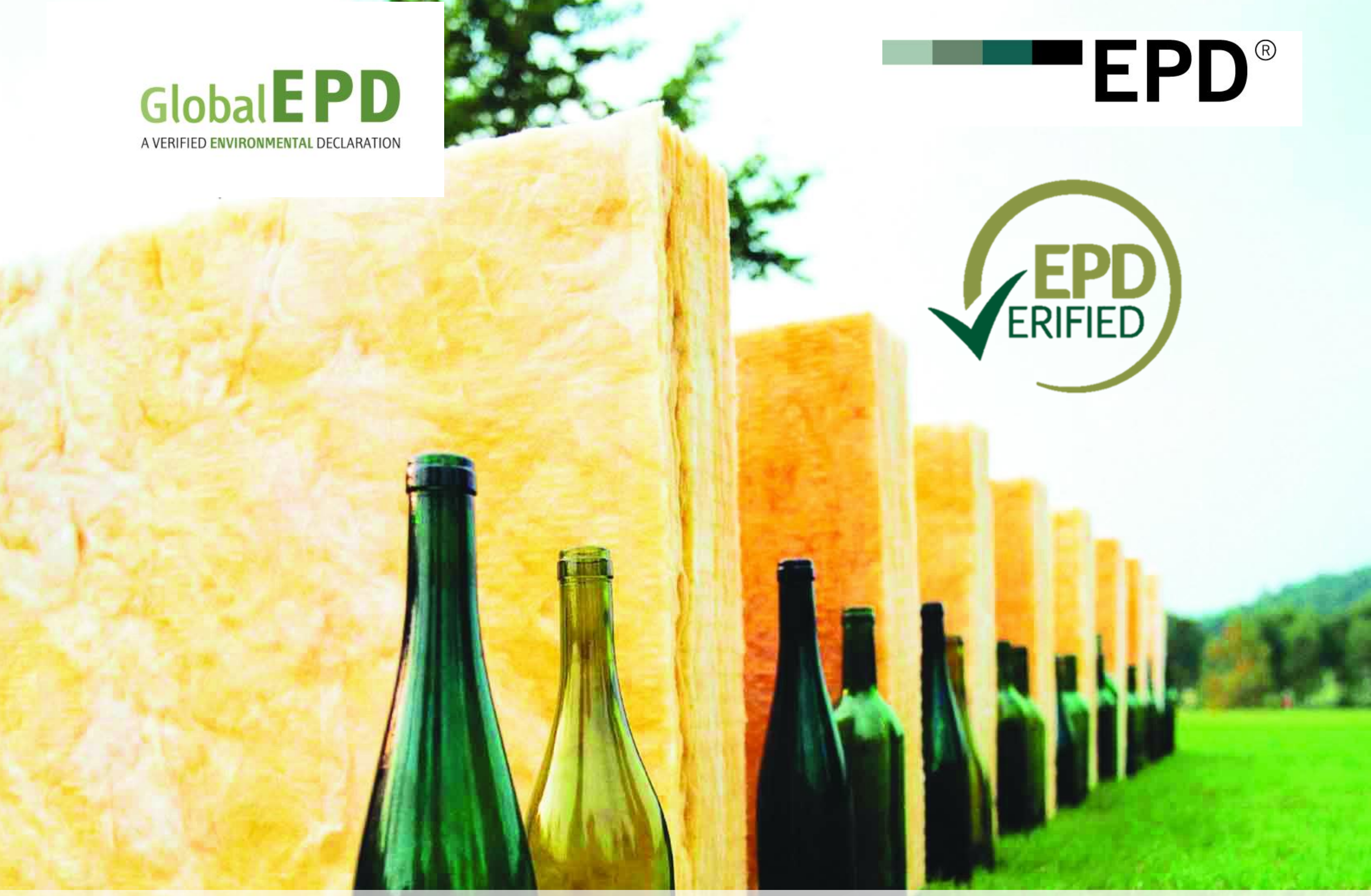

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804, ISO 14025, ISO 14040 and ISO14044

CLIMPIPE Section Alu2

Date of publication: 2018-07-17
Valid until: 2023-06-15
Based on PCR 2014:13 Insulation materials v 1.2
Scope of the EPD®: Spain and Portugal
Version: 2. EPD® registration number: S-P-01318
Nº AENOR Gobal EPD: Global EPD-IntEPD-S-P-01318

General information

Manufacturer: Saint-Gobain Isover Ibérica S.L. 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-01318
PCR identification: Insulation materials version 1.2 (2014:13)
Product name and manufacturer represented: Climpipe Section Alu 2; Saint-Gobain Isover Ibérica SL **Owner of the declaration:** Saint-Gobain Isover Ibérica SL
EPD® prepared by: Nicolás Bermejo y Alfonso Díez
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Declared issued: 2018-07-18, Valid until: 2023-06-15.

