

EPD - ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804



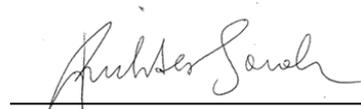
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Mineral insulation materials made of Stonewool İzocam Ticaret ve Sanayi A.Ş.

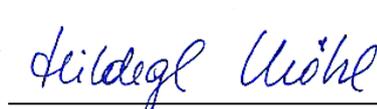


General information

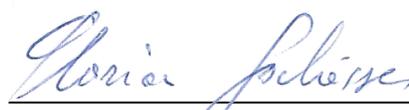
Product name İzocam Stonewool insulation in the form of slabs and blankets	Declared Product / Declared Unit İzocam insulation materials made of stone wool are used for thermal insulation as well as acoustic and fire protection in building constructions. The products are made of recycled glass and other basic materials, typical for stone wool industry. A binder on the basis of phenol-formaldehyde resin is used. The EPD represents the average of a selection of Stonewool insulation materials in form of slabs and blankets, unfaced or faced with glass veil, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Dilovası (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Stonewool products. The weighted average density is 70 kg/m ³ , the weighted average thermal conductivity is 0.035 W/mK. One cubic metre of insulation material (m ³) was defined as declared unit. Range of validity The average data published in this EPD are representative for a sample of İzocam Stonewool products, selected by İzocam and produced in the site in Dilovası (Turkey). The EPD report is based on the information from the verified Life Cycle Assessment described in the background report for İzocam Stonewool 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.
Declaration number EPD-İzocam Ticaret ve Sanayi A.Ş.-2014-1	
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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)	
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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 <input type="checkbox"/> internally <input checked="" type="checkbox"/> 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 stone wool are used for thermal insulation as well as acoustic and fire protection in building constructions. Stone 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 minerals, recycled glass and other basic materials typical for stone wool industry. A binder on the basis of phenol-formaldehyde resin is used.

The EPD represents the average of a selection of Stonewool insulation materials in form of slabs and blankets, unfaced or faced with glass veil, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Dilovası (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Stonewool products (see Table 2 and products catalogue available at <http://www.izocam.com.tr/>).

The weighted average density is 70 kg/m³, the weighted average thermal conductivity is 0.035 W/mK.

1.2 Placing and making available on the market

For placing İzocam Stonewool 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 Stonewool products are available.

Additional European requirements:

All stone 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 Stonewool are certified by EUCEB.

1.3 Application field

İzocam Stonewool insulation materials are used for all purposes in thermal, acoustic insulation and fire safety. Examples can be listed as follows: thermal insulation in walls (ETICS, facade boards (between frames), ventilated façades, partition walls), in floors (floating floors, suspended ceilings), in prefabricated houses, in loft conversion, 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.

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

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 Stonewool products declared by İzocam

Short name	Product designation code
	MW - EN 13162 - ...
Flat Roof Board, unfaced	from T4-CS(10)25 to T4- CS(10)100
Facade Board, unfaced or faced with glass tissue	T4-WS1
Manto Stone Wool	T4-CS(10)40-TR10-WS1
Manto Stone Wool R+	T4-CS(10)40-TR10-WS1
Stone Wool Partition Wall Board	T4
Stone Wool Partition Wall Board Eco	T4
Floating Floor Board	T4
Yalı Stone Wool	T4
Stone Wool Board, unfaced or faced with glass tissue	T4

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	0.035 ³⁾ 0.035 - 0.040	W/(mK)
Nominal density ²⁾ resp. range of nominal density for Stonewool materials	70 (35 - 150)	kg/m ³
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 Stonewool products with a density of 70 kg/m³ have a thermal conductivity valued at 0.035 W/(mK).

