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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

- in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Saint-Gobain Finland Oy / ISOVER
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-1969-869-EN
Registration number:	NEPD-1969-869-EN
ECO Platform reference number:	-
Issue date:	16.12.2019
Valid to:	16.12.2024

ISOVER VKL

Saint-Gobain Finland Oy / ISOVER

www.epd-norge.no



www.epd-norge.no

General information

Product

ISOVER VKL

Program operator

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Declaration number

NEPD-1969-869-EN

ECO Platform reference number

This declaration is based on Product Category Rules

CEN Standard EN 15804 serve as core PCR.
The Product Category Rules NPCR 012:2018 Part B for Thermal insulation products is used in addition to the core PCR.

Statement of liability

The owner of the declaration shall be liable for the underlying information and evidence.
EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Declared unit

1 m² with a thermal resistance of 1.0 m²K/W with a thickness of 32 mm.

Functional unit

1 m² with a thermal resistance of 1.0 m²K/W with a reference service life of 60 years.

Verification

Independent verification of calculation data and other environmental information and test of the computer program was carried out by Martin Erlandsson in accordance with ISO14025, 8.1.3 and 8.1.4 + EN 15804

☑ Externally

IVL Swedish Environmental Research Institute
(Independent verifier approved by EPD Norway)

Owner of the declaration

Saint-Gobain Finland Oy / ISOVER

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Manufacture

Saint-Gobain Finland Oy / ISOVER

Place of production

Forssa, Finland

Place of usage

Finland, Estonia, Latvia and Lithuania

Management system

DS/EN ISO 9001:2015
DS/EN ISO 14001:2015

Org. No.

1020917543

Issue date

16.12.2019

Valid to

16.12.2024

Year of study

2018

Comparability

EPD of construction products may not be comparable if they do not comply with EN15804 and seen in a building context.

The EPD has been worked out by

The EPD has been worked out by the use of the tool GaBi, version 8.7 by Saint-Gobain ISOVER Team by Janne Vainio

Company-specific data has been verified by SG central LCA team.

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product description

Product description and description of use:

This EPD describes the potential environmental impacts of 1 m² of glass wool insulation, ISOVER VKL, with a thermal resistance equal to 1.00 m^2K/W

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

ISOVER glass wool products are CE-labelled according to EN 13162 (2012) "*Thermal Insulation Products for Buildings. Factory made mineral wool (MW) Products. Specification*", and EN 13172 (2011) "*Thermal Insulation Products – Evaluation of Conformity*"

The production site of Saint-Gobain Finland Oy / ISOVER in Forssa Finland, uses a small amount of natural and abundant raw materials (sand, soda, limestone, feldspar) and a high share of recycled glass cullets (more than 50 % of external glass cullets). This material is converted by using fusion and fiberizing techniques to produce glass wool. The products obtained come in the form of "mineral wool slabs, rolls or lamellas" 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/(mK) (watts per meter Kelvin degree). The thermal conductivity of mineral wool is close to immobile air as its lambda varies from 0.030 W/(mK) for the most efficient, to 0.040 W/(mK) to the least efficient.

With its entangled structure, glass 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 airborne noise, impact noise and offers acoustic correction inside premises. Glass wool containing incombustible materials does not react to fire.

Glass wool insulation is used in buildings as well as industrial facilities. It ensures a high level of comfort and minimizes carbon dioxide (CO_2) emissions by preventing heat loss through roofs, walls, floors, pipes and boilers. It reduces noise and protects homes and industrial facilities against fire.

Correctly installed glass wool products and solutions do not require maintenance and last throughout the lifetime of the building (which is set at 60 years as a default value in the model), or as long as the insulated building component is a part of the building.

