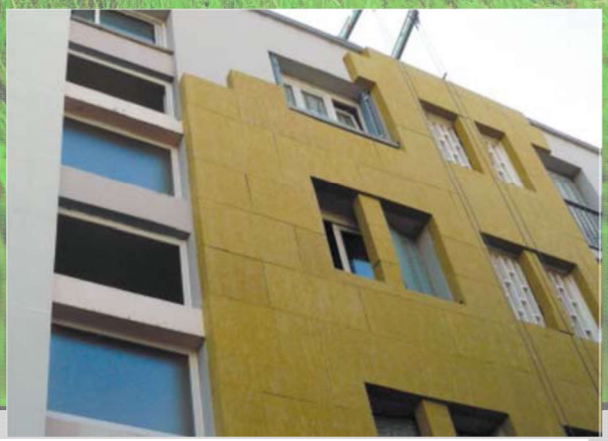


ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

ISOFEX



Date of publication: 2015-11-09
Revision date: 2018-11-06
Valid until: 2023-11-05
Based on PCR Construction products and construction services v2.2 and Sub-PCR-I Thermal insulation products
Scope of the EPD®: Spain and Portugal
Version: 2

Registration number The International EPD® System: S-P-00757
Reg. number Ecoplatform: ECO EPD 00000245

General information

Manufacturer: Saint Gobain Isover Ibérica SL. Avenida del Vidrio S/N. 19200 Azuqueca de Henares.
Programme used: The International EPD® System. More information at www.environdec.com
EPD® registration number: S-P-00757
Ecoplatform registration number: ECO EPD 00000245
PCR identification: PCR 2012:01 Construction products and construction services v2.2 and Sub-PCR-I Thermal insulation products
Product name and manufacturer represented: Isofex; Saint Gobain Isover Ibérica SL
Owner of the declaration: Saint Gobain Isover Ibérica SL
EPD® prepared by: Nicolás Bermejo and Alfonso Díez (Saint Gobain Isover Ibérica SL)
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Declaration issued: 2015-11-09, **Valid until**: 2023-11-05

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 Ibérica SL	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒	
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www.isover.es	

Product description

Product description and description of use:

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m² of mineral wool with a thermal resistance of 1,0 K*m²*W⁻¹.

The production site of Saint Gobain Isover Ibérica SL. in Azuqueca (Spain) uses raw materials of natural origin and abundant (i. e. volcanic rock or silica sand) in order to using fusion and fiberising techniques obtain mineral wool products. The products obtained from mineral wools are characterized by its lightness due to its air containing structure that keeps immobile between its intertwined filaments.

On Earth, 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, and its lambda value is between 0,030 W/(m·K) for the most efficient wools to 0.044 W/(m.K) to the least efficient ones.

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 noise and knocks,

offers acoustic correction inside of the buildings. Mineral wools contain mainly organic materials, considered incombustible and do not propagate flames.

Isover's mineral wool insulation (Glass wool, Stone wool, etc) is used in buildings as well as industrial facilities. It ensures a high level of comfort, lowers energy costs derived from the use of the housing, 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), or as long as the insulated building component is part of the building.

Technical data/physical characteristics:

The thermal conductivity of the mineral wool is: **0,036 W/(m·K)** (UNE EN 12667)
Reaction to fire: **Euroclass A1** (UNE EN 13501-1)
Acoustic properties: **Aw 0,9** (UNE EN ISO 354)
Water vapour transmission: **μ=1**(UNE EN 12086)

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

PARAMETER	VALUE
Quantity of wool for 1 m^2 of product	4,55 Kg
Thickness of wool	36 mm
Surfacing	None
Packaging for the transportation and distribution	Polyethylene Wood pallet Paper for the label
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.