Please refer to the products “Facade Board”, “Stone Wool Partition Wall Board”, “Yalı Stone Wool” and “Stone Wool Board” in the Declaration of Performance N°: 3-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 are 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⁾	Mineral raw material	ca. 28 %
Quartz sand ²⁾	Mineral raw material	ca. 22 %
Dolomite ³⁾	Mineral raw material	ca. 16 %
Limestone ⁴⁾	Mineral raw material	ca. 10 %
Basalt ⁵⁾	Mineral raw material	ca. 5 %
Iron ore ⁶⁾	Mineral raw material	ca. 5 %
Sodium sulphate ⁷⁾	Mineral raw material	< 1 %
Phenolic resin ⁸⁾	Binder	ca. 4 %
Additives ⁸⁾	Binder	ca. 2 %
Auxiliary materials ⁹⁾	- Hydrophobing agents - Adhesion agents - Auxiliary materials for coloring	Total < 1 %
Glass veil ¹⁰⁾	Facing	ca. 7 %

- 1) Recycled glass represents the greatest share in the raw materials. Its origin is from packaging glass collected in the region of Istanbul. 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) Quartz sand, also known as silica sand, has SiO₂ 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 Yalıköy (Çatalca, İstanbul) open-pit mine with shovel excavators.
- 3) Dolomite, CaMg(CO)₃, is a mineral raw material extracted at an open-pit mine with shovel excavators. The reserves of Dolomite are abundant all over the world and in Turkey as well. After being processed (washing, milling), dolomite has the aspect of a powder.
- 4) Limestone, Ca(CO)₃, is a sedimentary rock widely available at Turkish open-pit mines. After being processed (washing, milling), this component has the aspect of a powder.
- 5) The basalt is a common volcanic rock formed from the rapid cooling of lava. Some open-pit mines are located in Turkey, such as Karatepe, famous for its nepheline basalt deposit. Extraction of rocks occurs with shovel excavators.
Note: The composition of nepheline basalt varies naturally. Its chemical formula is generally NaAlSiO₄ and KAlSiO₄.
- 6) Iron ore (Fe₃O₄), naturally available in Turkey, is obtained from processed magnetite (crushing – grinding - magnetic separation – pelleting - cooking).

- 7) Turkey is rich of natural sodium sulphate (Na_2SO_3) deposits, like the Kirmir formation at Beypazari Basin. Therefore, sodium sulphate used in process is from natural sources.
- 8) Among others additives and chemicals to process the binder for the Stonewool, phenolic resin is required. İzocam is producing it in its site of Dilovasi.
- 9) Auxiliary materials are added in the smallest amounts compared to other raw materials. They play a role in binding and in the hydrophobic power.
- 10) Some of the declared products in this EPD are coated with a glass veil facing.

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

All Stonewool 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 silica sand, dolomite and limestone are used among other rocks which are also obtained domestically. Recycled glass from packaging bottles collected in the region of İstanbul takes a proportion in the inputs for İzocam Stonewool production.

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

Cut scraps from the edges of the production line are brought back into the production process.

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 m³) of insulation material.

Table 5: Declared unit

Characterisation	Value	Unit
Declared unit	1	m ³
Average density of Stonewool insulation materials for conversion into kg	70	kg/m ³

3.1.3 Functional unit:

1 m² of Stonewool with a thickness of 0.035 m that provides a thermal resistance of $R = 1 \text{ m}^2\text{K/W}$.

Conversion factor from functional unit into kg is 2.45.

3.1.4 Calculation of averages

The EPD represents the average of a selection of Stonewool insulation materials in form of slabs and blankets, unfaced or faced with glass veil, produced by İzocam Ticaret ve Sanayi A.Ş. in the production site of Dilovası (Turkey) from 01/12/2013 to 01/12/2014 (1 year). This selection is representative of most of İzocam's range of Stonewool products (see Table 2 and products catalogue available at <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 Dilovası 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 theecoinvent dataset [Rock wool factory], only available data set in Mai 2015.

The CO₂ 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 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 bottles collected in the region of İstanbul. The used glass 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 Stonewool 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 Stonewool process, 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 datasets (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 packaging glass collected in the region of Istanbul. 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).

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

- Silica extraction is realised with shovel excavators at an open-pit mine in the region of İstanbul (Turkey).
- The reserves of dolomite ($\text{CaMg}(\text{CO})_3$) are abundant all over the world and in Turkey as well. Extracted in the region of Kocaeli (Turkey) at an open-pit mine, dolomite is washed and milled to reach the aspect of a powder.
- Limestone ($\text{Ca}(\text{CO})_3$) is a sedimentary rock available in the region of Kocaeli (Turkey) at an open-pit mine. After being processed (washing, milling), this component has the aspect of a powder.
- Extraction of basalt rocks occurs with shovel excavators at the Karatepe open-pit mine.
- Iron ore (Fe_3O_4) is obtained from processed magnetite originally from the region of Zonguldak (crushing – grinding – magnetic separation – pelleting – cooking).
- Turkey is rich of natural sodium sulphate (Na_2SO_3) deposits, like the Kirmir formation at Beypazari Basin.

