket with binder coming from the forming section is subjected to hot air at around 250 °C the polymerisation furnace in order to polymerize the binder. The density and thickness characteristics of the blanket, the weight per unit area of which was determined previously at the forming section, are constituted at the polymerisation furnace.

The products, being cut into the desired dimensions, are packed in PE-film at the packaging machine. If they are mattress-type products, they are wrapped in PE film at the packaging roll-up machine. If they are Glasswool boards, they are packaged in PE film in the sheet packaging machine.
The products are placed in metal containers and stacked by electric forklifts at the warehouses for shipment.

The exhaust gases arising during the production go through a chimney without any previous treatment. Values are measured once a year by an accredited testing body.

Fresh water is taken from the municipal facilities and partly from a well source. During the process, water is used in close-loop. The losses caused by evaporation are compensated with fresh water.

Table 7: Energy and water demand for manufacturing, per m^3 product

Characterisation	Quantity per m^3 of insulation material
Natural gas	119.8 MJ/m^3
Electricity mix, Turkey	28 MJ/m^3
Use of fresh water from public water supply system and rain water	0.040 m^3/m^3

Output data declared by the manufacturer originates from the year 01/12/2013 to 01/12/2014, the conversion to kg is based on the production quantity of 01/12/2013 to 01/12/2014.

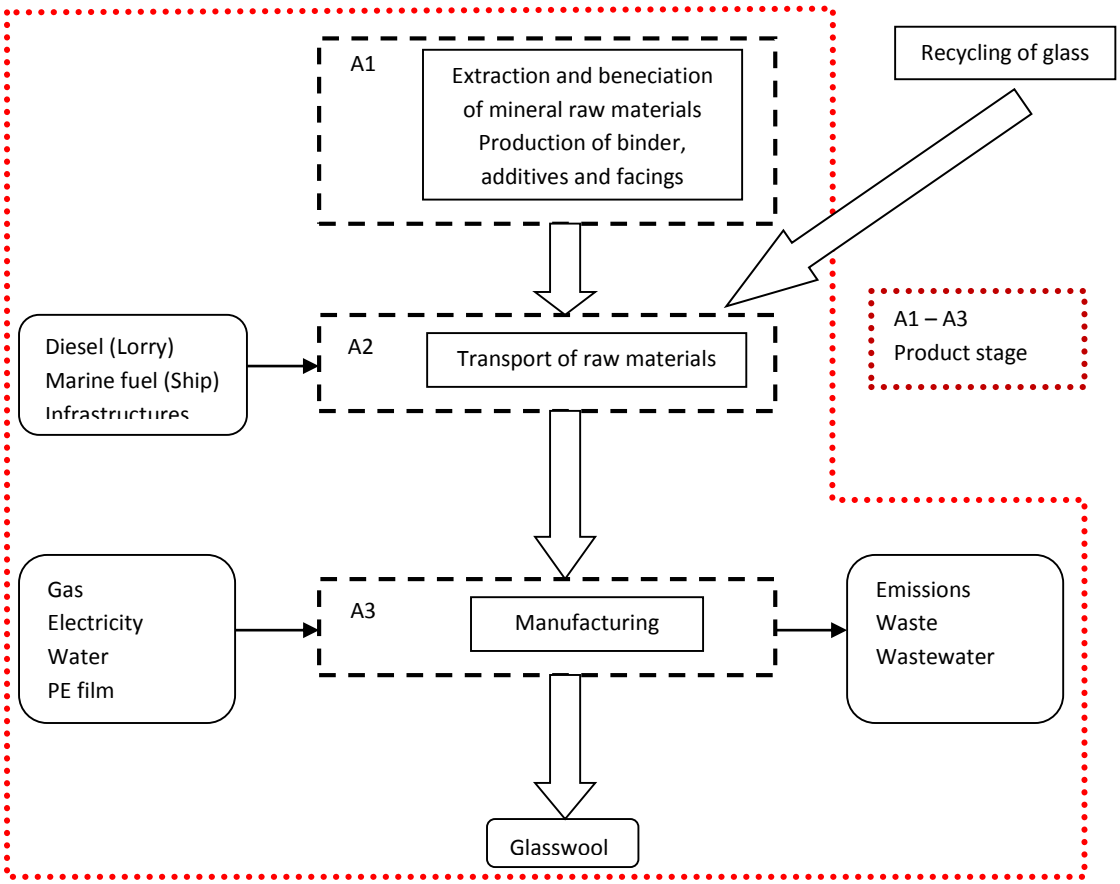
A measurement of gas emissions was carried out.

