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.

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

VentFacad-Bottom

Realization data: October 23, 2016
Validity: 3 years
Valid until: October 23, 2019
Based on PCR 2014:13 Insulation materials

Scope of the EPD®: Russia

Registration number The International EPD® System: S-P-00663

General information

Manufacturer: Saint-Gobain Isover (Russia, 140301, MR, Yegorievsk, Smychka, 60)
Management system: ISO 9001:2008; ISO 14001:2004
Programme used: The International EPD System. For more information see www.environdec.com
EPD registration number: S-P-00663
PCR identification: PCR Multiple UN CPC codes Insulation materials version 1.0 (2014:13)
PCR Multiple UN CPC codes Construction Products and construction services version 2.0 (2012:01)
Product name and manufacturer represented: VentFacad-Bottom; Saint-Gobain Isover (Russia)
CPC code: 371
Owner of the declaration: Saint-Gobain Isover
EPD prepared by: Ivan Smirnov (Saint-Gobain Russia) and Michaël Medard (Saint Gobain France)
Contact: +7(495)775-15-10; Ivan.Smirnov@saint-gobain.com
Declaration issued: 10/23/2016 **valid until**: 10/23/2019

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 Saint-Gobain Isover	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒	
Verifier: Matthias Schulz, Schulz Sustainability Consulting, 70469 Stuttgart, Germany.	

Product description

Product description and description of use:

This Environmental Product Declaration (EPD) describes the environmental impacts of 1 m² of mineral wool.

Saint-Gobain Isover Yegorievsk uses natural and abundant raw materials (sand), using fusion and fiberising techniques to produce mineral wool. The products obtained come in the form of a "mineral wool mat" consisting of a soft, airy structure.

On Earth, naturally, the best insulator is dry immobile air at 10°C: its thermal conductivity factor, expressed in λ, is 0.025 W/(m.K) (watts per meter Kelvin degree). The thermal conductivity of mineral wool is close to immobile air as its lambda varies from 0.030 W/(m.K) for the most efficient to 0.040 W/(m.K) to the least.

With its entangled structure, mineral wool is a porous material that traps the air, making it one of the best insulating materials. The porous and elastic structure of the wool also absorbs noise in the air, knocks and offers acoustic correction inside premises. Mineral wool containing incombustible materials does not fuel fire or propagate flames.

Mineral wool insulation is used in buildings as well as industrial facilities. It ensures a high level of comfort, lowers energy costs, minimizes carbon dioxide (CO_2) emissions, prevents heat loss through pitched roofs, walls, floors, pipes and boilers, reduces noise pollution and protects homes and industrial facilities from the risk of fire.

Mineral wool products last for the average building's lifetime (which is often set at 50 years as a default), or as long as the insulated building component is part of the building.

Technical data/physical characteristics:

The thermal resistance of the product: 1 K.m^2.W^{-1} (test method: EN 13162:2008)
The thermal conductivity of the product: 0.034 W/(m.K) (test method: GOST 32314-2012 (EN 13162:2008))
Water absorption: <1 kg/m^2 (test method: GOST EN 1609-2011)
Reaction to fire: A1 (test method: EN 13501-1:2007+A1:2009)

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

PARAMETER	VALUE
Quantity of wool cullet sand other raw material	646 g 50-60 mass-% 10-15 mass% 25-40 mass-%
Thickness of wool	34 mm
Surfacing	None
Packaging for the transportation and distribution	Paper for label: 0.52 g Wood pallet: 31 g Polyethylene: 21 g Thermaltransfer ribbon: 0.16 g
Product used for the Installation:	None