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 $K\cdot m^2\cdot W^{-1}$.

The Climpipe Section Alu 2 product is ISOVER glass wool shell, of cylindrical shape and with an opening made in its generatrix, covered on its outer face with an aluminum sheet reinforced with glass mesh, which acts as a vapor barrier.

The production site of Saint-Gobain Isover Ibérica SL uses raw materials of natural origin and abundant (i.e. volcanic rock or silica sand) in order to using fusion and fiberizing techniques to produce 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, 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 and knocks, offering acoustic correction inside premises. 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 (CO2) 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:

Thermal resistance of the product, R: **1,00 K·m²·W^{-1}**
The thermal conductivity of the mineral wool is: **0,032 W/(m·K)**
Reaction to fire: **Euroclass A2L-s1, d0. (UNE-EN 13501-1)**
Water vapor 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
Weight per 1 m^2 of product	**2,146 Kg**
Thickness of wool	**32 mm**
Surfacing	**Aluminum, polyethylene, glass fiber**
Packaging for the transportation and distribution	**Polyethylene** **Wood pallet** **Paperboard**
Product used for the Installation	**None**

During the life cycle of the product any hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization[1]" has been used in a percentage higher than 0,1% of the weight of the product.

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

LCA calculation information

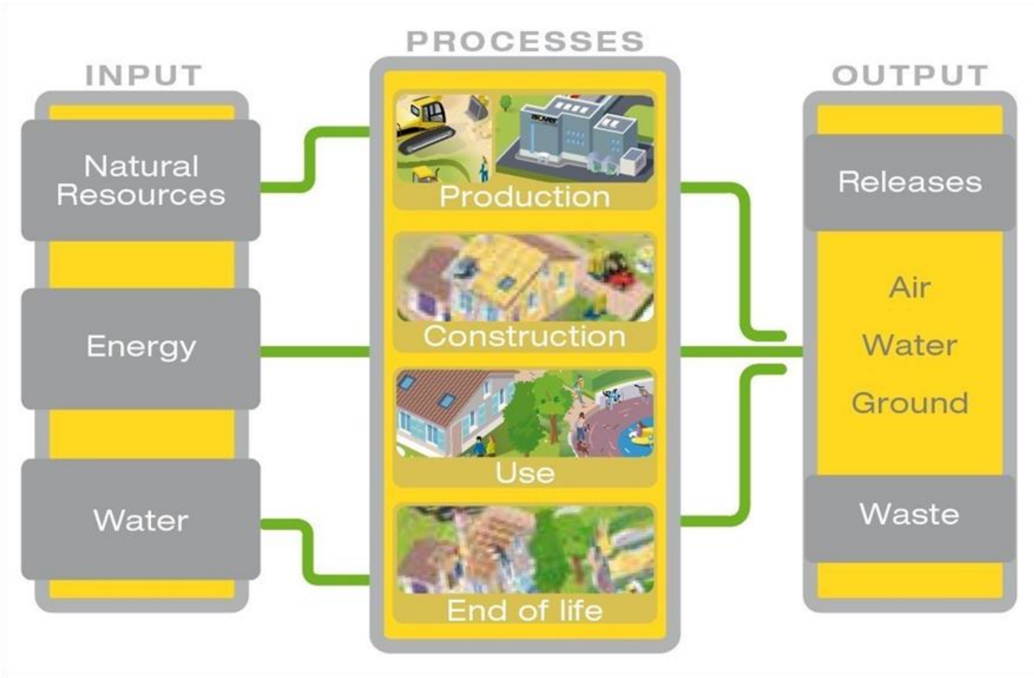
[1] http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

FUNCTIONAL UNIT	Providing a thermal insulation on 1 m² of product with a thermal resistance of 1 $K \cdot m^2 \cdot W^{-1}$
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, 2017

- “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 considers the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process