Technical data/physical characteristics (for a thickness of 32 mm):

The thermal resistance of the product: 1.00 m²K/W
The thermal conductivity of the product: 0.032 W/(mK)
Reaction to fire: Euroclass A2 – S1, d0
Product density: 13 mm 114 kg/m^3

Description of the main product components and/or materials:

Mineral wool	90-95 %	(REACH registration number 01-2119472313-44-0039)
Binder	0 -10 %	

PARAMETER	VALUE
Quantity of mineral wool	3648 g
Thickness of mineral wool	32 mm
Surfacing	None
Packaging for the transportation and distribution	PE-foil: 24,4 g/m² Wooden pallet: 129,1 g/m²
Product used for the Installation	None

LCA calculation information

FUNTIONAL UNIT	Providing a thermal insulation on 1 m² with a thermal resistance of equals 1 m²K/W a thickness of 31 mm
SYSTEM BOUNDARIES	Cradle to Grave. Mandatory stages: A1-3, A4-5, B1- 7, C1-4
REFERENCE SERVICE LIFE (RSL)	60 years
CUT-OFF RULES	See below
ALLOCATIONS	See below
ELECTRICITY USED FOR THE MANUFACTORING PROCESS	Renewable electricity mix (reference year 2018)
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Finland, 2018

Cut-off criteria

The cut-off criterion used in Saint-Gobain EPD will be the mass criterion with the following details:

- Taking into account all input and output flows in a unit process i.e. taking into account the value of all flows in the unit process and the corresponding LCI whenever available
- No simplification of the LCI by additional exclusions of material flows

Data collected at the manufacturing site was used. The inventory process in this LCA includes all data related

to raw material, packaging material and consumable items, and the associated transport to the manufacturing site. Process energy and water use, direct production waste and emissions to air and water are included. Scenarios have been developed to account for downstream processes such as demolition and waste treatment in accordance with the requirements of EN 15804:2012+A1:2013

All inputs and outputs to the manufacturing plants have been included and made transparent. All assumptions regarding the materials and water balances have also been included.

All hazardous and toxic materials and substances are considered in the inventory even though they are below the cut off criteria

There are excluded processes in the inventory:

- Flows related to human activities such as employee transport and administration activity.

