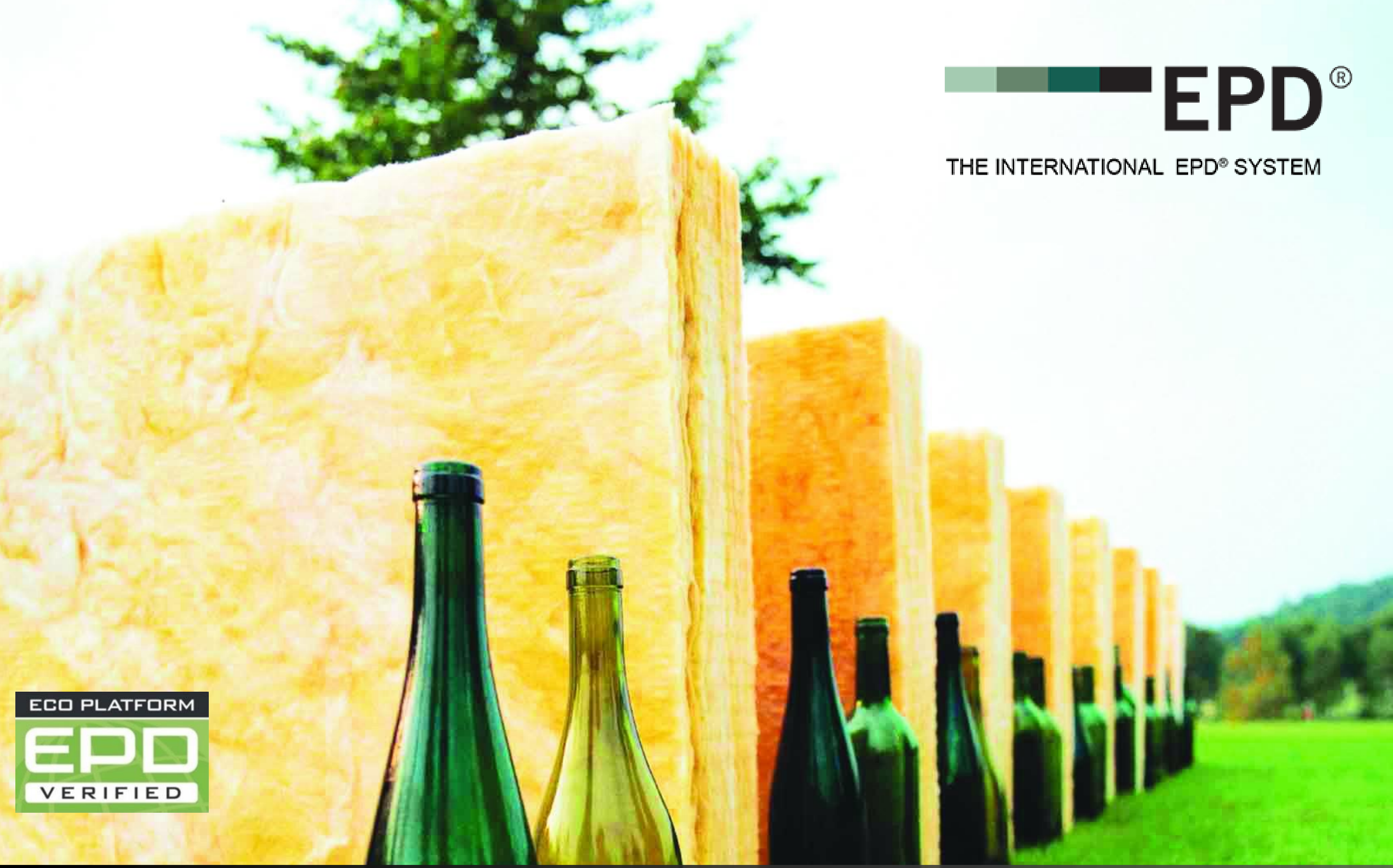

EPD®

THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804+A2:2019 for

Isover Standard 90 mm

from : Saint-Gobain, MAG-ISOVER K.K

Version 1
Publication date: 2022-08-08
Validity: 5 years
Valid until: 2027-08-07

Scope of the EPD®: Japan

Programme: The International EPD® System, www.environdec.com

Programme operator: EPD International AB

Production plant: **Akeno**
100 Mukoueno, Chikusei, Ibaraki 300-4522 (Japan)