Phenolic resin is produced in Dilovası by processing phenol and formaline, and it is the main component of the binder. Its polymerisation is ending at the curing stage, during which the stone 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 veil facing, which is supplied from Poland.

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 Dilovası were documented by the manufacturer and verified with a route planner.

3.2.1.3 A3: Manufacturing

Stonewool is a mineral fibre obtained from mineral raw materials. It is produced at İzocam Dilovası factory with the SILLAN process, under the patent of Grünzweig+Hartman. The SILLAN process, being the most advanced technology in the production of stone wool, as been used outside Germany for the first time in the world by İzocam.

The Stonewool production includes the following stages:

- **Raw material 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 appropriate ratios to form the fibrous glass compound by mixing in the automatic blend preparation system. It is fed into the furnace bunkers from daily usage bunkers via use of conveyors and elevators.
- **Melting, curing and conditioning:** Mineral raw materials are fed into the furnace via automatic feeders that weigh automatically the inputs for an exact composition of product. In the melting section of the furnace, the reached temperature is 1200 °C to 1250 °C. The attained melt is homogenised by freeing from the air bubbles at the curing section. The homogenised melt, coming out of the furnace at a temperature around 1450 °C, is heated at the forehearth feeder to maintain the temperature at around 1380 °C in order to bring it to the appropriate condition for fiberising.
- **Fiberising:** The conditioned melt first is taken into the platinum nozzle. Then, it is turned into fibres with the aid of 3-bar air in the fiberising machine. Phenol-formaline based binder and process oil are sprayed onto the formed fibres with the aid of the spraying nozzles. The fibres are collected onto the steel band with the aid of the suction air of the forming section.
- **Curing:** The stone wool mat with binder coming from the forming section is ventilated with hot air at around 250 °C in order to polymerize the binder. The density and thickness characteristics of the mats, of which the weight per unit area was determined previously at the forming section, are constituted at the polymerisation furnace.
- **Shaping:** After being sewn on to the supportive rabbits wire and its edges being trimmed, the cured product is cut into desired lengths via the guillotine. Board products are faced with facing material, if necessary. Following this operation, the edges are trimmed and product is cut to the desired length, within 0.2 % accuracy.

The products, being cut into the desired dimensions, are packed in PE-film at 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 m³ product

Characterisation	Quantity per m ³ of insulation material
Natural gas	193.5 MJ/m ³
Electricity mix, Turkey	54 MJ/m ³
Use of fresh water from public water supply system and rain water	0.051 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.