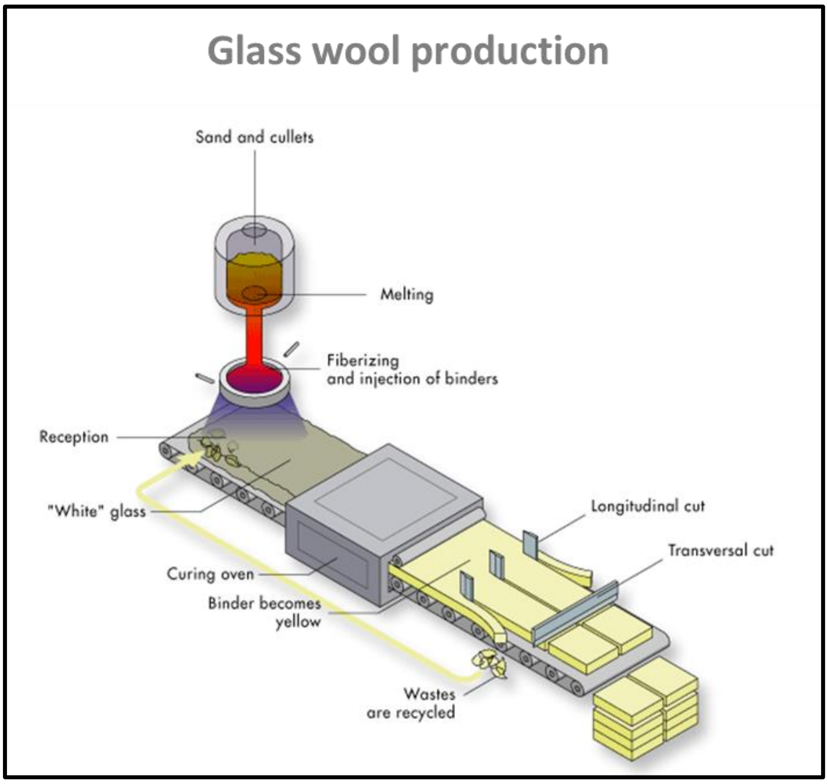
Specifically, the raw material supply covers production of binder components and sourcing (quarry) of raw materials for fiber production, e.g. sand and borax for glass wool. Besides these raw materials, recycled materials (agglomerates) are also used as input. Regarding to the electricity mix production, it has been used the Spanish mix corresponding to year 2017[2]

A2, Transport to the manufacturer
The raw materials are transported to the manufacturing site. In our case, the modeling includes the road distances traveled of each raw material.

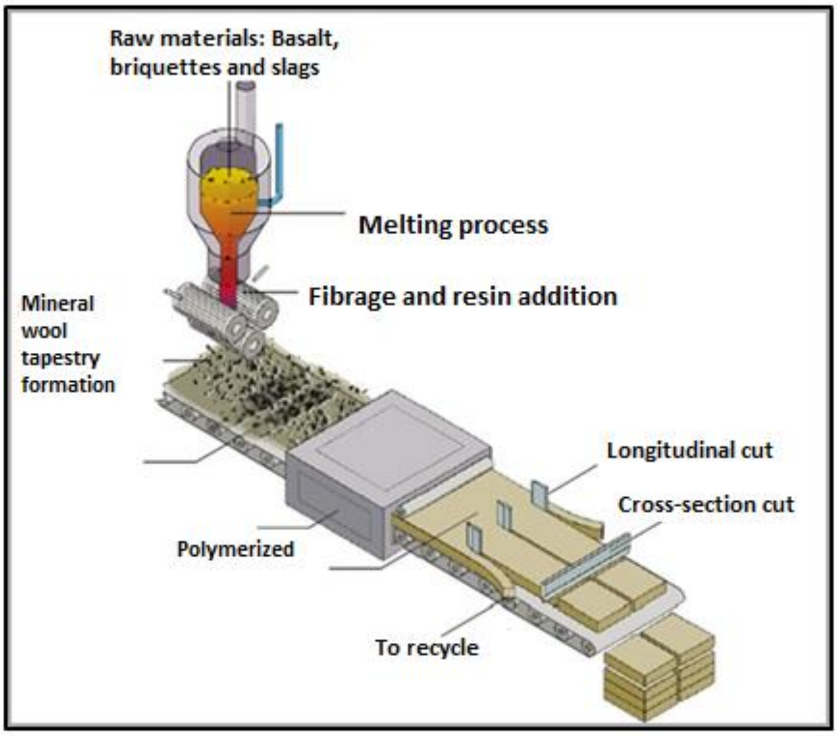
A3, Manufacturing
This module includes the manufacturing of the product and packaging. Specifically, it covers the manufacturing of glass, resin, mineral wool (including the processes of fusion and fiberizing showed in the flow diagram), and the packaging.