Registration number:
S-P-06611

General information

Company information

Manufacturer: Saint-Gobain, MAG-ISOVER K.K Saint-Gobain Bldg 3F, 3-7 Kojimachi, Chiyoda-ku, Tokyo 102-0083 Japan. https://www.isover.co.jp
Production plant: Akeno, 100 Mukoueno, Chikusei, Ibaraki 300-4522 (Japan)
Management system: ISO 9001 : Quality management systems (JP13/062467) & ISO 14001 - Environment management systems (JP13/071252)
Framework: The LCA is based on 2020 production data for one site Japan.
Geographical scope : Japan
Program used: The International EPD® System. More information at www.environdec.com
PCR identification: PCR 2019:14 Construction Products, version 1.11
Complementary PCR (c-PCR-005): 2019-12-20. Thermal insulation products (EN 16783:2017)
Prepared by: IVL Swedish Environmental Research Institute, EPD International Secretariat
UN CPC CODE: 37990
Owner of the declaration: Saint-Gobain, MAG-ISOVER K.K
Product name and manufacturer represented: Isover Standard 90 mm. Saint-Gobain, MAG-ISOVER K.K
This EPD covers information modules A1 to C4 (cradle to grave) + module D as defined in EN 15804:2012 + A2:2019
EPD® prepared by: Miwa, Yuichi (Saint-Gobain, MAG-ISOVER K.K., Yuichi.Miwa@saint-gobain.com) & Sandra, Perez-Jimenez (Saint-Gobain LCA central team, sandra.perez-jimenez@saint-gobain.com)
Geographical scope of the EPD®: Japan
The intended use of this EPD is for B2B communication.
EPD® registration number: S-P-06611
Declaration issued: 2022-08-08, **valid until**: 2027-08-07
Demonstration of verification: an independent verification of the declaration was made, according to EN ISO 14025:2010. This verification was external and conducted by a third party, based on the PCR mentioned above (see information below).

Programme	The international EPD© System
Adress:	EPD© International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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CEN standard EN 15804:2012 + A2:2019 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction Products, version 1.11
PCR review was conducted by: El Comité Técnico del Sistema Internacional EPD© President: Claudia A. Peña. Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier : Marcel Gomez Marcel Gómez Consultoria Ambiental Tlf 0034 630 64 35 93 - info@marcelgomez.com In case of recognized individual verifiers: Approved by: The International EPD© System
Procedure for follow-up of data during EPD validity involves third part verifier: ☒ Yes ☐ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with E EN 15804:2012 + A2:2019. For further information about comparability, see EN 15804:2012 + A2:2019 and ISO 14025.

Product description

Product description and description of use

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m^2 of mineral wool with a thermal resistance of 2,4 $m^2.K/W$.

If the study is done for one specific product, the annual values provided by the site are used. If the manufacturing takes place in different sites, a weighted arithmetic mean is applied. This average is calculated by considering the yearly production per site, then, divide their share by the total sum and finally multiply the share by the total site inputs and outputs. This EPD, applies for one specific product coming from one single plant in Saint-Gobain Japan.

The production site Akeno of Saint-Gobain, MAG-ISOVER K.K uses natural and abundant raw materials (sand), using fusion and fiberizing techniques to produce glass wool. The products obtained come in the form of a "mineral wool mat" consisting of a soft and 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 0,045 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 (glass wool) 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 (for a thickness of 90 mm):

The thermal resistance of the product is 2,4 $K.m^2.W^{-1}$ (JIS A 1412-2: Thermal Conductivity)
The thermal conductivity of the mineral wool is: 0.038 W/(m·K) (JIS A 1412-2: Thermal Conductivity)
Reaction to fire: certification NM-4596

Declaration of the main product components and/or materials

Description of the main components and/or materials for 1 m^2 of mineral wool with a thermal resistance of 2.4 $K.m^2.W^{-1}$ for the calculation of the EPD®:

PARAMETER	VALUE
Quantity of wool for 1 m^2 of product	1,74 kg of finished product (containing mineral wool, binder and facing) packaging is not included
Thickness of wool	90 mm
Facing	Polyethylene (PE) in top and in bottom 2.86 g/m^2 + glue: 0.075 g/m^2
Packaging for the transportation and distribution	High-density polyethylene (HDPE) bag: 0.38 g/m^2
Product used for the Installation	None

At the date of issue of this declaration, there is no “Substance of Very High Concern” (SVHC) in concentration above 0.1% by weight, and neither do their packaging, following the European REACH regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

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

<u>Description of the main product components and/or materials:</u>

Isover Standard (IS38090L390)

