ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

VELIMAT

Date of publication: 2020-01-24
Validity: 5 years
Valid until: 2024-12-15
Based on PCR 2012:01 Construction products and construction services v 2.3 (EN 15804:2012+A1)
UN CPC CODE: 37990

Scope of the EPD®: EUROPE

EPD VERIFIED

The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

ADFORS SAINT-GOBAIN

Registration number
The International EPD® System:
S-P- 01684

EPD®

General information

Manufacturer: ADFORS – GORLICE Plant - Biecka 11, 38-300 Gorlice, Pologne
Programme used: The International EPD® System. More information at www.environdec.com
EPD® registration number: S-P-01684
PCR identification: PCR 2012:01 Construction products and construction services v 2.3 (EN 15804:2012+A1)
UN CPC CODE: 37990
Owner of the declaration: ADFORS Saint- Gobain
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Declaration issued: 2020-01-24, **valid until**: 2024-12-15

CEN standard EN 15804 served as the core PCR Accredited or approved by: The International EPD® System	
EPD program operator	The International EPD® System. Operated by EPD® International AB. www.environdec.com.
PCR review conducted by	The Technical Committee of the International EPD® System
LCA and EPD® performed by LCA Central TEAM	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒	
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Product description

Product description and description of use:

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m² of an acoustic glass mat with thickness of 2,5 mm and a laboratory sound insulation [17 – 24] dB.

The production site of ADFORS uses natural and abundant raw materials (sand) and recycled materials (cullet), using fusion and fiberising techniques to produce glass mat. The products obtained come in the form of a "glass mat" consisting of a soft, airy structure

To be used under screed or wooden floor, the acoustic glass mat can be easily laminated with bitumen or any other protective foil. The acoustic glass mats can also be used directly under dry floor construction such as gypsum boards. Adfors offers a full acoustic mat product range (from 100 to 450 g/m² - in jumbo rolls) allowing you to reach the requirements of your national acoustic regulation. Thin acoustic glass mats offer a good impact insulation, a high pressure resistance performance and is compatible with all heated floor systems. These high quality products come from ADFORS worldwide exclusive technology.

Technical data/physical characteristics (for a thickness of 2,5 mm):

Material Chemically bounded glass non-woven	LB230Y
Weight	389,2 g/m²
Thickness	2,5 mm
Dynamic stiffness (EN 29052) – s'	[11-50] MN/m³
Laboratory impact sound insulation (ISO 140-8) - Δlw	[17-24] dB

Description of the main components and/or materials for 1 m² of product for the calculation of the EPD®:

PARAMETER	VALUE
Quantity of wool for 1 m² of product	233,7 g (Glass mat + Binder)
Thickness of glass mat	2,5 mm
Surfacing	Upper and bottom foil of polyethylene 155,5 g/m²
Packaging for the transportation and distribution	Cardboard: 1,1 g/m² Paper label: 0,2 g/m² Staples: 0,1 g/m² Stretch film / hood: 8,4 g/m² Thermal ribbon/glue: 10,0 g/m² Wood Pallet: 25,0 g/m²
Product used for the Installation	None

During the life cycle of the product any hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization[1]" has been used in a percentage higher than 0.1% of the weight of the product.

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product.

1 http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

LCA calculation information

FUNCTIONAL UNIT	Providing a noise insulation with a sound insulation range of 17 -24 dB on 1 m² with an acoustic glass mat of 2,5 mm
SYSTEM BOUNDARIES	Cradle to Grave: Mandatory stages = A1-3, A4-5, B1-7, C1-4. Optional stage = D not taken into account
REFERENCE SERVICE LIFE (RSL)	50 Years (as long as building life part because it is a foil embedded between scredd and structure)
CUT-OFF RULES	In the case that there is not enough information, the process energy and materials representing less than 1% of the whole energy and mass used can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded cannot be bigger than the 5% of the whole mass and energy used, as well of the emissions to environment occurred. Flows related to human activities such as employee transport are excluded. The construction of plants, production of machines and transportation systems are excluded since the related flows are supposed to be negligible compared to the production of the building product when compared at these systems lifetime level.
ALLOCATIONS	Allocation criteria are based on mass The polluter pays and modularity principles have been followed
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Europe Gorlice Plant (Poland) production 2018 Adfors Velimat transportation 2018