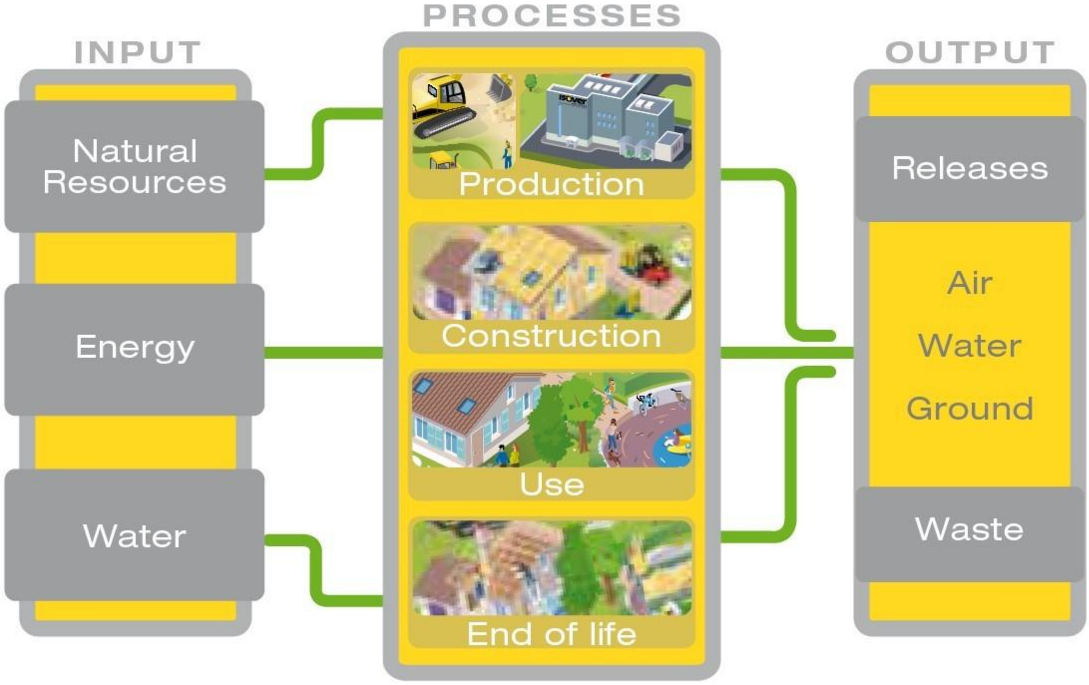
LCA calculation information

FUNCTIONAL UNIT	Providing a thermal insulation on 1 m² with a thermal resistance of equals 1.0 K.m^2.W^{-1}.
SYSTEM BOUNDARIES	Cradle to Grave: Mandatory stages = A1-3, A4-5, B1-7, C1-4 and Optional stage = D
REFERENCE SERVICE LIFE (RSL)	50 years
CUT-OFF RULES	The use of cut-off criterion on mass inputs and primary energy at the unit process level (1%) and at the information module level (5%) 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	Input and output data are attributed to each specific product where possible. In cases for which data was only available for the whole facility, inputs and outputs were allocated by mass according to product-specific annual production amounts
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Russia (Yegorievsk) 2015

- "EPD 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."

Life cycle stages

Flow diagram of the Life Cycle



GPI module	Asset life cycle stages	Information module
Upstream	A1) Raw material supply	A1-3) Manufacturing phase
Core	A2) Transport	
	A3) Manufacturing	
Downstream	A4) Transport	A3-4) Manufacturing phase
	A5) Construction, installation process	
	B1) Material emission from usage	B) Usage stage
	B2) Maintenance	
	B3) Repair	
	B4) Replacement	
	B5) Refurbishment	
	C1) Deconstruction, demolition	C) End of life
	C2) Transport	
	C3) Waste processing	
	C4) Disposal	

Product stage, A1-A3

Description of the stage:
The product stage of the mineral wool 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.

A1, Raw material supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process (with the exception of packaging used in product manufacturing process).

Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production. Besides these raw materials, recycled materials (cullet) are also used as input.

The essential raw materials for the ISOVER production are cullet (50-60 mass-%) and sand (10-15 mass-%). Other components are soda, feldspar, dolomite... The cullets are considered a secondary raw material because the cullets are not initially produced for the purpose of mineral wool insulation production.
The interlacing of the fibers is achieved with a maximum of 6% phenol-formaldehyde resin and a maximum of 0,1% silane in the finished product.