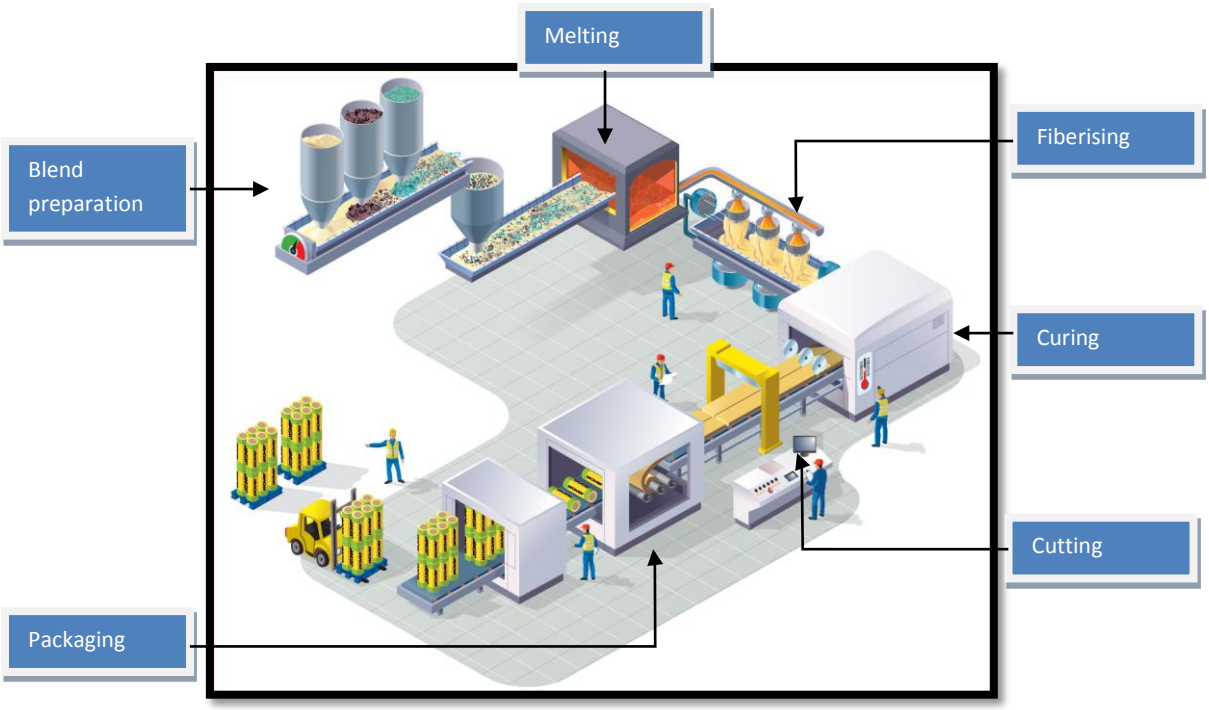
For infrastructure or machine parks, no specific data was collected. Missing data was completed with the ecoinvent dataset [Rock wool plant].

The CO_2 emissions were calculated on the basis of the energy input.

Waste was declared with the corresponding waste disposal codes per ton of end product.

Figure 1: Flow chart of production process





3.2.2 A4-A5: Transport, assembly and installation

Non applicable as module not declared.

3.2.3 B1-B7: Use stage

Non applicable as module not declared.

3.2.4 C1-C4: End-of-life stage

Non applicable as module not declared.

3.2.5 D: Potential of reuse and recycling

Non applicable as module not declared.

3.3 Declaration of environmental indicators

A variance cannot be documented as calculations are based on average data provided by the manufacturer.