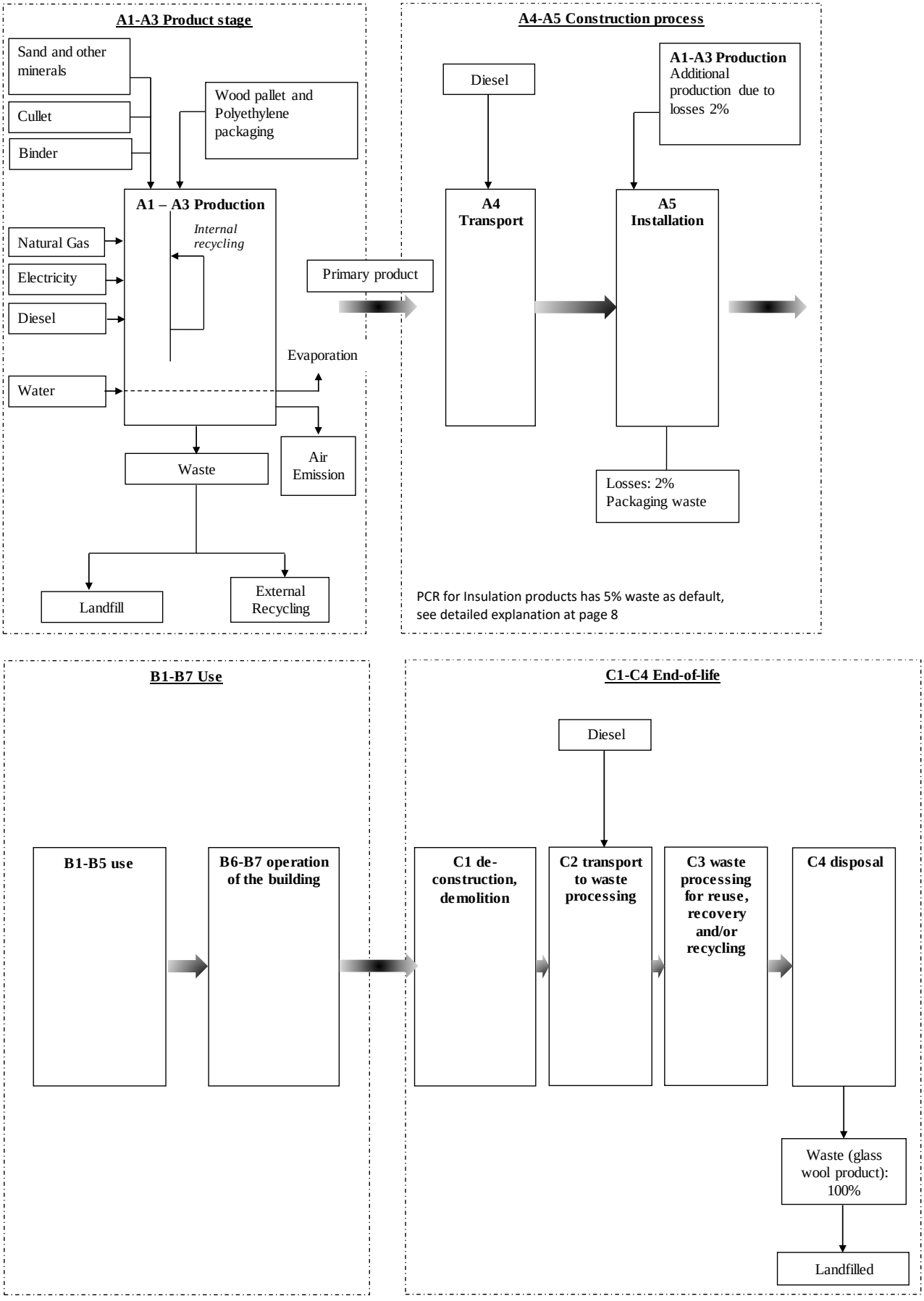
Allocation

Allocation criteria are based on mass.

The allocation of all the air emissions, wastes and energy usage are based on mass (kg). The reason we can use a mass basis is because we use the exact same manufacturing process shown for every product. We only produce glass mineral wool in the Hyvinkää and Forssa sites using the same process and therefore all the factors can be allocated by a mass basis. The amount of binder varies for different products and is accounted for as well as if different surface layers are used.

A mass balance was conducted for the 2018 production year to ensure that we have not excluded any materials, emissions and hence potential environmental impacts. Regarding the mass balance, all the raw materials and corresponding production goods and wastes generated were taken into account.

Flow diagram of the Life Cycle



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

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 15804 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.

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, glass cullet is also used as input.

About cullet: The main raw material for the production of glass insulation material is cullets or/and sand. Only specific cleaning activities and transport is included for the cullets – and thus not the impacts from the full life cycle of glass. The reason is that cullets are considered a waste product and not initially produced for the purpose of glass wool insulation production.
The only activities included are:

- Magnetic separation of metallic piece
- Separation of other piece-crushing of glass (<20 mm)
- Separation of bottle cap crushing (<2 mm) sieving
- Transport