Product components	Weight (%)	Post-consumer material weight (%)	Renewable material weight (%)
Standard product	**100%**	**16 - 65%**	**3.0 - 17%**
Glass wool	20 – 80.0 %	81%	0%
Binder	3.0 – 20.0 %	0%	85%
Facing	0.5 – 5.0 %	0%	0%

Product	Weight (kg/m^2)
Isover Standard (IS38090L390)	**1.74**

Packaging materials	Weight (%)	Weight (%)
High-density polyethylene film	2.17E-04	1.0 – 2.0 %
PP band	4.31E-06	0.1 – 0.6 %

LCA calculation information

EPD SCOPE	Cradle to grave and module D
FUNCTIONAL UNIT	Providing a thermal insulation on 1 m² with a thermal resistance of 2,4 m².K/W during 50 years
SYSTEM BOUNDARIES	Mandatory Stages = A1-A3 ; A4-A5, B1-B7 ; C1-C4 and D
REFERENCE SERVICE LIFE (RSL)	The Reference Service Life (RSL) of the isulation product is considered to be 50 years. This 50-year value is the amount of time that we recommend our products last for without refurbishment, and corresponds to standard building design life.
CUT-OFF RULES	Life Cycle Inventory data for a minimum of 99% of total inflows to the upstream and core module shall be included. Flows related to human activities such as employee transport are excluded. Transportation in-site is excluded The construction of plants, production of machines and transportation systems are excluded
ALLOCATIONS	Allocation has been avoided when possible. For those cases, when recycled material has been used, a physical allocation based on mass is used. The polluter pays and modularity principles have been followed
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Data included is collected from 1 production site in Japan (Akeno) Production year from 2020 Background data: Ecoinvent v3.6 (2020) and GaBi ts 2020

EPDs of construction products may be not comparable if they do not comply with EN 15804:2012 + A2:2019 or ISO 21930.
Environmental Product Declarations within the same product category from different programs may not be comparable".

LCA scope

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

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-recovery
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	JP	JP	JP	JP	JP	-	-	-	-	-	-	-	JP	JP	JP	JP	JP
Specific data used	>90% GWP- GHG																
Variation products	One site one product																
Variation sites	One site one product																