- “EPDs of construction products may be not comparable if they do not comply with EN 15804"
- “Environmental Product Declarations within the same product category from different programs may not be comparable”

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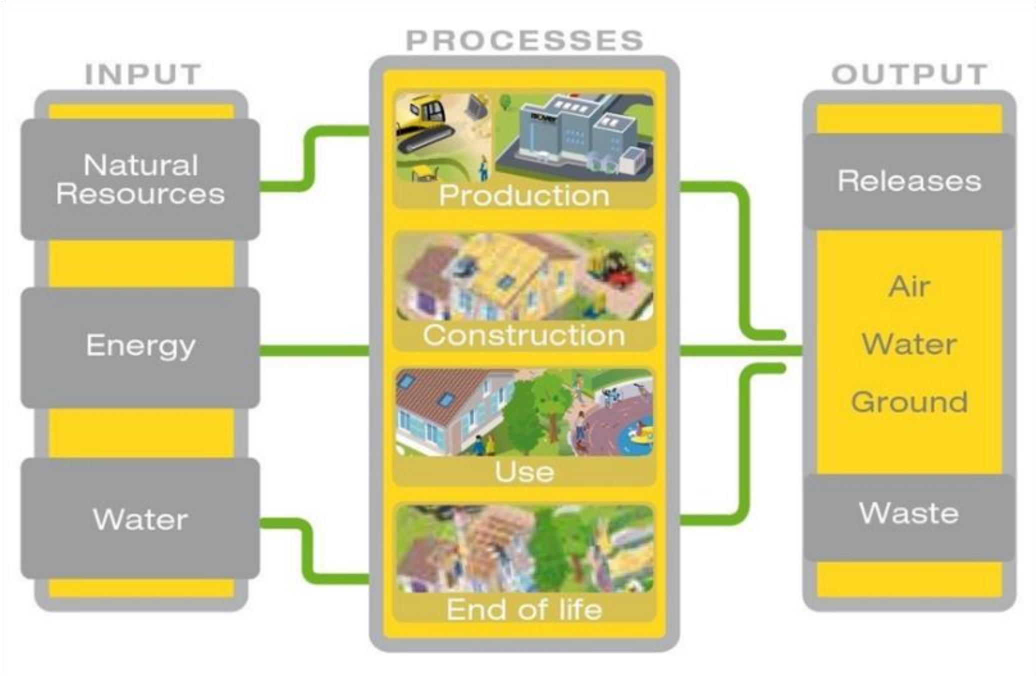
Life cycle stages

Flow diagram of the Life Cycle



Product stage, A1-A3

Description of the stage: the product stage of the glass mat products is subdivided into 3 modules A1, A2 and A3 respectively "Raw material supply", "transport" and "manufacturing".

The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15 804 standard. This rule is applied in this EPD.

Description of the scenarios and other additional technical information:

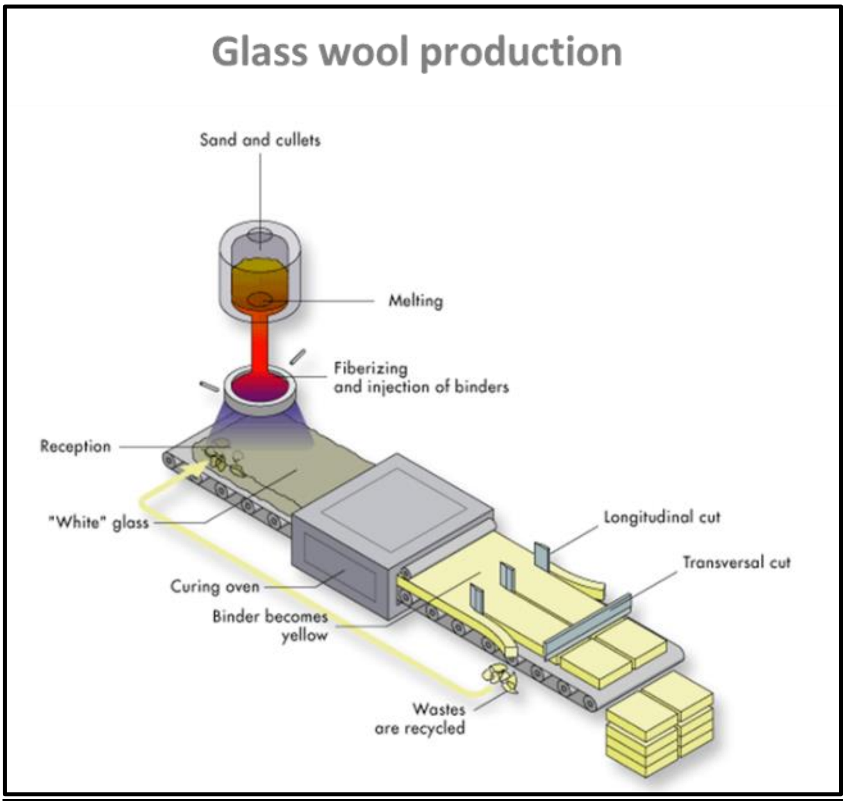
A1, Raw materials supply
This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process

Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. sand and borax for glass mat. Besides these raw materials, recycled materials (agglomerates) are also used as input.

A2, Transport to the manufacturer
The raw materials are transported to the manufacturing site. In our case, the modeling include: road (average values) of each raw material.

A3, Manufacturing
This module includes the manufacturing of the product and packaging. Specifically, it covers the manufacturing of glass, resin, glass mat (including the processes of fusion and fiberizing showed in the flow diagram), and the packaging.

Manufacturing process flow diagram



Construction process stage, A4-A5

Description of the stage: the construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

A4, Transport to the building site: this module includes transport from the production gate to the building site.

Transport is calculated on the basis of a scenario with the parameters described in the following table.

PARAMETER	VALUE/DESCRIPTION
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer (27 t payload) with a real 3,84 t payload, diesel consumption 38 liters for 100 km
Distance	1500 km
Capacity utilisation (including empty returns)	50 % of the capacity in volume 30 % of empty returns
Bulk density of transported products*	92 kg/m^3
Volume capacity utilisation factor	1

A5, Installation in the building: this module includes:

No additional accessory was taken into account for the implementation phase insulation of the product.

PARAMETER	VALUE/DESCRIPTION
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	5 %
Distance	50 km to landfill by truck
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	Packaging wastes are 100 % collected and modeled as landfilled Mat Glass losses are landfilled

Use stage (excluding potential savings), B1-B7

Description of the stage: the use stage is divided into the following modules:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational energy use
- B7: Operational water use

Description of the scenarios and additional technical information:
Once installation is complete, no actions or technical operations are required during the use stages until the end of life stage. Therefore, glass mat products have no impact on this stage.

End of Life Stage, C1-C4

Description of the stage: this stage includes the next modules:

C1, Deconstruction, demolition
The de-construction and/or dismantling of Glass mat products take part of the demolition of the entire building. In our case, the environmental impact is assumed to be very small and can be neglected

C2, Transport to waste processing
The model use for the transportation (see A4, transportation to the building site) is applied.

C3, Waste processing for reuse, recovery and/or recycling
The product is considered to be landfilled without reuse, recovery or recycling.

C4, Disposal
The glass mat is assumed to be 100% landfilled.

Description of the scenarios and additional technical information:

End of life:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	The entire product, including any surfacing is collected alongside any mixed construction waste 389,2 g of glass wool (collected with mixed construction waste)
Recovery system specified by type	There is no recovery, recycling or reuse of the product once it has reached its end of life phase.
Disposal specified by type	The product alongside the mixed construction waste from demolishing will go to landfill 389,2 g of glass wool are landfilled
Assumptions for scenario development (e.g. transportation)	We assume that the waste going to landfill will be transported by truck with 24 tons payload, using diesel as a fuel consuming 38 liters per 100km. Distance covered is 50 km

Reuse/recovery/recycling potential, D

Description of the stage: As product and packaging are considered to be landfilled the module D does not contain any benefit nor impact.