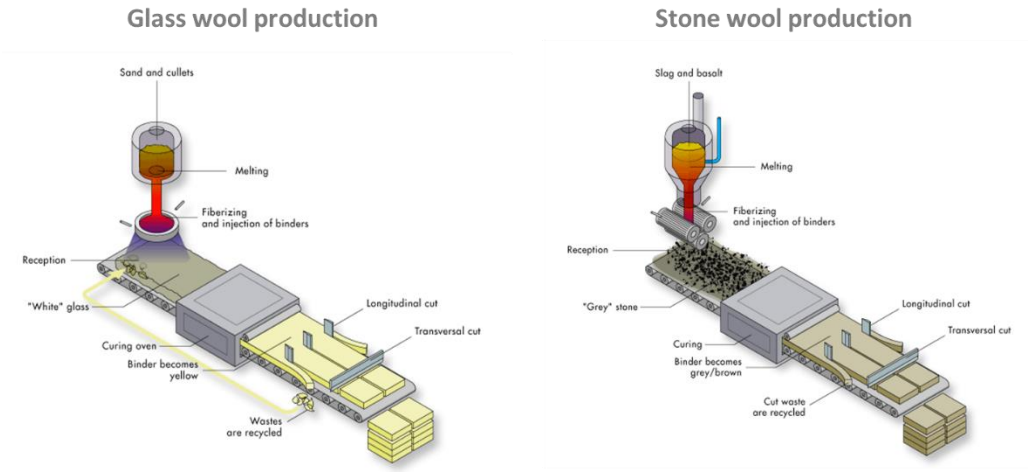
A2, Transport to the manufacturer

The raw materials are transported to the manufacturing site. In our case, the modeling include: road and boat transportations (specific values) of each raw material.

A3, Manufacturing

This module covers glass wool fabrication, including melting and fiberizing (see process flow diagram). In addition, the production of packaging material is taking into account at this stage.

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.

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 27t payload, diesel consumption 31,6 liters for 100 km
Distance	150 km
Capacity utilisation (including empty returns)	100 % of the capacity in volume 30 % of empty returns
Bulk density of transported products	114 kg/m^3 (uncompressed density)
Volume capacity utilisation factor	1.00

A5, Installation into the building:

This module includes:

- Wastage of products: 2 %. These losses are landfilled (landfill model for glass, see chapter End-of-life)
- Additional production processes to compensate for the loss
- Processing of packaging wastes: they are 100 % collected and modeled as recovered matter.

This module does not include:

- Energy for installation of the insulation, as the installation is done manually, and do not require energy

PARAMETER	VALUE
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	2 %*
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 recovered matter Following a conservative methodology mineral wool losses are considered to be landfilled, while they are 100% recyclable and/or reusable.

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

End-of-life stage, C1- C4

Description of the stage:

The stage includes the following different modules of end-of-life:

C1, De-construction, demolition

The de-construction and/or dismantling of insulation products are part of the demolition of the entire building, and are assumed to be made manually. In our case, the environmental impact is assumed to be very small and can be neglected.

C2, Transport to waste processing

Transport is included and calculated on the basis of a scenario with the parameters described in the End-of-life table below.

C3, Waste processing for reuse, recovery and/or recycling

Today the product is considered to be landfilled without reuse, recovery or recycling.

C4, Disposal

The glass wool is assumed to be 100% landfilled.

Description of scenarios and additional technical information: See below

PARAMETER	DESCRIPTION
Collection process specified by type	The entire insulation product (wool) is collected with mixed construction waste. 3648 g of glass wool (collected with mixed construction waste)
Recovery system specified by type	No re-use, recycling or energy recovery
Disposal specified by type	The entire insulation product (wool) is landfilled. 3648 g of glass wool are landfilled
Assumptions for scenario development (e.g. transportation)	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km. 25 km (default distance from the building site to landfill). Min. 30% empty returns

Reuse/recovery/recycling potential, D

Module D is not included in the EPD.

LCA results

LCA model, aggregation of data and potential environmental impact are calculated from the GaBi software 8.7 and CML impact method has been used, together with thinkstep 8.7 (2018) and ecoinvent V3.1 (2014) databases to obtain the inventory of generic data. Biogenic carbon is not reported in the context of GWP.

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant of Saint-Gobain Finland Oy / ISOVER in Forssa (Production data according 2018).

Resume of the LCA results detailed on the following tables.