A2, transport to the manufacturer

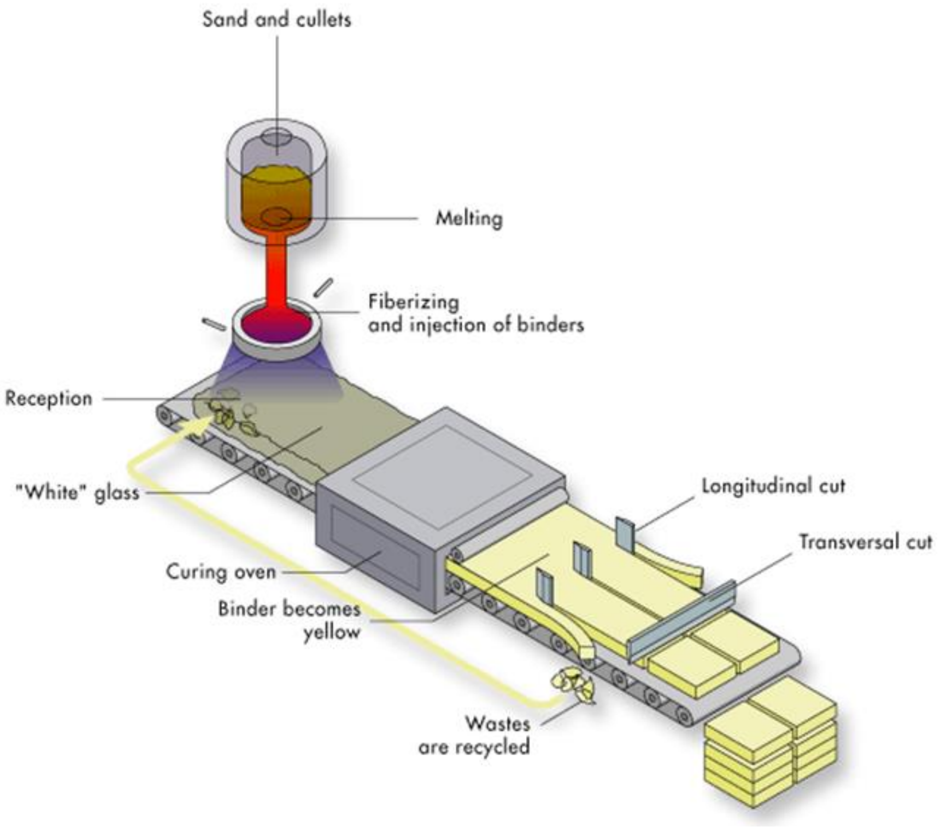
The raw materials are transported to the manufacturing site. In our case, to facilitate the modeling, road (truck) and train transportations (average values) of each raw material are modeled for each plant.

A3, manufacturing

This module includes manufacturing of products, manufacturing of packaging and also the transport of waste generated. Specifically, it covers liquid melt production, binder production, mineral wool fabrication (including melting and fiberization see process flow diagram) and packaging.
The production of packaging material is taking into account at this stage.

Manufacturing process flow diagram

Mineral wool production



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.

Description of scenarios and additional technical information:

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
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km
Distance	760 km by truck (average distance) 6860 km by train (average distance)
Capacity utilisation (including empty returns)	100 % of the capacity in volume 30 % of empty returns
Bulk density of transported products (if available)	19 kg/m^3
Volume capacity utilisation factor (if available)	1

A5, Installation in the building:

This module includes wastage of products during the implementation, the additional production processes to compensate the loss and the waste processing which occurs in this stage.

Scenarios used for quantity of product wastage and waste processing are:

PARAMETER	VALUE
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	5 %
Distance	25 (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 landfilled Mineral wool 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 or application of the installed product mineral wool insulation is installed into the building, ranging from applications in lofts to cavity walls etc. There are no environmental impacts associated with this information module as we don't directly use the product once it has been installed

- ***B2***, maintenance of the product – There is no need to maintain the product once it has been installed into the site. It will continue to provide its declared product performance for the duration of its reference service life.

- ***B3***, repair of the product – Once the product has been installed into the building, there should be no need for corrective/reactive treatment to repair the product and return it to an acceptable condition. It will provide the declared product performance for the full reference service life.
- ***B4***, replacement of the product – Our reference service life for mineral wool insulation is assumed to be equal to or greater than the lifetime of the building it is installed in. Therefore, there is no need to replace the product.
- ***B5***, refurbishment of the product – During the reference service life of our product, the performance will not diminish and therefore there is no need to refurbish the product.
- ***B6***, operational energy use of the building – There is no need for operational energy usage for mineral wool insulation (apart from potential energy savings)
- ***B7***, operational water use of the building – No water is required during the use stage of mineral wool insulation.