Table 8: Parameters to describe the environmental impact of İzocam Glasswool products per m³

Parameters	Unit in equiv.	A1	A2	A3	Total A1-A3
GWP	kg CO_2 Eq	9.60	3.00	13.97	26.57
ODP	kg CFC-11 Eq	8.86E-07	4.72E-07	1.37E-06	2.72E-06
AP	kg SO_2 Eq	0.040	0.015	0.092	0.147
EP	kg PO_4^{3-} Eq	0.013	0.004	0.033	0.050
POCP	kg C_2H_4 Eq	5.43E-03	1.71E-03	1.52E-02	2.23E-02
ADPE	kg Sb Eq	2.09E-05	7.41E-06	1.72E-05	4.54E-05
ADPF	MJ	179.54	43.54	218.24	441.32
Legend	GWP = Global warming potential ODP = Depletion potential of the stratospheric ozone layer AP = Acidification potential of land and water EP = Eutrophication potential POCP = Formation potential of tropospheric ozone photochemical oxidants ADPE = Abiotic depletion potential for non-fossil resources ADPF = Abiotic depletion potential for fossil resources				

Table 9: Parameters to describe the use of resources of İzocam Glasswool products per m³

Parameters	Unit	A1	A2	A3	Total A1-A3
PERE	MJ	4.32	0.57	7.90	12.79
PERM	MJ	0	0	0	0
PERT	MJ	4.32	0.57	7.90	12.79
PENRE	MJ	193.36	45.97	209.66	448.99
PENRM	MJ	0	0	19.24	19.24
PENRT	MJ	193.36	45.97	209.66	448.99
SM	kg	9.88	0	0	9.88
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m³	1.65E-02	1.60E-03	4.59E-02	6.40E-02
Legend	PERE = Renewable primary energy as energy carrier PERM = Renewable primary energy resources as material utilisation PERT = Total use of renewable primary energy resources PENRE = Non-renewable primary energy as energy carrier PENRM = Non-renewable primary energy as material utilisation PENRT = Total use of non-renewable primary energy resources SM = Use of secondary material RSF = Use of renewable secondary fuels NRSF = Use of non-renewable secondary fuels FW = Use of fresh water				

Table 10: Parameters describing the waste categories of İzocam Glasswool products per m³

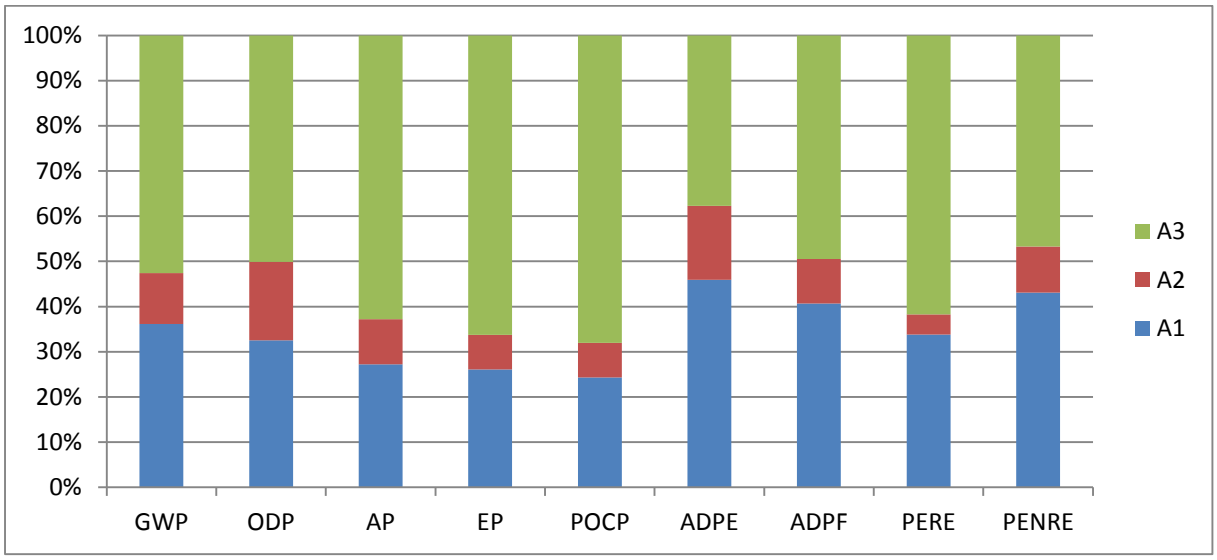
Parameter	Unit	A1	A2	A3	Total A1-A3
HWD	kg	1.75E-04	4.29E-05	1.89E-04	4.06E-04
NHWD	kg	0.78	0.26	1.58	2.62
RWD	kg	4.66E-04	6.35E-05	1.41E-04	6.70E-04
Legend	HWD = Hazardous waste disposed NHWD = Non-hazardous waste disposed RWD = Radioactive waste disposed				