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 CO_2 equiv/FU*	3,37E+00	2,67E-01	7,01E-02	0	0	0	0	0	0	0	0	2,39E-02	0	6,48E-02	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*	2,62E-07	4,06E-17	5,24E-09	0	0	0	0	0	0	0	0	2,08E-14	0	3,61E-16	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 break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
Acidification potential (AP) *kg SO_2 equiv/FU*	4,11E-02	1,21E-03	8,36E-04	0	0	0	0	0	0	0	0	1,00E-04	0	3,70E-04	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 $(PO_4)^{3-}$ equiv/FU*	1,07E-02	2,99E-04	2,16E-04	0	0	0	0	0	0	0	0	2,43E-05	0	4,19E-05	MND
Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.															
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	2,95E-03	4,43E-05	5,98E-05	0	0	0	0	0	0	0	0	3,72E-06	0	3,04E-05	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 resources (ADP-elements) - *kg Sb equiv/FU*	4,39E-04	3,53E-09	8,78E-06	0	0	0	0	0	0	0	0	3,24E-10	0	2,20E-08	MND
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	5,22E+01	3,70E+00	1,08E+00	0	0	0	0	0	0	0	0	3,33E-01	0	8,63E-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				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*	7,82E+01	8,5E-02	1,6E+00	0	0	0	0	0	0	0	0	8,6E-03	0	1,1E-01	MND
Use of renewable primary energy used as raw materials *MJ/FU*	2,17E+00	-	4,3E-02	-	-	-	-	-	-	-	-	-	-	-	MND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	8,03E+01	8,5E-02	1,6E+00	0	0	0	0	0	0	0	0	8,6E-03	0	1,1E-01	MND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	5,59E+01	3,7E+00	1,2E+00	0	0	0	0	0	0	0	0	3,3E-01	0	8,9E-01	MND
Use of non-renewable primary energy used as raw materials - *MJ/FU*	4,84E+00	-	9,7E-02	-	-	-	-	-	-	-	-	-	-	-	MND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	6,07E+01	3,7E+00	1,3E+00	0	0	0	0	0	0	0	0	3,3E-01	0	8,9E-01	MND
Use of secondary material *kg/FU*	3,04E+00	0	6,1E-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 - *m^3/FU*	7,65E-02	2,8E-05	1,5E-03	0	0	0	0	0	0	0	0	2,8E-06	0	2,3E-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 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1,96E-07	1,33E-08	4,30E-09	0	0	0	0	0	0	0	0	1,20E-09	0	1,52E-08	MND
Non-hazardous waste disposed *kg/FU*	3,13E-01	4,50E-05	9,24E-02	0	0	0	0	0	0	0	0	4,43E-06	0	4,15E+00	MND
Radioactive waste disposed *kg/FU*	4,63E-05	4,33E-06	1,19E-06	0	0	0	0	0	0	0	0	3,90E-07	0	1,19E-05	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*	4,42E-02	0	1,55E-01	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	0	0	0	0	0	0	0	0	0	0	0	0	MND

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.

ADDITIONAL INFORMATION

Influence of particular thicknesses

All the results in the table of this EPD refer to ISOVER VKL with a thickness of 32 mm for a functional unit of 1 m² with a thermal resistance equals to 1.00 m²K/W

This EPD of ISOVER VKL includes a range of thicknesses between 13 mm and 32 mm.
For every thickness, use 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 (value of R= 1.00 m²K/W for 32 mm).

The various multiplication factors are obtained by making the LCA calculations for all thicknesses, including packaging.

In the table below the multiplication factors are shown for products and specific thickness of the product family. In order to obtain the environmental performance associated with every specific product and thickness, the results expressed in this EPD must be multiplied by its corresponding multiplication factor. Such factor is based on GWP indicator and should be used as a proxy for the rest of indicator showed in this EPD. If there is a need for environmental performance for a thickness not presented in the table below, please use a thickness just above it.

PRODUCT THICKNESS (mm)	THERMAL RESISTANCE	MULTIPLICATION FACTOR
32	1.00	1.00
13	0.41	0.42

Influence of transportation to others countries

The results of stage A4 (transportation of product) in the table of this EPD refer to transportation in Finland.
This product is also delivered to the countries in the table below. In order to adapt the impact of transportation in the A4 column, figures from the current EPD shall be multiply by the multiplication factors below.