Life cycle stages

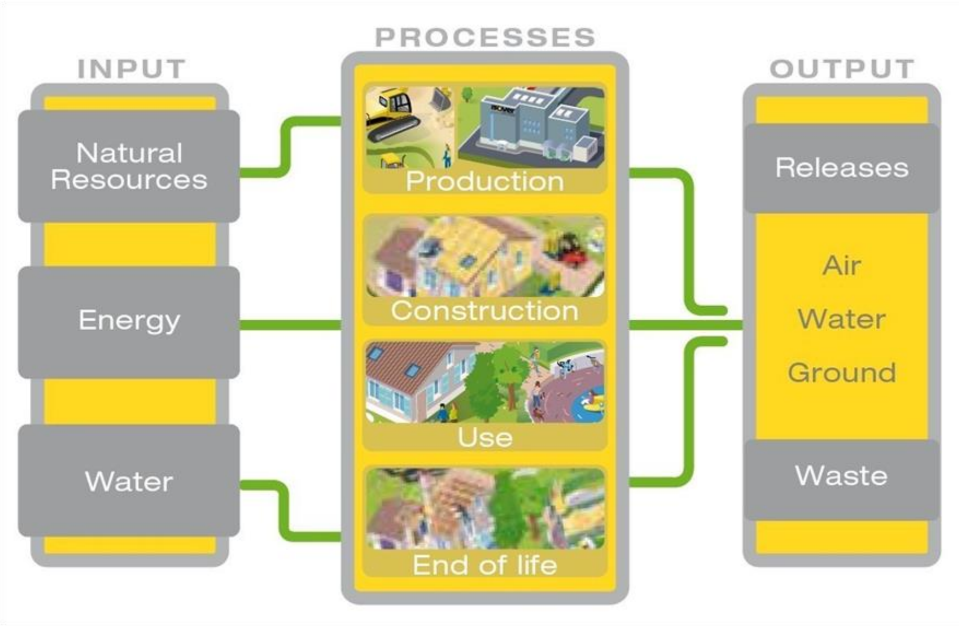


Figure 1.Flow diagram of the Life Cycle

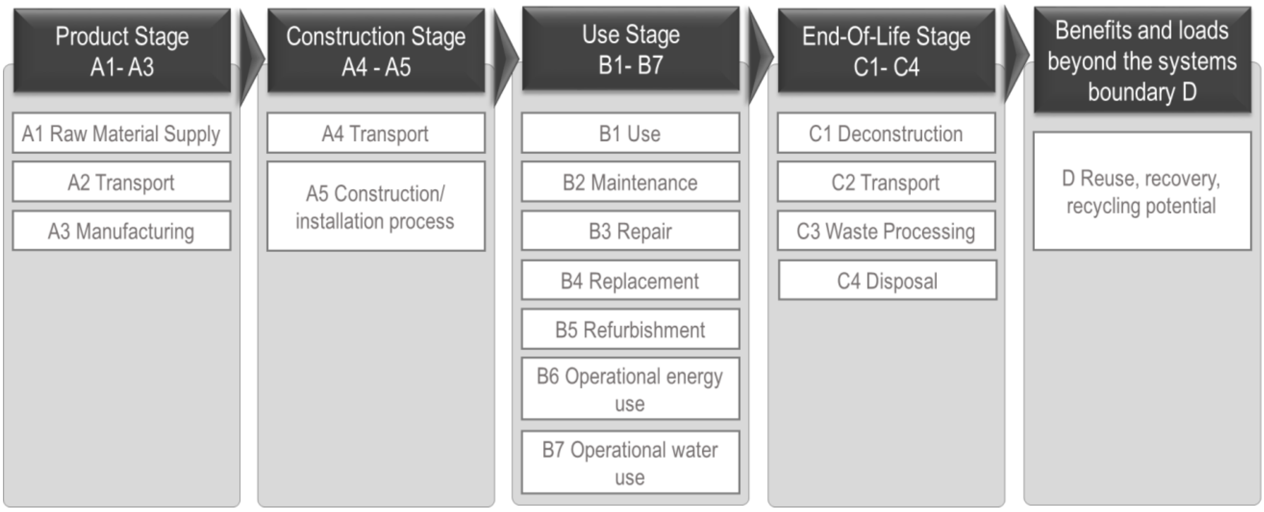


Figure 2: Cradle to grave analysis taking into account all stages of the Life Cycle product

A1-A3, Product stage

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.

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

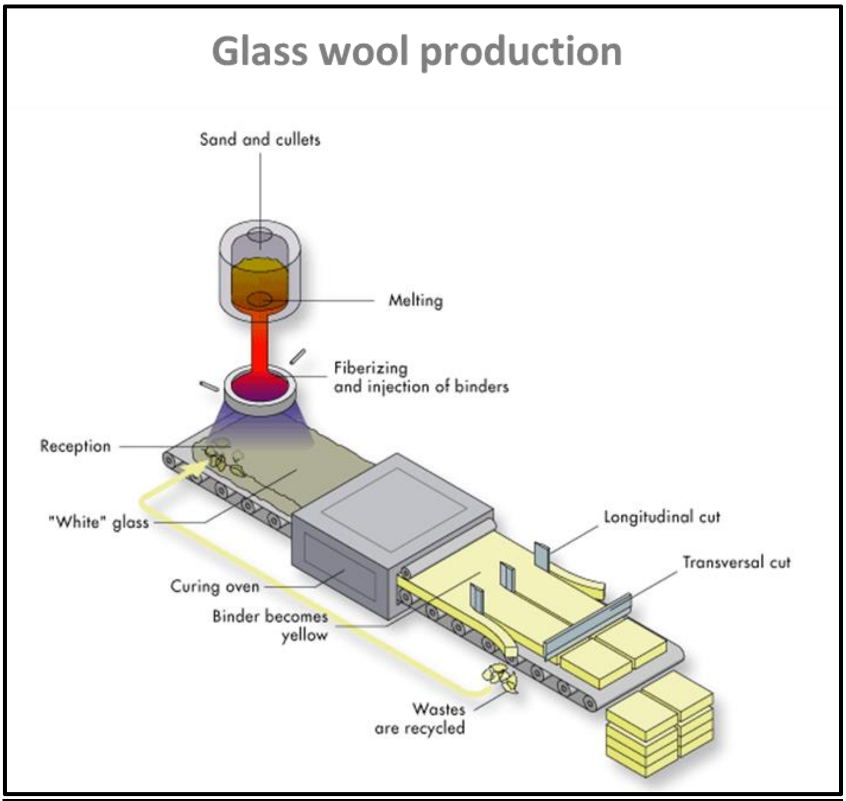
Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. sand and borax for glass wool. Besides these raw materials, recycled materials (agglomerates) are also used as input.