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

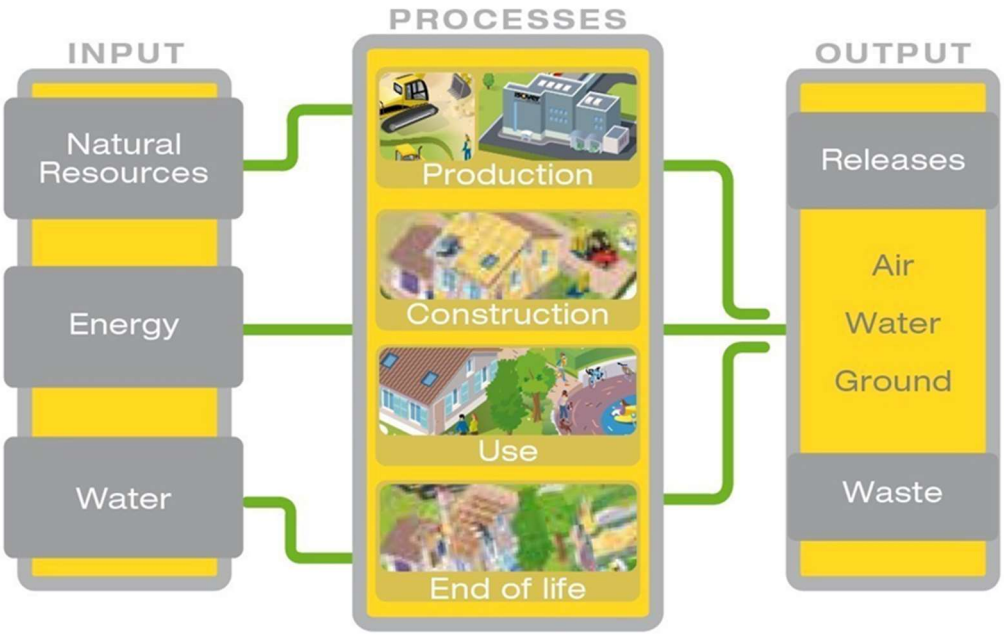
LCA calculation information

FUNCTIONAL UNIT	Providing a thermal insulation on 1 m² of product with a thermal resistance of 1 $K.m^2.W^{-1}$
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
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
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Spain and Portugal 2014

- “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”

Life cycle stages

Flow diagram of the Life Cycle



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®.

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

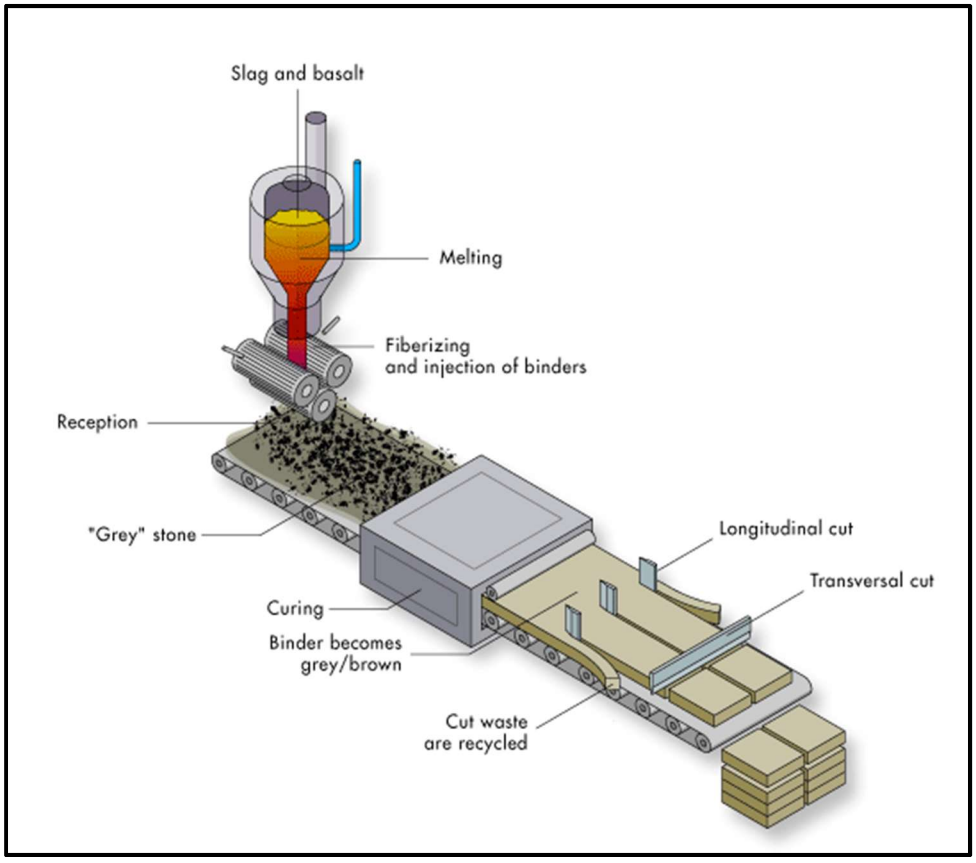
Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. sand and borax for glass wool. Besides these raw materials, recycled materials (agglomerates) are also used as input.