[2] Source: Red Eléctrica de España

Manufacturing process flow diagram



Rock 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 based on 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 i.e. long distance truck, boat, etc.	Average truck trailer with a >32t 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 m^2 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 production 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	VALOR/DESCRIPCIÓN
Collection process specified by type	**2,146** kg (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	**2,146** Kg landfilled
Assumptions for scenario development (e.g. transportation)	Average truck trailer with a 16-32t payload, diesel consumption 31 liters for 100 km 50 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 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 (year 2017).

Below, are attached the tables with the detailed LCA results, which corresponds to the referent thickness results (32mm, when R=1). The results for the other commercial thicknesses are showed trough a conversion factor table.

ENVIRONMENTAL IMPACTS CLIMPIPE Section Alu 2 32mm

Parameters	Product stage	Construction stage		Use stage							End of life				
	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 [3]
Global Warming Potential (GWP) - *kg CO2 equiv/FU*	2,00E+00	9,51E-02	1,08E-01	0	0	0	0	0	0	0	0	1,77E-02	0	1,14E-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*	2,00E-07	1,87E-08	1,17E-08	0	0	0	0	0	0	0	0	3,23E-09	0	3,84E-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*	9,91E-03	2,64E-04	5,20E-04	0	0	0	0	0	0	0	0	4,45E-05	0	8,57E-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*	3,53E-03	5,53E-05	1,82E-04	0	0	0	0	0	0	0	0	9,34E-06	0	1,83E-05	MND
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *Ethene equiv/FU*	8,72E-04	1,55E-05	4,51E-05	0	0	0	0	0	0	0	0	2,80E-06	0	4,21E-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*	6,65E-06	1,83E-07	3,51E-07	0	0	0	0	0	0	0	0	5,27E-08	0	1,27E-08	MND
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	2,65E+01	1,63E+00	1,47E+00	0	0	0	0	0	0	0	0	2,82E-01	0	3,43E-01	MND
	Consumption of non-renewable resources, thereby lowering their availability for future generations														

[3] MND=Module Not Declared

USE OF RESOURCES CLIMPIPE Section Alu 2 32mm

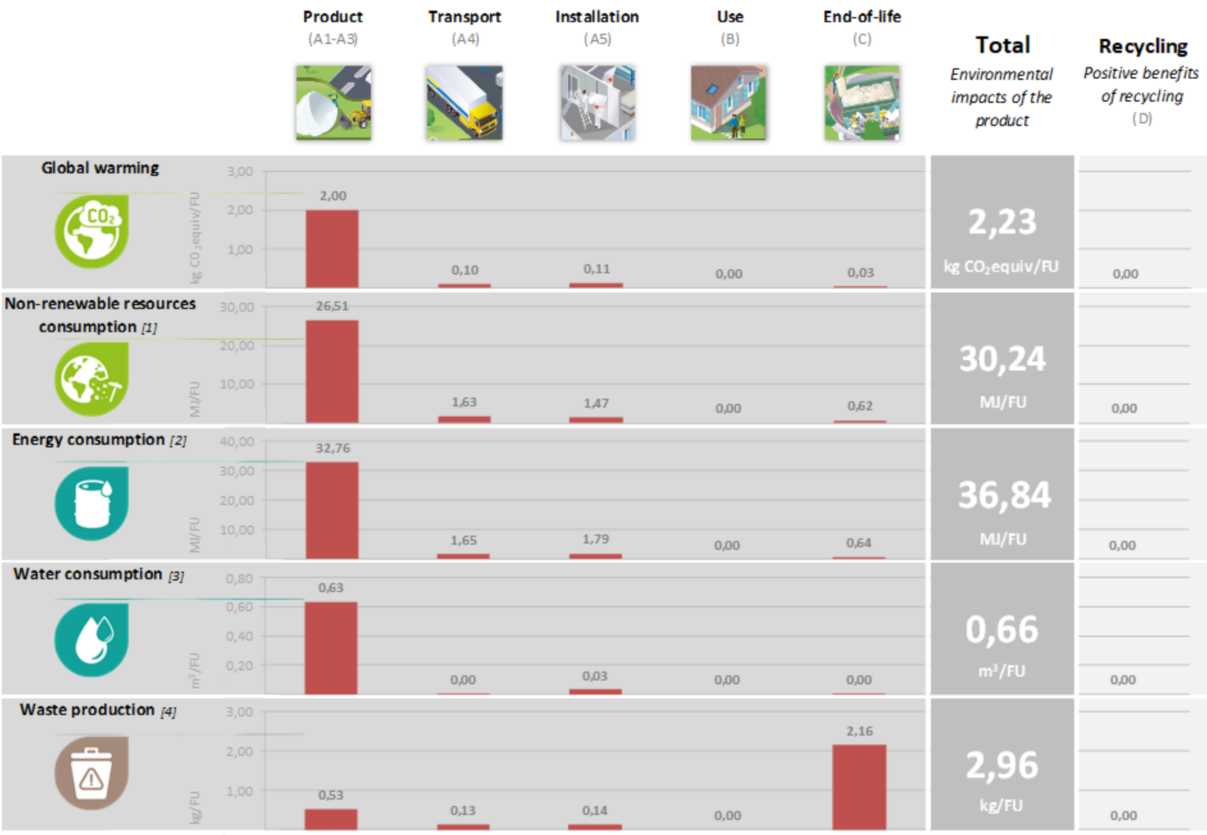
Parameters	Product stage	Construction process stage		Use stage							End of life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	6,25E+00	2,24E-02	3,15E-01	0	0	0	0	0	0	0	0	3,44E-03	0	8,19E-03	MND
Use of renewable primary energy used as raw materials *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	6,25E+00	2,24E-02	3,15E-01	0	0	0	0	0	0	0	0	3,44E-03	0	8,19E-03	MND
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2,65E+01	1,63E+00	1,47E+00	0	0	0	0	0	0	0	0	2,82E-01	0	3,43E-01	MND
Use of non-renewable primary energy used as raw materials *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2,65E+01	1,63E+00	1,47E+00	0	0	0	0	0	0	0	0	2,82E-01	0	3,43E-01	MND
Use of secondary material *kg/FU*	3,5E-01	0	0	0	0	0	0	0	0	0	0	0	0	0	MND
Use of renewable secondary fuels- *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Use of non-renewable secondary fuels - *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Use of net fresh water - *m3/FU*	6,31E-01	3,74E-04	3,16E-02	0	0	0	0	0	0	0	0	5,21E-05	0	3,57E-04	MND