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, mineral wool (including the processes of fusion and fiberizing showed in the flow diagram), and the packaging.

This module also includes the emissions and wastes generated during manufacturing.

Manufacturing process flow diagram



A4-A5, Construction process stage

Description of the stage: the construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building. Since there is a product loss during installation (5 %). The quantification of raw material compensation (A5) and its transport to the building site (A4) are considered.

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 (13 t payload) with a real 3,5 t payload, diesel consumption 29 liters for 100 km
Distance	1399 km by truck 74 by boat

Capacity utilisation (including empty returns)	100% of the capacity in volume 0% of empty returns
Bulk density of transported products*	112 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 product.
No energy is needed to install the product (manual installation without tool)

PARAMETER	VALUE/DESCRIPTION
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	5%
Distance	100 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% landfilled Glass wool losses are landfilled

B1-B7, Use stage (excluding potential savings)

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, mineral wool insulation products have no impact (excluding potential energy savings) on this stage.

C1-C4, End of Life Stage

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

C1, Deconstruction, demolition
The de-construction and/or dismantling of insulation products take part of the demolition of the entire building. In our case, the environmental impact is assumed to be lesser than 1% of the total environmental impacts 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 mineral wool 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 facing is collected alongside any mixed construction waste and sent to landfill
Recovery system specified by type	1,74 kg of glass wool (collected with mixed construction waste)
Disposal specified by type	There is no recovery, recycling or reuse of the product once it has reached its end of life phase 1,74 kg of glass wool are landfilled
Assumptions for scenario development (e.g. transportation)	The product alongside the mixed construction waste from demolishing will go to landfill The waste going to landfill will be transported by truck with 27 t payload, using diesel as a fuel consuming 38 liters per 100km Distance covered is 100 km

D, Reuse/recovery/recycling potential

100% of wastes are landfilled. There is no reuse, nor recovery, nor recycling of this product. Hence, no recycling benefits are reported on stage D.

LCA results

As specified in EN 15804:2012+A2:2019 and the PCR 2019:14 Construction Products, version 1.11. The environmental impacts are declared and reported using the baseline characterization factors are from the ILCD. Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2020 and transport data according 2020).

According to the EN 15804:2012+A2:2019 standard, the LCIA results are relative expressions translating impacts into environmental themes such as climate change, ozone depletion, etc. (midpoint impact categories). Thus, the LCIA results do not predict impacts on category endpoints such as impact on the extinction of species or human health. In addition, the results do not provide information about the exceeding of thresholds, safety margins or risks.

All the results refer to 90 mm of thickness with vale of R = 2,4 $m^2.K.W^{-1}$ weighting 1,76kg/m^2.

Environmental Impacts

Environmental indicators	Product stage	Construction stage		Use stage							End of life stage				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	D Reuse, recovery, recycling
Climate Change [kg CO2 eq.]	4,33E+00	5,96E-01	2,30E-01	0	0	0	0	0	0	0	0	1,12E-02	0	1,12E-01	0
Climate Change (fossil) [kg CO2 eq.]	4,46E+00	5,70E-01	2,32E-01	0	0	0	0	0	0	0	0	1,07E-02	0	2,76E-02	0
Climate Change (biogenic) [kg CO2 eq.]	-1,34E-01	2,57E-02	-2,39E-03	0	0	0	0	0	0	0	0	4,85E-04	0	8,44E-02	0
Climate Change (land use change) [kg CO2 eq.]	1,68E-03	5,64E-06	8,80E-05	0	0	0	0	0	0	0	0	1,06E-07	0	7,95E-05	0
Ozone depletion [kg CFC-11 eq.]	1,47E-06	1,26E-16	7,34E-08	0	0	0	0	0	0	0	0	2,37E-18	0	1,02E-16	0
Acidification terrestrial and freshwater [Mole of H+ eq.]	1,11E-02	3,80E-03	6,16E-04	0	0	0	0	0	0	0	0	6,66E-05	0	1,98E-04	0
Eutrophication freshwater [kg P eq.]	2,10E-04	1,21E-07	1,05E-05	0	0	0	0	0	0	0	0	2,27E-09	0	4,75E-08	0
Eutrophication freshwater [kg $(PO_4)^3$ eq.]	6,44E-04	3,70E-07	3,22E-05	0	0	0	0	0	0	0	0	6,97E-09	0	1,46E-07	0
Eutrophication marine [kg N eq.]	3,13E-03	1,82E-03	1,83E-04	0	0	0	0	0	0	0	0	3,21E-05	0	5,10E-05	0
Eutrophication terrestrial [Mole of N eq.]	3,19E-02	2,00E-02	1,88E-03	0	0	0	0	0	0	0	0	3,52E-04	0	5,61E-04	0
Photochemical ozone formation - human health [kg NMVOC eq.]	7,28E-03	3,47E-03	4,18E-04	0	0	0	0	0	0	0	0	6,08E-05	0	1,55E-04	0
Resource use, mineral and metals [kg Sb eq.][1]	3,23E-05	6,05E-09	1,62E-06	0	0	0	0	0	0	0	0	1,14E-10	0	2,48E-09	0
Resource use, energy carriers [MJ][1]	5,90E+01	8,04E+00	3,08E+00	0	0	0	0	0	0	0	0	1,51E-01	0	3,63E-01	0
Water deprivation potential [m^3 world equiv.][1]	9,06E-01	5,61E-04	4,54E-02	0	0	0	0	0	0	0	0	1,06E-05	0	2,90E-03	0