Description of 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 mineral wool insulation products have no impact (excluding potential energy savings) in this stage.
Mineral wool does not affect an indoor air quality. This fact is confirmed by hygienic tests of emissions of volatile organic compounds (VOCs) (according to Russian standard SanPiN 2.1.2.729-99) and by fiber emissions tests (according to Russian standard GOST R 56732).

End-of-life stage C1-C4

Description of the stage:
The stage includes the different modules of end-of-life: C1, de-construction, demolition; C2, transport to waste processing; C3, waste processing for reuse, recovery and/or recycling; C4, disposal.

Description des scenarios et des informations techniques supplémentaires :

C1, de-construction, demolition
The de-construction and/or dismantling of insolation 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. The mineral wool is assumed to be 100% collected.
.

C2, transport to waste processing
The model and scenario used for the transportation are described in the table below.

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

C4, disposal;
The mineral wool is assumed to be 100% landfilled.

End of life PARAMETER	VALUE per square meter of Insulation
Collection process specified by type	The entire product, including any surfacing is collected alongside any mixed construction waste 646 g of mineral 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 (646 g of mineral 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 25 km

LCA results

LCA model, aggregation of data and environmental impact are calculated from the TEAM™ software 5.1. CML impact method has been used, together with DEAM (2006) and Ecoinvent 2.2 databases for generic data.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant of Isover Saint-Gobain Yegorievsk in 2015.

Influence of particular thicknesses:

As this EPD covers a range of thicknesses, a multiplication factor was used to determine their individual environmental impacts. In order to calculate the multiplication factors, a reference unit was chosen (R value = 1 m^2.K/W for 34 mm) which also acts as our functional unit. The various impacts for the other thicknesses were compared against this reference unit and a multiplication factor was calculated.

The table below highlights the multiplication factors for each individual thickness in the product family. In order to determine the environmental impacts associated with a specific product thickness, multiply the LCA results by the corresponding multiplication factor.

Product Thickness (mm)	R Value	Multiplication Factor
34	1	1
50	1.47	1.43
70	2.06	1.97
80	2.35	2.24
90	2.65	2.51
100	2.94	2.77
110	3.24	3.05
120	3.53	3.31
130	3.82	3.59
140	4.12	3.87
150	4.41	4.13
170	5	4.67
180	5.29	4.94

ENVIRONMENTAL IMPACTS

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	
Global Warming Potential (GWP) - *kg CO2 equiv/FU*	1.1E+00	1.8E-01	6.8E-02	0	0	0	0	0	0	0	0	3.8E-03	0	6.5E-03	MND
	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*	2.8E-08	8.2E-08	6.2E-09	0	0	0	0	0	0	0	0	2.6E-09	0	1.7E-09	MND
	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 breakdown when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO2 equiv/FU*	7.7E-03	9.9E-04	4.5E-04	0	0	0	0	0	0	0	0	2.3E-05	0	3.8E-05	MND
	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 (PO4)3- equiv/FU*	1.3E-03	1.9E-04	7.4E-05	0	0	0	0	0	0	0	0	5.6E-06	0	9.4E-06	MND
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *Ethene equiv/FU*	2.4E-04	3.6E-05	1.6E-05	0	0	0	0	0	0	0	0	5.0E-07	0	1.4E-06	MND
	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 ressources (ADP-elements) - *kg Sb equiv/FU*	2.0E-08	5.0E-10	1.7E-09	0	0	0	0	0	0	0	0	6.5E-13	0	6.1E-09	MND
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.7E+01	2.3E+00	1.0E+00	0	0	0	0	0	0	0	0	4.6E-02	0	1.4E-01	MND
	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				
	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	D Reuse, recovery, recycling
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	3.4E-01	7.4E-02	6.5E-02	0	0	0	0	0	0	0	0	2.4E-05	0	1.3E-03	MND
Use of renewable primary energy used as raw materials *MJ/FU*	8.6E-01	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1.2E+00	7.4E-02	6.5E-02	0	0	0	0	0	0	0	0	2.4E-05	0	1.3E-03	MND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.9E+01	2.5E+00	1.2E+00	0	0	0	0	0	0	0	0	4.7E-02	0	1.5E-01	MND
Use of non-renewable primary energy used as raw materials *MJ/FU*	9.9E-01	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.0E+01	2.5E+00	1.2E+00	0	0	0	0	0	0	0	0	4.7E-02	0	1.5E-01	MND
Use of secondary material *kg/FU*	3.4E-01	0	1.7E-02	0	0	0	0	0	0	0	0	0	0	0	MND
Use of renewable secondary fuels- *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of non-renewable secondary fuels - *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of net fresh water - *m3/FU*	3.9E-03	2.9E-04	2.3E-04	0	0	0	0	0	0	0	0	4.5E-06	0	1.2E-04	MND