LCA results

LCA model, aggregation of data and environmental impact are calculated from the Gabi software. CML 4.1 impact method has been used, together with Gabi database (2016) and ECOINVENT 3.1 database to obtain the inventory of generic data.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2018 and transport data according 2018)

System boundaries (X=included, MND=module not declared)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	7,72E-01	6,86E-02	6,34E-02	0	0	0	0	0	0	0	0	8,99E-04	0	6,24E-03	0
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	4,65E-08	1,13E-12	2,33E-09	0	0	0	0	0	0	0	0	9,55E-13	0	5,96E-15	0
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	3,07E-03	3,02E-04	1,63E-04	0	0	0	0	0	0	0	0	3,89E-06	0	3,72E-05	0
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl, buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1,02E-03	7,30E-05	8,94E-05	0	0	0	0	0	0	0	0	9,02E-07	0	5,11E-06	0
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	3,39E-04	1,15E-05	2,52E-05	0	0	0	0	0	0	0	0	1,53E-07	0	3,07E-06	0
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	2,31E-05	1,12E-09	1,16E-06	0	0	0	0	0	0	0	0	1,61E-11	0	2,19E-09	0
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	1,66E+01	9,62E-01	8,59E-01	0	0	0	0	0	0	0	0	1,26E-02	0	8,15E-02	0
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE																
Parameters	Product stage	Construction process stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	1,20E+00	2,36E-02	6,28E-02	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable primary energy used as raw materials *MJ/FU*	4,42E-01	0	2,21E-02	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2,09E+00	2,36E-02	8,50E-02	0	0	0	0	0	0	0	0	3,05E-04	0	9,84E-03	0
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1,82E+01	9,65E-01	9,44E-01	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable primary energy used as raw materials *MJ/FU*	6,66E+00	0	3,33E-01	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2,49E+01	9,65E-01	1,28E+00	0	0	0	0	0	0	0	0	1,27E-02	0	8,43E-02	0
Use of secondary material *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels- *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels - *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water - *m3/FU*	8,07E-03	8,27E-06	4,07E-04	0	0	0	0	0	0	0	0	1,26E-07	0	1,60E-05	0

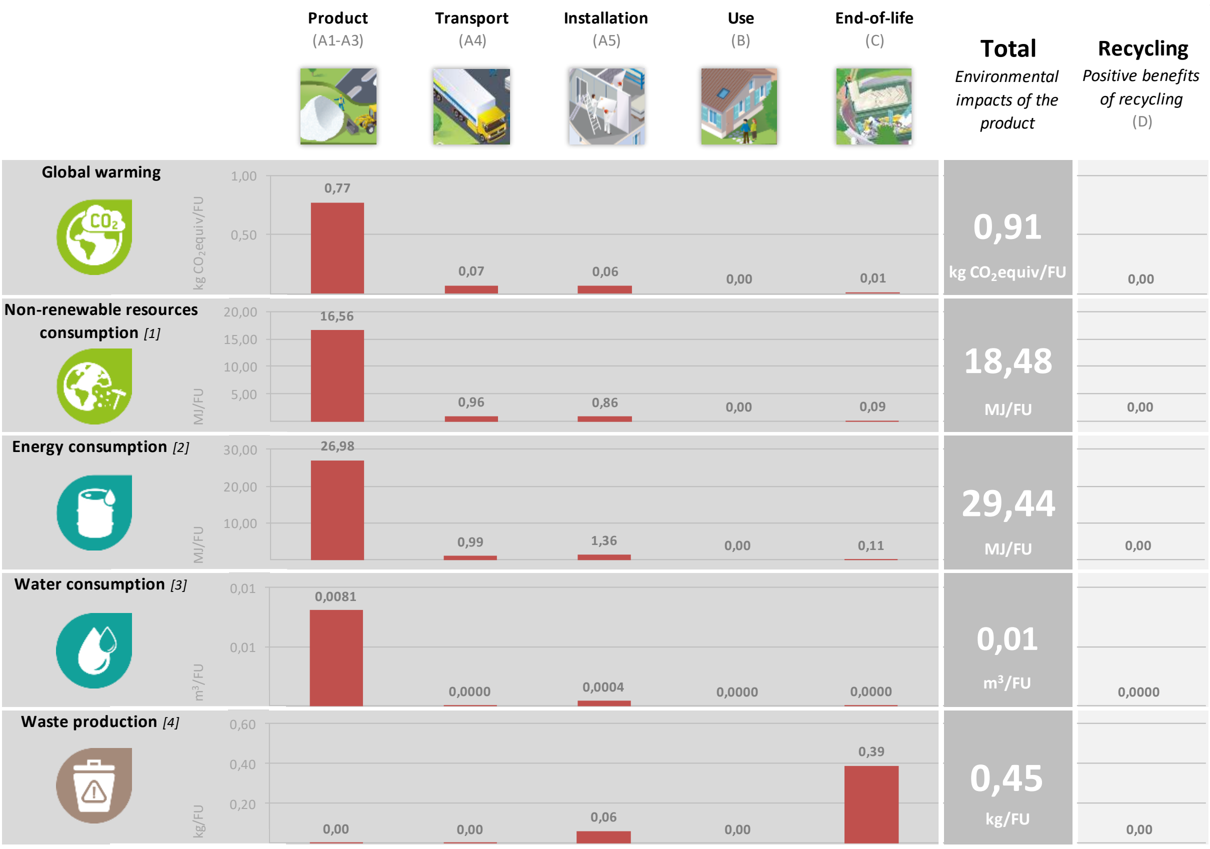
WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	3,63E-10	3,95E-09	2,61E-10	0	0	0	0	0	0	0	0	5,11E-11	0	1,33E-09	0
Non-hazardous waste disposed *kg/FU*	4,62E-04	1,05E-05	6,08E-02	0	0	0	0	0	0	0	0	1,37E-07	0	3,90E-01	0
Radioactive waste disposed *kg/FU*	4,12E-07	1,06E-06	4,65E-07	0	0	0	0	0	0	0	0	1,37E-08	0	1,14E-06	0