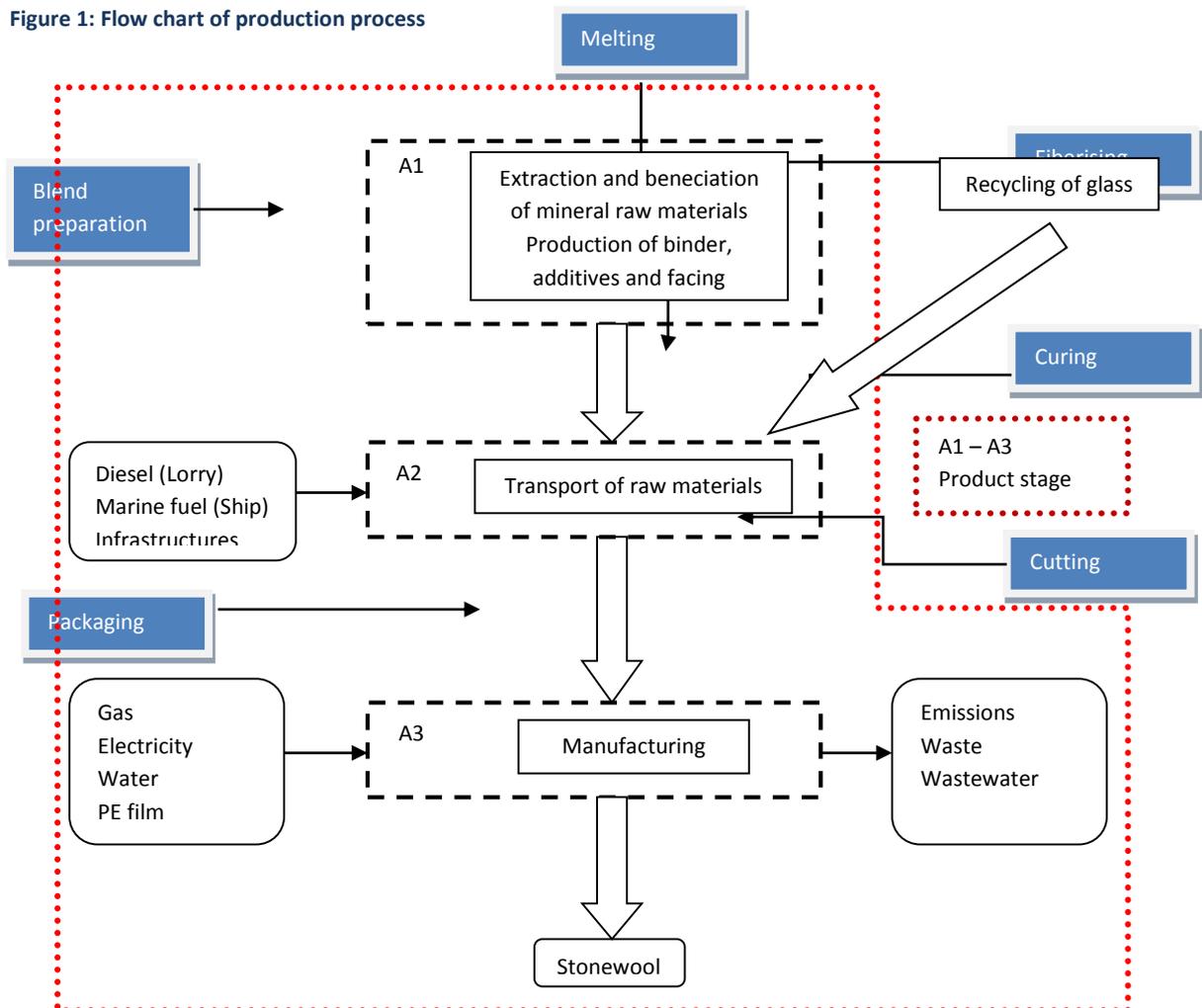
A measurement of gas emissions was carried out.

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

The CO₂ 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 İzcam Stonewool products per m³

Parameters	Unit in equiv.	A1	A2	A3	Total A1-A3
GWP	kg CO ₂ Eq	33.52	3.75	25.63	62.90
ODP	kg CFC-11 Eq	3.32E-06	5.88E-07	2.40E-06	6.30E-06
AP	kg SO ₂ Eq	0.166	0.019	0.451	0.637
EP	kg PO ₄ ³⁻ Eq	0.056	0.005	0.131	0.192
POCP	kg C ₂ H ₄ Eq	1.74E-02	2.15E-03	1.56E-02	3.52E-02
ADPE	kg Sb Eq	1.03E-04	9.16E-06	8.85E-05	2.00E-04
ADPF	MJ	596.30	54.34	395.54	1046.18
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 İzcam Stonewool products per m³

Parameters	Unit	A1	A2	A3	Total A1-A3
PERE	MJ	18.00	0.72	18.86	37.57
PERM	MJ	0	0	0	0
PERT	MJ	18.00	0.72	18.86	37.57
PENRE	MJ	651.51	57.37	375.91	1084.79
PENRM	MJ	0	0	69.50	69.50
PENRT	MJ	651.51	57.37	375.91	1084.79
SM	kg	28.06	0	0	28.06
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m ³	7.32E-02	2.00E-03	5.84E-02	1.34E-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				