WASTE CATEGORIES

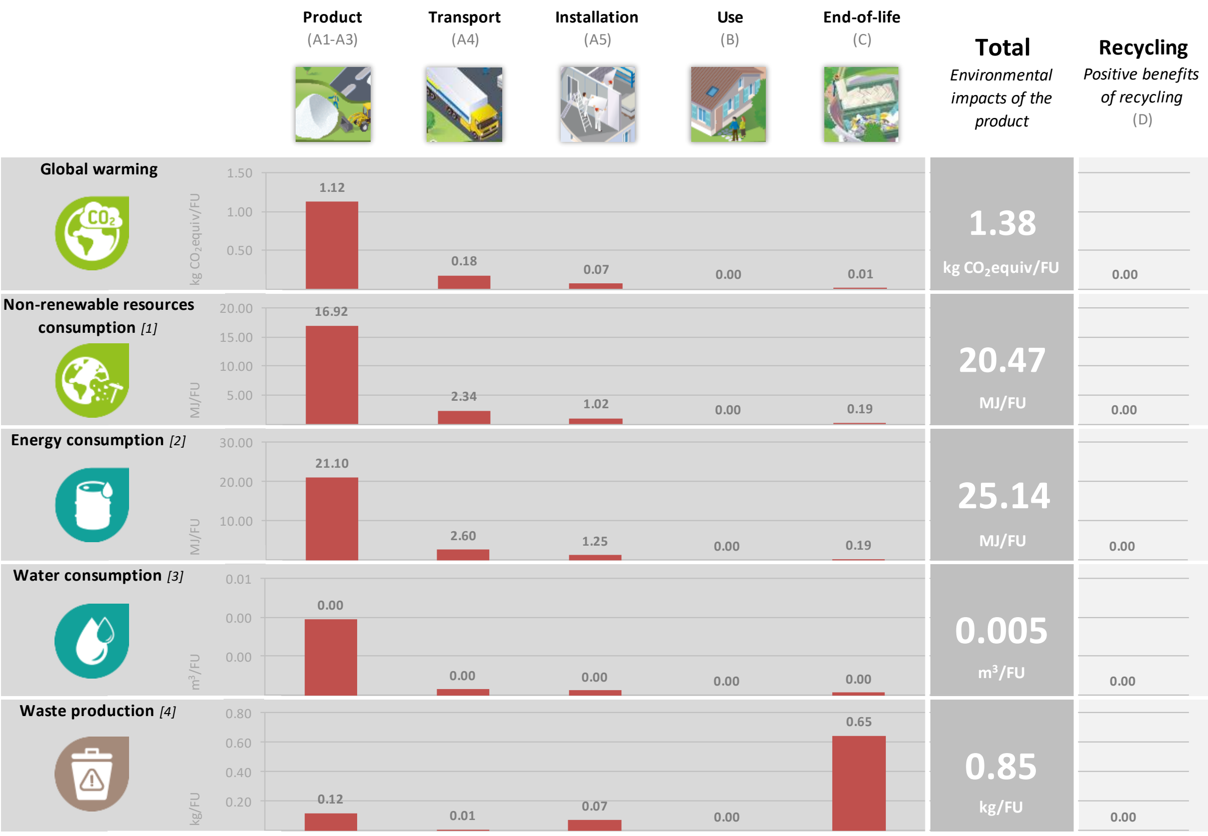
Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstructio n / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	4.1E-03	3.3E-05	2.1E-04	0	0	0	0	0	0	0	0	1.1E-06	0	0	MND
Non-hazardous waste disposed *kg/FU*	1.2E-01	8.0E-03	7.2E-02	0	0	0	0	0	0	0	0	5.3E-06	0	6.5E-01	MND
Radioactive waste disposed *kg/FU*	1.4E-05	2.4E-05	2.0E-06	0	0	0	0	0	0	0	0	7.5E-07	0	0	MND

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 Deconstruction / demolition	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	MND
Materials for recycling *kg/FU*	0	0	9.0E-04	0	0	0	0	0	0	0	0	0	0	0	MND
Materials for energy recovery *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Exported energy *MJ/FU*	0	0	4.1E-08	0	0	0	0	0	0	0	0	0	0	0	MND

LCA interpretation

The following section contains the interpretation of VentFacad-Bottom 34 mm product results.