OTHER OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstructio	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling *kg/FU*	4,15E-03	0	2,07E-04	0	0	0	0	0	0	0	0	0	0	0	0
Materials for energy recovery *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LCA interpretation



[1] This indicator corresponds to the abiotic depletion potential of fossil resources.
[2] This indicator corresponds to the total use of primary energy.
[3] This indicator corresponds to the use of net fresh water.
[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Global Warming Potential (Climate Change) (GWP)
When analyzing the above figure for GWP, it can clearly be seen that the majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the sources of greenhouse gas emissions are predominant in this part of the life cycle. CO2 is generated upstream from the production of electricity and is also released on site by the combustion of natural gas. We can see that other sections of the life cycle also contribute to the GWP; however the production modules contribute to over 85 % of the contribution. Combustion of fuel in transport vehicles will generate the second highest percentage of greenhouse gas emissions.

Non-renewable resources consumptions
We can see that the consumption of non – renewable resources is once more found to have the highest value in the production modules. This is because a large quantity of natural gas is consumed within the factory, and non – renewable fuels such as natural gas and coal are used to generate the large amount of electricity we use. The contribution to this impact from the other modules is very small and primarily due to the non – renewable resources consumed during transportation.

Energy Consumptions
As we can see, modules A1 – A3 have the highest contribution to total energy consumption. Energy in the form of electricity and natural gas is consumed in a vast quantity during the manufacture of glass mineral wool so we would expect the production modules to contribute the most to this impact category.

Water Consumption
As we don't use water in any of the other modules (A4 – A5, B1 – B7, C1 – C4), we can see that there is no contribution to water consumption. For the production phase, water is used within the manufacturing facility and therefore we see the highest contribution here. However, we recycle a lot of the water on site so the contribution is still relatively low.

Waste Production
Waste production does not follow the same trend as the above environmental impacts. The largest contributor is the end of life module. This is because the entire product is sent to landfill once it reaches the end of life state. However, there is a still an impact associated with the production module since we do generate waste on site. The very small impact associated with installation is due to the loss rate of product during implementation.

ANNEX Influence of thicknesses

Influence of particular thicknesses

This EPD® includes the range of thicknesses between 2,5 mm and 4,5 mm, for every thickness, using a multiplication factor in order to obtain the environmental performance of every thickness. In order to calculate the multiplication factors, a reference unit has been selected. All the results refer to 2,5 mm of thickness.

The following table shows the multiplication factors for each individual thickness in the product family. In order to determine the environmental impacts associated with a determinate product thickness, the results indicated in this EPD® must be multiplied by the corresponding multiplication factor. To obtain this factor, a conservative principle has been followed, being the real impact of the product slightly lower than that indicated in the table.