Table 11: Parameters describing the potential of waste treatment and recovery İzocam Glasswool products per m³

Parameter	Unit	A1-A3
CRU	kg	0
MFR	kg	0
MER	kg	0
EEE	MJ	0
EET	MJ	0
Legend	CRU = Components for re-use MFR = Materials for recycling MER = Materials for energy recovery EEE = Exported electric energy EET = Exported thermal energy	

3.4 Interpretation of the LCA results

Figure 2: Load components in the product stage of İzocam Glasswool products life cycle

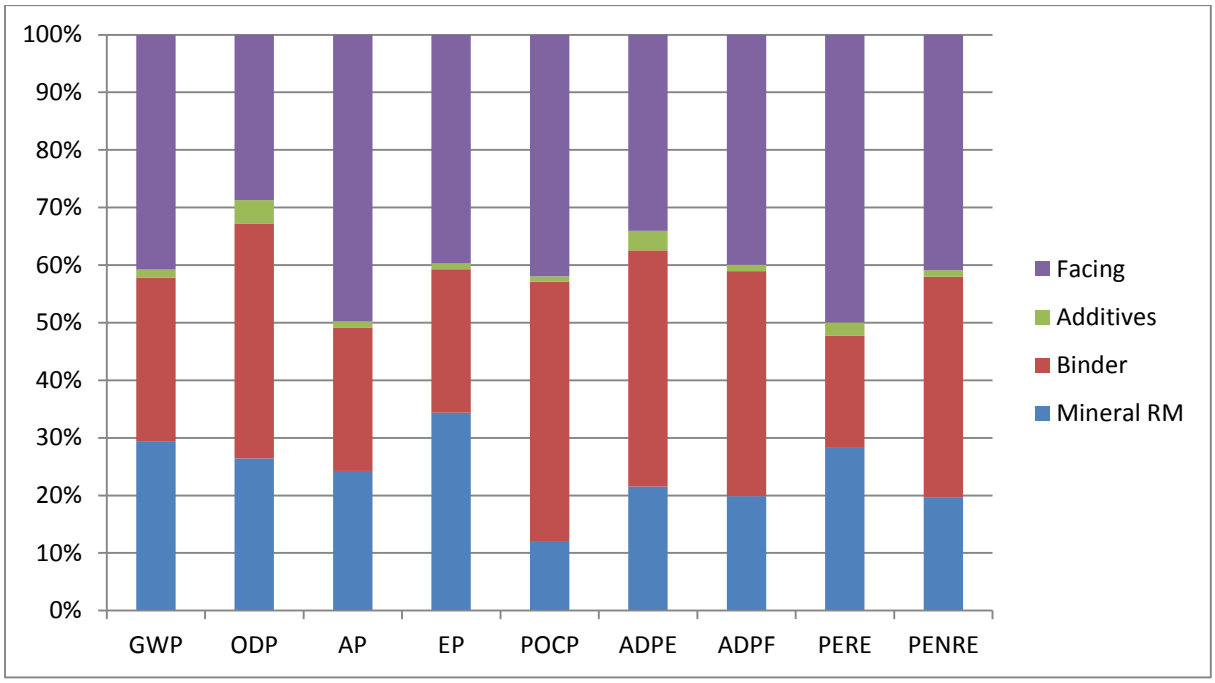


Legend	GWP = Global warming potential ODP = Depletion potential of the stratospheric ozone layer AP = Acidification potential of land and water EP = Eutrophication potential POCP = Formation potential of tropospheric ozone photochemical oxidants ADPE = Abiotic depletion potential for non-fossil resources ADPF = Abiotic depletion potential for fossil resources PERE = Renewable primary energy as energy carrier PENRE = Non-renewable primary energy as energy carrier

Regarding the LCA of İzocam Glasswool insulation materials over the product stage, the manufacturing part (A1) is causing the highest load in all considered parameters, except the abiotic depletion potential for non-fossil resources (ADPE) in which the raw materials supply (A1) is the main contributor.

This A1 stage, including the extraction of minerals and the chemicals processes inducted by the binder, the additives and the facings, is the second responsible in environmental impacts generation.