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

A3, Manufacturing
This module includes the manufacturing of the product and packagings. 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.

Manufacturing process flow diagram

Stone 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.

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 with a 24t payload, diesel consumption 38 liters for 100 km
Distance	450 km
Capacity utilisation (including empty returns)	100 % of the capacity in volume 30 % of empty returns
Bulk density of transported products*	20-200 kg/m^3
Volume capacity utilisation factor	1

Isover products presents a compression factor between 1 and 4. For an average volume of the truck of 65 m^3 and the m2 of product specified in the prices.

A5, Installation in the building: this module includes:

- Waste produced during the installation of the product (see value in percentage shown in the next table). These losses are sent to landfill (see landfill model for mineral wool at End of life chapter)
- Additional manufacturing processes done in order to compensate losses
- Packaging waste processing, which are 100% collected and recycled

PARAMETER	VALUE/DESCRIPTION
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	5 %
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)	Product packaging waste is 100% collected and recycled. 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 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.

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 insulation 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 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	**4.550 g** (collected with mixed construction waste)
Recovery system specified by type	No re-use, recycling or energy recovery
Disposal specified by type	**4.550 g** landfilled
Assumptions for scenario development (e.g. transportation)	Average truck trailer with a 24t payload, diesel consumption 38 liters for 100 km 25 km of average distance to landfill

Reuse/recovery/recycling potential, D

Description of the stage: module D has not been taken into account.

LCA results

LCA model, aggregation of data and environmental impact are calculated from the TEAM™ software 5.2. CML v 4.2 impact method has been used, together with DEAM (2006) and Ecoinvent 2.3 databases 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 of Isover Saint Gobain Spain in 2014.

The tables below summarize in detail the results of the LCA, corresponding to a product thickness of 36 mm. This thickness, although it does not correspond to a real product, corresponds to an R = 1 $K.m^2.W^{-1}$ facilitating in this way the comparison between different insulating materials.

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 CO2 equiv/FU*	4,55E+00	2,55E-01	2,45E-01	0	0	0	0	0	0	0	Irrelevant	1,30E-02	0	3,23E-02	MND[2]
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*	2,64E-07	1,77E-07	2,23E-08	0	0	0	0	0	0	0	Irrelevant	9,55E-09	0	9,68E-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 break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
Acidification potential (AP) *kg SO2 equiv/FU*	3,32E-02	1,55E-03	1,73E-03	0	0	0	0	0	0	0	Irrelevant	8,18E-05	0	1,92E-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 (PO4)3- equiv/FU*	5,45E-03	3,77E-04	3,00E-04	0	0	0	0	0	0	0	Irrelevant	2,00E-05	0	4,70E-05	MND
Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.															
Photochemical ozone creation (POPC) *Ethene equiv/FU*	1,41E-03	3,45E-05	7,27E-05	0	0	0	0	0	0	0	Irrelevant	1,82E-06	0	7,06E-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 resources (ADP-elements) - *kg Sb equiv/FU*	1,05E-06	3,77E-11	5,45E-08	0	0	0	0	0	0	0	Irrelevant	1,95E-12	0	0	MND

[2] MND=Module Not Declared

Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	7,27E+01	3,14E+00	3,82E+00	0	0	0	0	0	0	0	Irrelevant	1,64E-01	0	2,98E-04	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*	5,45E+00	1,77E-03	2,68E-01	0	0	0	0	0	0	0	Irrelevant	9,09E-05	0	0	MND
Use of renewable primary energy used as raw materials *MJ/FU*	-	-	-	-	-	-	-	-	-	-	Irrelevant	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	5,45E+00	1,77E-03	2,68E-01	0	0	0	0	0	0	0	Irrelevant	9,09E-05	0	0	MND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	6,82E+01	3,18E+00	3,55E+00	0	0	0	0	0	0	0	Irrelevant	1,68E-01	0	0	MND
Use of non-renewable primary energy used as raw materials *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	6,82E+01	3,18E+00	3,55E+00	0	0	0	0	0	0	0	Irrelevant	1,68E-01	0	0	MND
Use of secondary material *kg/FU*	5,00E-01	0	2,41E-02	0	0	0	0	0	0	0	0	0	0	0	MND