[1] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Resources Use

	Product stage	Construction stage		Use stage							End of life stage				D Reuse, recovery, recycling
Resources Use indicators	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 (PERE) [MJ]	6,32E+00	2,37E-02	3,19E-01	0	0	0	0	0	0	0	0	4,46E-04	0	4,75E-02	0
Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	6,32E+00	2,37E-02	3,19E-01	0	0	0	0	0	0	0	0	4,46E-04	0	4,75E-02	0
Use of non-renewable primary energy (PENRE) [MJ]	5,86E+01	8,04E+00	3,06E+00	0	0	0	0	0	0	0	0	1,51E-01	0	3,63E-01	0
Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	3,76E-01	0	1,88E-02	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	5,90E+01	8,04E+00	3,08E+00	0	0	0	0	0	0	0	0	1,51E-01	0	3,63E-01	0
Input of secondary material (SM) [kg]	1,39E+00	0	6,94E-02	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels (RSF) [MJ]	6,64E-26	0	3,318E-27	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels (NRSF) [MJ]	7,80E-25	0	3,897E-26	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water (FW) [m3]	2,63E-02	3,95E-05	1,32E-03	0	0	0	0	0	0	0	0	7,43E-07	0	9,14E-05	0

Waste Category & Output flows

Waste Category & Output Flows	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	D Reuse, recovery, recycling
Hazardous waste disposed (HWD) [kg]	1,63E-08	4,12E-10	1,09E-09	0	0	0	0	0	0	0	0	7,75E-12	0	5,528E-09	0
Non-hazardous waste disposed (NHWD) [kg]	3,84E-02	2,60E-04	8,90E-02	0	0	0	0	0	0	0	0	4,89E-06	0	1,82E+00	0
Radioactive waste disposed (RWD) [kg]	1,95E-04	1,31E-06	9,96E-06	0	0	0	0	0	0	0	0	2,46E-08	0	4,12E-06	0
Components for re-use (CRU) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for Recycling (MFR) [kg]	8,55E-02	0	4,27E-03	0	0	0	0	0	0	0	0	0	0	0	0
Material for Energy Recovery (MER) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported electrical energy (EEE) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported thermal energy (EET) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Additional voluntary indicators from EN 15804 (according to ISO 21930:2017)

		Product stage	Construction stage		Use stage							End of life stage				Reuse, Recovery Recycling
	Environmental indicators	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
	Climate Change [kg CO2 eq.][2]	4,39E+00	5,65E-01	2,29E-01	0	0	0	0	0	0	0	0	1,06E-02	0	2,71E-02	0

[2] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Information on biogenic carbon content