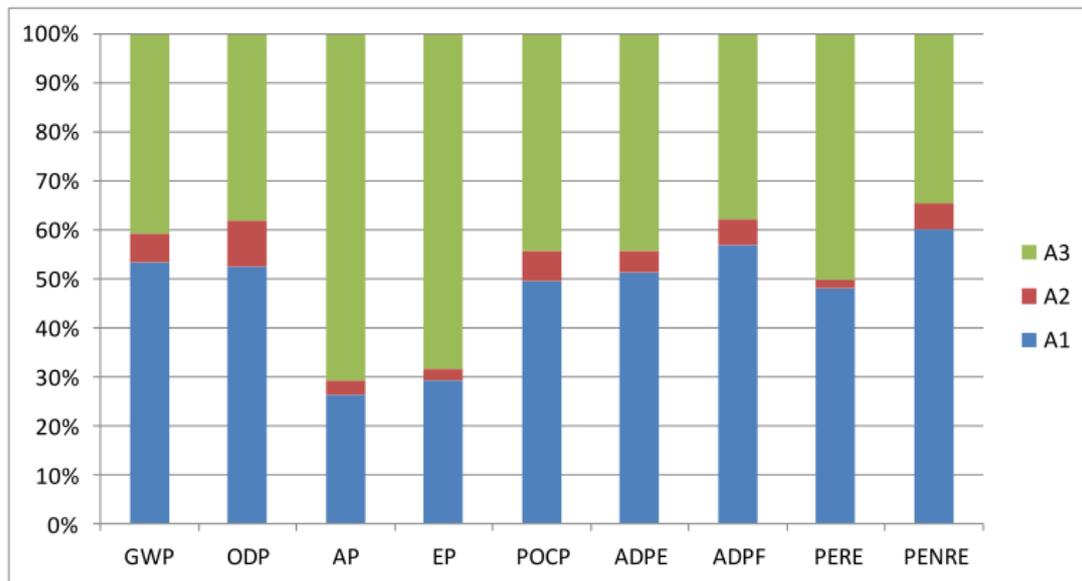
Table 10: Parameters describing the waste categories of İzocam Stonewool products per m³

Parameter	Unit	A1	A2	A3	Total A1-A3
HWD	kg	8.50E-04	5.34E-05	3.69E-04	1.27E-03
NHWD	kg	2.93	0.33	4.59	7.84
RWD	kg	2.32E-03	7.98E-05	3.37E-04	2.73E-03
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 Stonewool 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	

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



Legend	<p>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</p>
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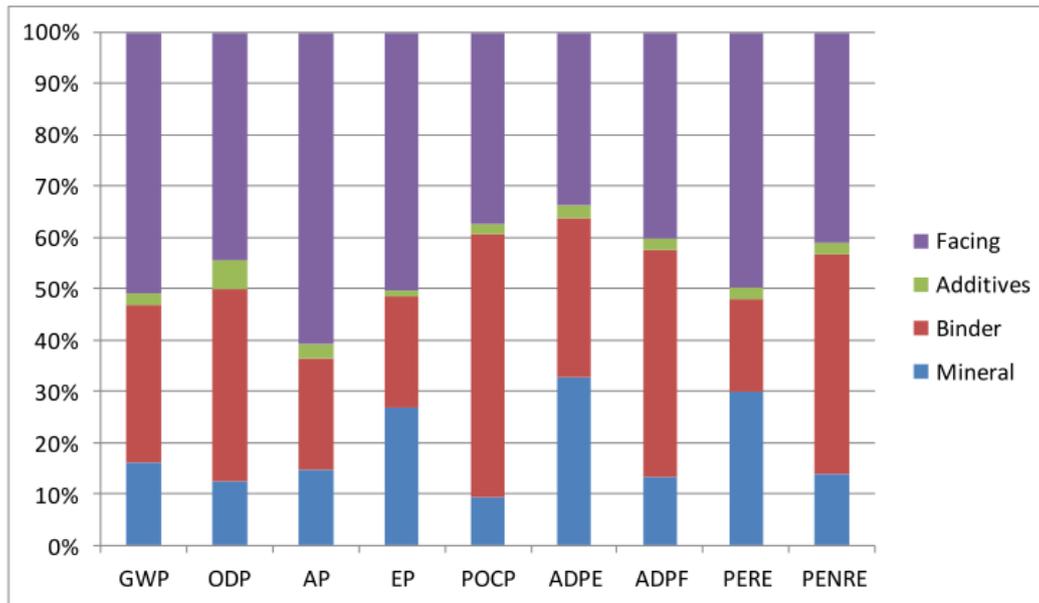
Regarding the LCA of İzocam Stonewool insulation materials over the product stage, the production of raw materials (A1) is causing the highest load in all considered parameters, except the acidification potential of land and water (AP), the eutrophication potential (EP) and the use of renewable primary energy as energy carrier (PERE).