WASTE CATEGORIES CLIMPIPE Section Alu 2 32mm																
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*	5,66E-04	8,86E-07	2,84E-05	0	0	0	0	0	0	0	0	1,65E-07	0	2,25E-07	MND
Non-hazardous waste disposed *kg/FU*	5,29E-01	1,31E-01	1,42E-01	0	0	0	0	0	0	0	0	1,27E-02	0	2,15E+00	MND
Radioactive waste disposed *kg/FU*	1,27E-04	1,07E-05	7,28E-06	0	0	0	0	0	0	0	0	1,83E-06	0	2,18E-06	MND

OTHER OUTPUT FLOWS CLIMPIPE Section Alu 2 32mm															
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	
Components for re-use *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Materials for recycling *kg/FU*	0	0	1,80E-01	0	0	0	0	0	0	0	0	0	0	0	MND
Materials for energy recovery *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MND
Exported energy *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MND

LCA Interpretation

The product stage (A1-A3) is the stage with a major impact over the life cycle, since it represents between 93% (Eutrophication) and 84% (Ozone Layer Depletion) of the total life cycle impacts. This stage accumulates an 88% of the impacts (generated due the consumption of non-renewable resources), and a 95% of the water consumption over the life cycle. Waste is produced mainly during the End of Life stage (C1-C4), representing 73% of the total impact. This is due the 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.

On the next table are shown the conversion factors that can be used to calculate the environmental performance of the different commercial thicknesses of the product Climpipe Section Alu 2. In order to know their environmental impact, it's needed to multiply the previous results by the following conversion factors.

Mineral wool thickness (mm)	Conversion factor
25	0,83
30	0,92
32	1
40	1,20
50	1,37

The following table shows the conversion factors to obtain the impact per linear meter of product. To know the environmental impact of the different thicknesses and diameters per linear meter, you must multiply the previously obtained impact results per m^2 by the corresponding conversion factor:

Diameter		Mineral wool thickness			
Inches	**Mm**	**25**	**30**	**40**	**50**
1/2	21	0,361	0,481	0,583	0,803
3/4	27	0,408	0,537	0,657	0,870
1	34	0,398	0,518	0,669	0,699
1,25	42	0,403	0,519	0,742	0,766
1,5	48	0,413	0,529	0,758	0,816
2	60	0,427	0,543	0,666	0,915
2,5	76	0,420	0,529	0,772	1,048
3	89	0,474	0,594	0,858	1,157
4	114	0,578	0,719	1,025	1,365
5	140	0,687	0,848	1,198	1,581
6	169	0,808	0,993	1,392	1,823
8	219	1,015	1,243	1,724	2,238

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