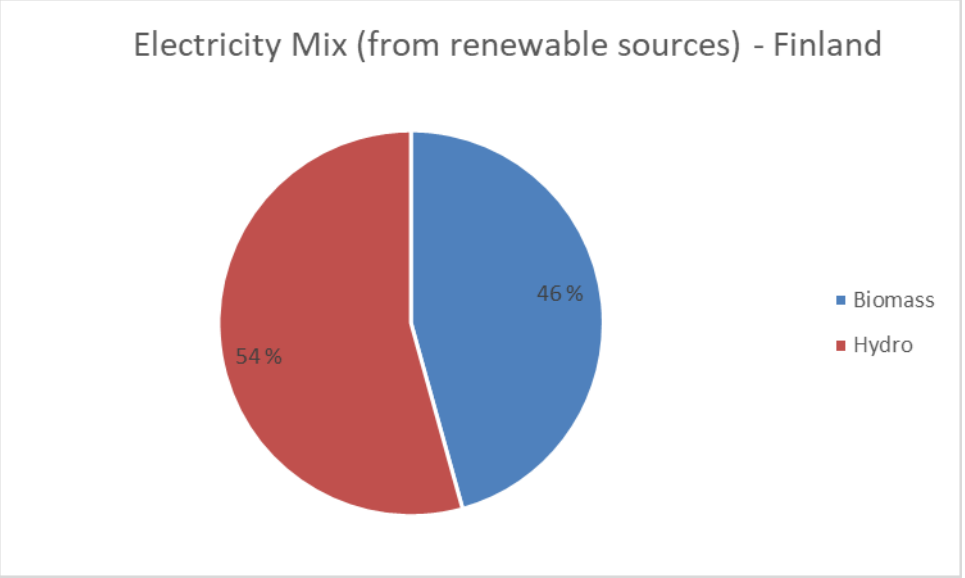
Country	Average distance	MULTIPLICATION FACTOR
Finland	**150 (Truck)**	**1,00**
Estonia	**200 (Truck 110 km, boat 90 km)**	**0,98**
Latvia	**510 (Truck 420 km, boat 90 km)**	**1,12**
Lithuania	**800 (Truck 710 km, boat 90 km)**	**1,24**

Additional Norwegian requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

The LCA calculation has been made taking into account the fact that during the manufacturing process it is used 100% renewable electricity. This 100% renewable electricity bought is evidenced by Guarantee of Origin certificates (GOs) from LOS, valid for the period chosen in the calculation (2018).

TYPE OF INFORMATION	DESCRIPTION
Location	Representative of average production in Finland
Geographical representativeness description	Split of energy sources in Finland - Hydro: 54% - Biomass: 46%
Reference year	2018
Type of data set	Cradle to gate from Thinkstep
Source	Gabi database from International Energy Agency -2013 Guarantee of Origin certificates (GOs) - 2018



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

DATA SOURCE	AMOUNT	UNIT
thinkstep (2018)	0.05	kg CO2 eq /KWh

Dangerous substances

The product contains no substances given by the REACH Candidate list (of 15.01.2018) or the Norwegian priority list. (REACH registration number 01-2119472313-44-0039)

Carbon footprint

Carbon footprint has not been worked out for the product

Bibliography

- Product Category Rules: NPCR 012:2018 Part B for Thermal insulation products

- Environmental labels and declarations - Type III environmental declarations -Principles and procedures (ISO 14025:2006)
- Environmental management - Life cycle assessment – Requirements and guidelines (ISO 14044:2006)
- Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products (EN 15804:2012)
- Ecoinvent database V3.1 (2014)
- Gabi database (2018)
- SS-EN 13172:2012 Thermal Insulation Products – Evaluation of conformity
- SS- EN 14303 "Thermal insulation products for building equipment and industrial installations. Factory made mineral wool (MW) products. Specification
- LCA report, Information for the Environmental Product Declaration of Isover product. Saint-Gobain Finland Oy/ Isover, June 2019

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