Figure 3: Shares of the different raw materials in the whole raw material supply (A1) of İzocam Glasswool production



Legend	GWP = Global warming potential ODP = Depletion potential of the stratospheric ozone layer AP = Acidification potential of land and water EP = Eutrophication potential POCP = Formation potential of tropospheric ozone photochemical oxidants ADPE = Abiotic depletion potential for non-fossil resources ADPF = Abiotic depletion potential for fossil resources PERE = Renewable primary energy as energy carrier PENRE = Non-renewable primary energy as energy carrier

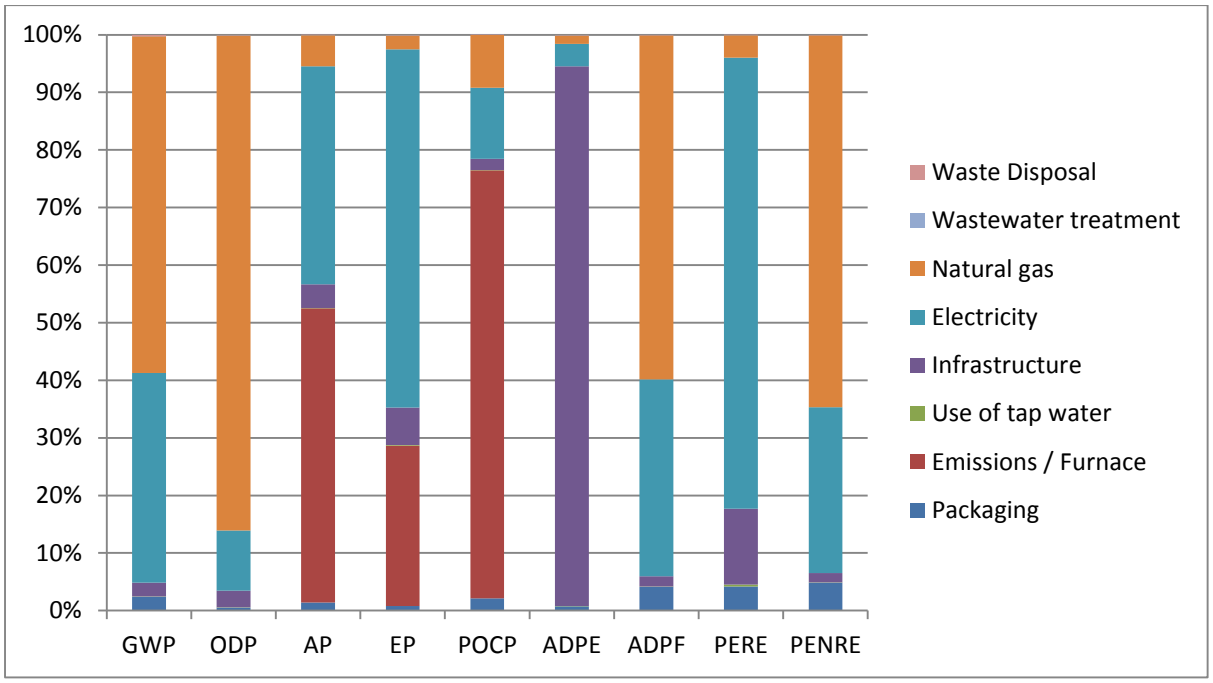
Regarding the shares of load of the different raw materials in Glasswool insulation materials in Figure 3, the productions of the glass tissue and non-woven textile facings are the greatest generators of environmental impacts.

Nevertheless, impacts caused by the binder and the extraction of mineral raw materials are comparable to the facings ones.

Extraction of minerals is generating from 20 % to 34 % of the environmental impacts, except from the formation potential of tropospheric ozone photochemical oxidants (POCP) for which the minerals production is responsible for ca. 12%.

The role of the binder is also important. Indeed, it leads to the generation of 20 % to 45 % of the environmental impacts.

Figure 4: Load components in manufacturing (A3) of İzocam Glasswool insulation materials



Legend	GWP = Global warming potential ODP = Depletion potential of the stratospheric ozone layer AP = Acidification potential of land and water EP = Eutrophication potential POCP = Formation potential of tropospheric ozone photochemical oxidants ADPE = Abiotic depletion potential for non-fossil resources ADPF = Abiotic depletion potential for fossil resources PERE = Renewable primary energy as energy carrier PENRE = Non-renewable primary energy as energy carrier

The production plant (infrastructure) is of big influence on the abiotic depletion potential for non-fossil resources (ADPE) due to the intensive use of materials.