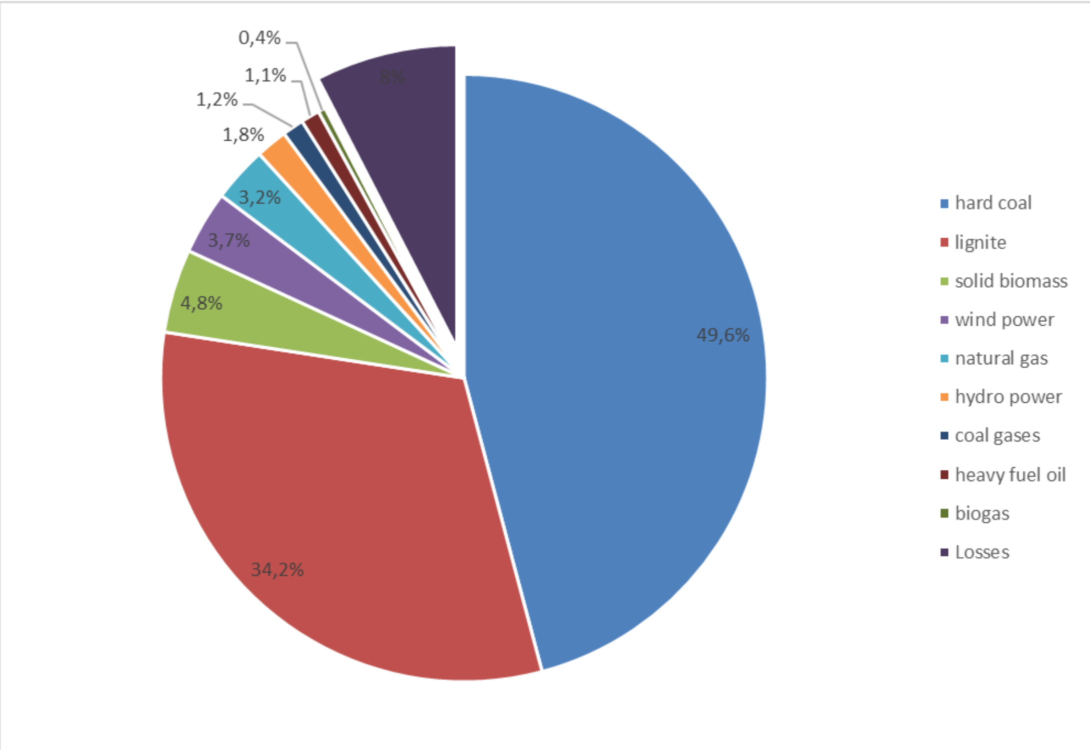
PRODUCT THICKNESS (MM)	MULTIPLICATION FACTOR
2,5	**1**
3	**1,30**
4,5	**1,95**

Additional information

. **Electricity Production**

TYPE OF INFORMATION	DESCRIPTION
Location	**Representative of average production in Poland (2015)**
Geographical representativeness description	Split of energy sources in POLAND Electricity from hard coal 49,3% Electricity from lignite 34,2% Electricity from solid biomass 4,8% Electricity from wind power 3,7% Electricity from natural gas 3,2% Electricity from hydro power 1,8% Electricity from coal gases 1,2% Electricity from heavy fuel oil 1,1% Electricity from biogas 0,4% **Losses 8,3 %**
Reference year	**2015**
Type of data set	**Cradle to gate**
Source	**Thinkstep**

Poland



The dataset used to model the electricity mix used for these calculations come from ecoinvent database.

DATA SOURCE	AMOUNT	UNIT
Thinkstep 2015	1,075	kg CO2 eq / MJ

Bibliography

- ISO 14040:2006: Environmental Management-Life Cycle Assessment-Principles and framework.
- ISO 14044:2006: Environmental Management-Life Cycle Assessment-Requirements and guidelines.
- ISO 14025:2006: Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
- EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- General Program Instructions for the International EPD® System, version 2.5
- The underlying LCA study
- EN 16783:2017 Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations
- ISO 14020:2000 Environmental labels and Declarations - General principles
- EN 15978 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method