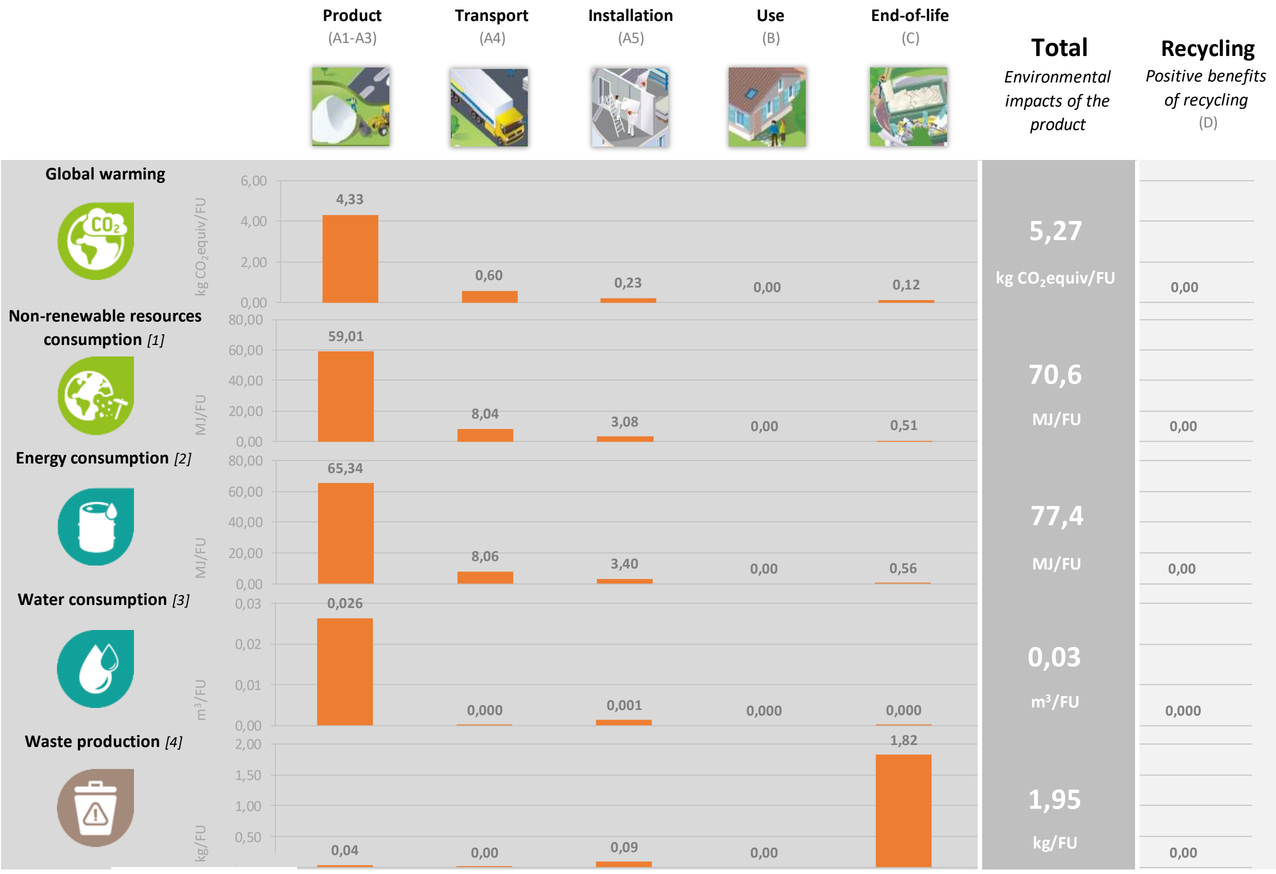
		Product stage
	Biogenic Carbon Content	A1 / A2 / A3
	Biogenic carbon content in product [kg]	1,17E-02
	Biogenic carbon content in packaging [kg]	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

The biogenic carbon content in the product, is due to the production of citric acid, that is used as part of the binder recipe. On the other hand, there is no biogenic carbon content in packaging, since the product is compressed and packed in high-density polyethylene bags and tied up with polypropylene bands.

LCA interpretation

The following figure refers to a functional unit of 1 m² Providing a thermal insulation on 1 m² with a thermal resistance of 2,4 m².K/W during 50 years. The product analyzed is: Isover Standard (IS38090L390).



[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)

The majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the energy 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 heating raw materials. 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 total contribution. Combustion of fuel in transport vehicles will generate the second highest percentage of greenhouse gas emissions together with the waste during the installation stage.

Non-renewable resources consumptions

The consumption of non – renewable resources is once more found to have the highest value in the production modules. This is due to electricity, natural gas and LPG consumed within the factory. The contribution to this impact from the other modules, like transportation upstream and downstream is very small.

Energy Consumptions

Modules A1 – A3 have the highest contribution to total energy consumption. Energy in the form of electricity, natural gas and LPG, 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.