The load shares of the factory emissions to air were to be expected in this magnitude as they contain a part of sulphur and potassium, and their equivalents.

The energy mix used for electricity in the model has a part of renewable energies. Even though the supply of this kind of energy is growing in Turkey (thanks to water dams, solar parks and wind farms), thermal power plants (gas and coal) remain the major supplier of energy in Turkey.
The electricity has nearly the same eutrophication potential (EP) as the gas emissions of the factory.

Natural gas consumption is leading to the high share of global warming potential (GWP), depletion potential of the stratospheric ozone layer (ODP), the abiotic depletion potential for non-fossil resources (ADPE) and the use of non-renewable primary energy (PENRE).

4 Dangerous substances and emissions into indoor air and environment

4.1 Declaration of substances of very high concern

No hazardous substances or materials with properties as per table 12 are used.

Table 12: Declaration of substances of very high concern

Properties of hazardous materials as per EG-regulation 1272/2008 (CLP regulation)	Chemical characterisation (CAS-Number)
Carcinogenic Cat. 1A or 1B (H350, H350i):	substance is not used in the product
Mutagenic Cat. 1A or 1B (H340):	substance is not used in the product
Toxic for reproduction Cat. 1A or 1B (H360F, H360D, H360FD, H360Fd, H360Df):	substance is not used in the product
PBT (persistent, bio-accumulative and toxic) (REACH, annexe XIII):	substance is not used in the product
vPvB (very persistent and very bio-accumulative) (REACH, annexe XIII):	substance is not used in the product
Substances of very high concern (SVHV):	substance is not used in the product

4.2 Formaldehyde emission

Mineral insulating products produced in Turkey are not ruled by any regulations regarding formaldehyde emission. As a consequence, as measurement is not required, no specific data on formaldehyde emitted by İzocam Glasswool products are available.

Table 13: Formaldehyde emission

Characterisation	Value	Unit
Formaldehyde emission as per Eurofins Gold	Non applicable	Limit Value: 10 µg/m³
Formaldehyde-emission acc. to EN 13986 (2005:04) and testing standard EN 717 (28 days) compare test report Holzforschung 2011:	Non applicable	Limit Value: 0.1 ppm

4.3 Exoneration criteria as per CLP regulation

Glasswool belongs to the group of artificial mineral wools which consist of undirected, vitreous (silicate) fibres with more than 18 % alkali and alkaline earth compounds (EG-regulation 1272/2008 (CLP-regulation), annexe VI, table 3.1. “List of harmonised classification and labelling of hazardous substances”, Index-No. 650-016-00-2). Production and use of products made from bio-persistent mineral fibres is prohibited.

All Glasswool products manufactured by İzocam Ticaret ve Sanayi A.Ş. are excluded from classification as per EU directive 97/69/EG as well as regulation (EG) 1272/2008 with reference to bio-persistent fibres. They are certified by EUCEB since 2009.

Advice and safety instructions can be taken from the safe use instruction sheet connected to the declarations and can be downloaded on http://www.izocam.com.tr/.

5 References

EUCEB-Certificate	EUCEB Secretariat, Ticaret ve Sanayi A.Ş., Plant Tarsus, Mersin, Glass Wool AA 1, Certificate N° 263, 30/04/2009
Declaration of Performance	Declaration of Performance for İzocam Glasswool products N°: 1-CPR-2013/07/01
Background report	LCA assessment in compliance with EN 15804 Project report for İzocam unfaced and faced Glasswool insulation products in form of slabs and rolls SUSTAiNOVA, 2015
Holzforschung 2011	Holzforschung Austria 2011 test report, order number 2109/2011-HC, report from 18.11.2011

Rules and standards:

EN 13162:2012 Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification

EN ISO 14040:2009-10 Environmental management - Life cycle assessment -- Principles and framework (ISO 14040:2006)

EN ISO 14044:2006-10 Environmental management - Life cycle assessment -- Requirements and guidelines

EN ISO 14025:2010-07 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures (ISO 14025: 2010)

EN 15804 Sustainability of construction works - environmental product declarations. Core rules for the product category of construction products, version: 2012-04-01

General Principles and Guidelines
Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. Bau-EPD GmbH, version 1.5, April 7th 2014

Part B: Requirements on the EPD for Mineral insulating products, PCR-Code: 2.22.2.1, December 1st 2014

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