Use of renewable secondary fuels- *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water - *m3/FU*	1,55E-02	3,05E-04	7,72E-04	0	0	0	0	0	0	0	0	1,59E-05	0	0	MND

WASTE CATEGORIES

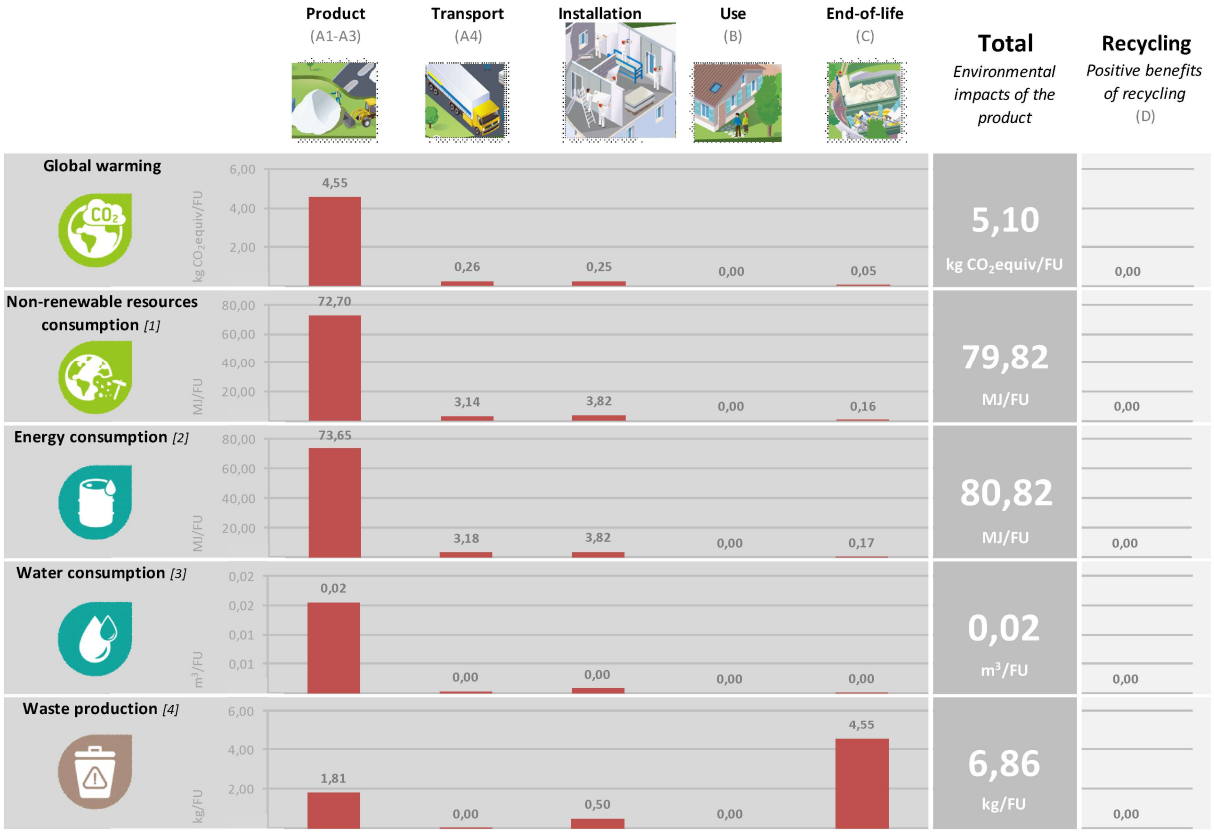
Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1,45E-03	7,27E-05	7,72E-05	0	0	0	0	0	0	0	Irrelevant	3,82E-06	0	0	MND
Non-hazardous waste disposed *kg/FU*	1,81E+00	2,73E-04	5,00E-01	0	0	0	0	0	0	0	Irrelevant	1,45E-05	0	4,55E+00	MND
Radioactive waste disposed *kg/FU*	1,36E-04	5,00E-05	9,54E-06	0	0	0	0	0	0	0	Irrelevant	2,68E-06	0	0	MND

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 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Materials for recycling *kg/FU*	9,54E-01	1,27E-06	1,36E-01	0	0	0	0	0	0	0	Irrelevant	6,82E-08	0	0	MND
Materials for energy recovery *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Exported energy *MJ/FU*	0	0	0	0	0	0	0	0	0	0	Irrelevant	0	0	0	MND

LCA interpretation

The Product stage (A1-A3) is the life cycle stage with the biggest impact, since it represents more than 90% of the whole impact of the product for the next impact categories: Global warming, Non-renewable resources consumption, energy and water consumption.
Waste production is mainly produced during the End of life stage (66% of the whole impact). This is due to the fact that 100% of the product is landfilled at the end of its service life.