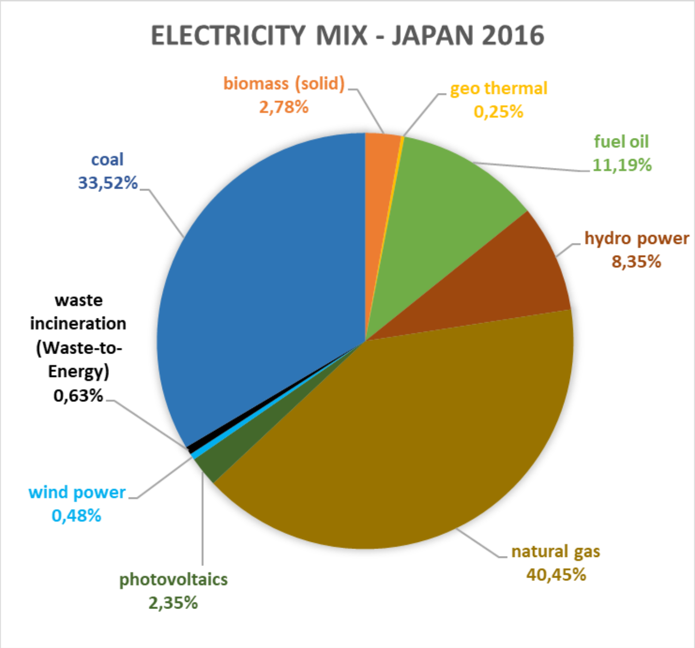
Water Consumption
As we don't use water in any of the other modules (A4 – A5, B1 – B7, C1 – C4), we can see that there is no contribution to water consumption. For the production phase, water is used within the manufacturing facility and therefore we see the highest contribution here. Water is also recycled on site; however, the contribution is relatively lower compared to the manufacturing facility consumption.

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. There is also an impact associated with the production module, since we do generate waste on site. The impact associated with installation (A5) is due to the loss rate of product during implementation.

Appendix:

Electricity information

TYPE OF INFORMATION	DESCRIPTION
Location	Representative of Electricity purchased by Saint-Gobain, MAG-ISOVER K.K. Japan
Geographical representativeness description	40,45% natural gas 33,52% coal 11,19% fuel oil 8,35% hydro power 2,78% biomass (solid) 2,35% photovoltaics 0,63% waste incineration (Waste-to-Energy) 0,48% wind power 0,25% geo thermal
Reference year	2016
Type of dataset	Cradle to gate from Gabi ts 2020 or ecoinvent v3.6 (2020)
Source	Gabi database 2020 : dataset valid until 2022
CO_2 emission kg CO_2 eq. / kWh	0.672 (calculated under the method EN15804+A2 Climate Change : fossil)



Data quality

Inventory data quality is judged by geographical, temporal, and technological representativeness. To cover these requirements and to ensure reliable results, first-hand industry data crossed with LCA background datasets were used. The data was collected from internal records and reporting documents from Saint-Gobain, MAG-ISOVER K.K. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects poor inventory data quality for the geographical representation, fair for technological and good for temporal representation.

Environmental impacts according to EN 15804:2012 + A1

The following tables presents results of Isover Standard (IS38090L390) according to EN 15804 +A1.

		Product stage	Construction stage		Use stage							End of life stage				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	D Reuse, recovery, recycling
Environmental impacts	Global Warming Potential (GWP) [kg CO2eq.]	4,39E+00	5,65E-01	2,29E-01	0	0	0	0	0	0	0	0	1,06E-02	0	2,71E-02	0
	Ozone depletion (ODP) [kg CFC 11eq.]	1,89E-06	1,68E-16	9,46E-08	0	0	0	0	0	0	0	0	3,16E-18	0	1,37E-16	0
	Acidification potential (AP) [kg SO2eq.]	8,76E-03	2,63E-03	4,81E-04	0	0	0	0	0	0	0	0	4,60E-05	0	1,59E-04	0
	Eutrophication potential (EP) [kg (PO4)3-eq.]	2,50E-03	6,21E-04	1,34E-04	0	0	0	0	0	0	0	0	1,09E-05	0	1,79E-05	0
	Photochemical ozone creation (POCP) - [kg Ethylene eq.]	5,36E-04	7,76E-05	2,85E-05	0	0	0	0	0	0	0	0	1,33E-06	0	1,28E-05	0
	Abiotic depletion potential for non-fossil resources (ADP-elements) [kg Sb eq.]	9,25E-05	6,24E-09	4,63E-06	0	0	0	0	0	0	0	0	1,18E-10	0	9,57E-09	0
	Abiotic depletion potential for fossil resources (ADP-fossil fuels) [MJ]	5,76E+01	8,04E+00	3,01E+00	0	0	0	0	0	0	0	0	1,51E-01	0	3,52E-01	0

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