[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. CO_2 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 80% 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 the total energy consumption. Energy in the form of electricity and natural gas is consumed in a vast quantity during the manufacture of 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.

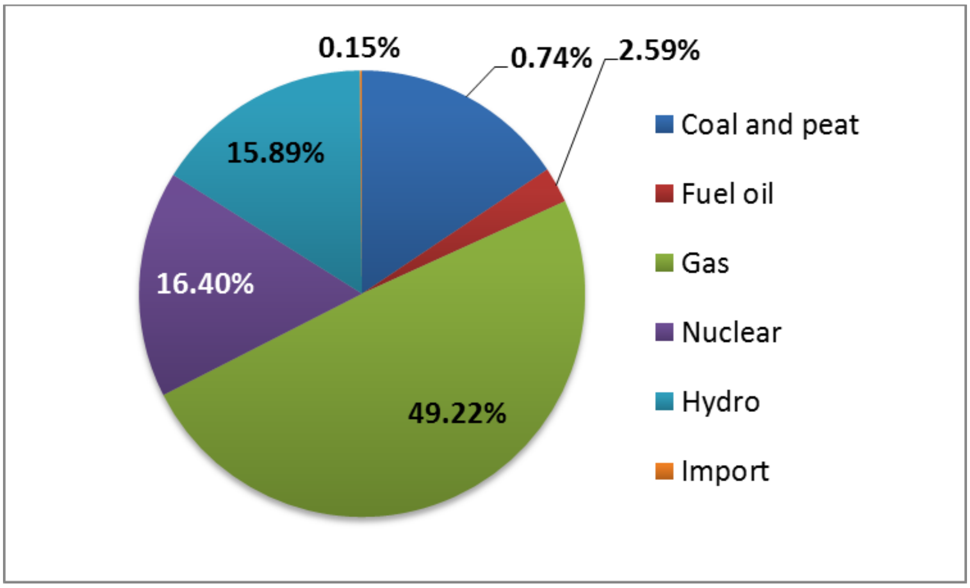
Waste Production

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 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.

Additional information

The electricity production model considered for the modelling of Saint-Gobain plant is:
401 Electricity (Russia, 2011): Production

TYPE OF INFORMATION	DESCRIPTION
Location	Representative of average production in Russia (2011)
Geographical representativeness description	Breakdown of energy sources in Russia (source: IEA 2011):- Coal and peat: 15.58%- Fuel oil: 2.59%- Gas: 49.22%- Nuclear: 16.40%- Hydro: 15.89%- Tide: 0.00%- Wind: 0.00%- Solar PV: 0.00%- Other non-thermal: 0.00%Import: 0.15%
Reference year	2011
Type of data set	Cradle to gate
Source	IEA 2011



All Isover products are manufactured under Environmental Management System – ISO 14001:2004.

The manufacturing process does not use or contain CFC's, HCFC's or other damaging gases.

Environmental positive contribution

The manufacturing process in Saint – Gobain Isover Russia uses a very large amount of recycled cullet that would have otherwise been sent to landfill.

Bibliography

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- 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
- PCR Multiple UN CPC codes Insulation materials (2014:13) version 1.0
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- General Programme Instructions for the International EPD® System, version 2.5
- PCR Multiple UN CPC codes Insulation materials version 1.0 (2014:13)
- PCR Multiple UN CPC codes Construction Products and construction services version 2.0 (2012:01)
- EN 13162:2008: Factory made mineral wool products used for thermal insulation of buildings. General specification
- GOST 32314-2012 (EN 13162:2008): Factory made mineral wool products used for thermal insulation of buildings. General specification
- EN 13501-1:2007+A1:2009: Fire classification of construction products and building elements
- GOST EN 1609-2011: Thermal insulating products for building applications. Methods for determination of short term water absorption by partial immersion
- SanPiN 2.1.2.729-99: Hygiene safety requirements to polymer building materials
- GOST R 56732-2015: Heat insulating materials and products. Methods for determining the emission characteristics of fibers with air flow around