İzocam Stonewool production has the same influence as the raw materials one in the use of renewable primary energy as energy carrier (PERE).

Acidification potential of land and water (AP) and eutrophication potential (EP) are mainly due to the manufacturing of İzocam Stonewool products.

The share of loads caused by the transport of raw materials is minor compared to the other considered stages.

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



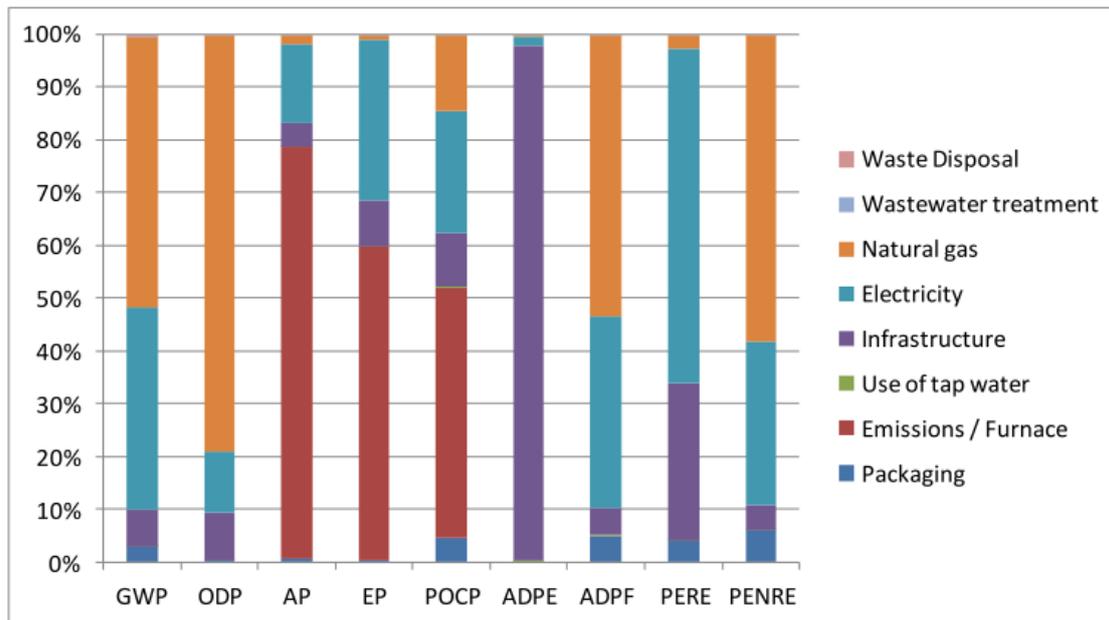
Legend	<p>GWP = Global warming potential ODP = Depletion potential of the stratospheric ozone layer AP = Acidification potential of land and water EP = Eutrophication potential POCP = Formation potential of tropospheric ozone photochemical oxidants ADPE = Abiotic depletion potential for non-fossil resources ADPF = Abiotic depletion potential for fossil resources PERE = Renewable primary energy as energy carrier PENRE = Non-renewable primary energy as energy carrier</p>
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Regarding the shares of load of the different raw materials in Stonewool insulation materials in Figure 3, the production of the glass veil facing is the greatest generator of environmental impacts.

The binder, mainly composed of chemical components, plays a major role in the formation potential of tropospheric ozone photochemical oxidants (POCP), the abiotic depletion potential for fossil resources (ADPF) and the use of non-renewable primary energy (PENRE).

The abiotic depletion potential for non-fossil resources (ADPE) is virtually equally shared between the facing production, the binder and the extraction of minerals.

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



Legend	<p>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</p>
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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.

Natural gas consumption is leading to the high share of global warming potential (GWP), depletion potential of the stratospheric ozone layer (ODP) 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 Stonewool products are available.

Table 13: Formaldehyde emission

Characterisation	Value	Unit
Formaldehyde emission as per Eurofins Gold	Non applicable	Limit Value: 10 µg/m ³
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

Stonewool 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 Stonewool 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 Gebze, Stone Wool HTGF 2, Certificate N° 147, 5/12/2008
Declaration of Performance	Declaration of Performance for İzocam Stonewool products N°: 3-CPR-2013/07/01
Background report	LCA assessment in compliance with EN 15804 Project report for izocam unfaced and faced Stonewool insulation products in form of slabs and blankets 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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