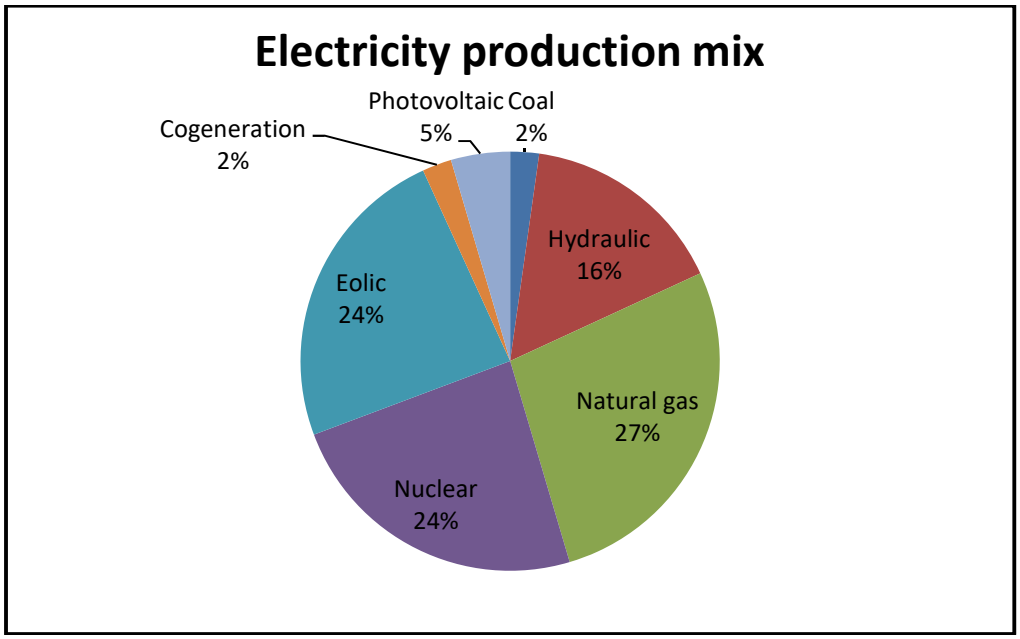


[1] This indicator corresponds to the abiotic depletion potential of fossil resources.
[2] This indicator corresponds to the total use of primary energy.
[3] This indicator corresponds to the use of net fresh water.
[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive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

Additional information

The electricity production mix considered for A1-A3 product stage is the Spanish electricity production mix in 2013[3].

The composition of the electricity production mix used is detailed in the next figure.
.



EPD® modifications regarding the previous version

- The present EPD® has been adapted to the requirements indicated in the Sub-PCR-I Thermal insulation products.
- The conversion table to the impact of the different thicknesses of the product has been moved to Annex I
- An explanation of the table indicated in the previous point has been introduced, as well as an explanation about the fact that the thickness corresponding to the Functional Unit (with R = 1 $K.m^2.W^{-1}$) does not correspond to a commercially sold thickness (FU used in order to facilitate the comparison between different types of insulation).

[3] Source: Red Eléctrica Española.

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- UNE-EN 15978:2012 Sostenibilidad en la construcción. Evaluación del comportamiento ambiental de los edificios. Método de cálculo.

Annex I Impact on the environment of the life cycle of different thicknesses of product

This EPD® includes the range of thicknesses between 40 mm and 300 mm, for every 10 mm, 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 (value of R= 1 m^2.K / W for 36 mm). All the results refer to 36 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 determinated 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
36	1
40	1,11
50	1,39
60	1,67
70	1,94
80	2,22
90	2,50
100	2,78
110	3,06
120	3,33
130	3,61
140	3,89
150	4,17
160	4,44
170	4,72
180	5,00
190	5,28
200	5,56
210	5,83
220	6,11
230	6,39
240	6,67
250	6,94
260	7,22
270	7,50
280	7,78
290	8,06
300	8,33