

ENVIRONMENTAL PRODUCT DECLARATION

In Accordance with ISO 14025 and 15804:2002+A2:2019 for

fibran[®]GEO



Programme

The International EPD[®] System, www.environdec.com

Programme operator

EPD International AB

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fibran

 **EPD[®]**

THE INTERNATIONAL EPD[®] SYSTEM

PROGRAMME RELATED INFORMATION

Programme:	The international EPD System
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EPD Based on Product Category Rules (PCR)	The CEN standard EN 15804 serves as the core Product Category Rules (PCR) PCR 2019:14 Construction products (EN 15804:A2); Version 1.1; 2020-09-14 C-PCR-005 "Thermal insulation products (EN 16783:2017)
PCR review was conducted by	The Technical Committee of the International EPD® System.
Independent third-party verification of the declaration and data, according to ISO 14025:2006	☐ EPD process certification ☒ EPD verification
Third party verifier:	Vladimir Koci Approved by: The International EPD® System
EPD Prepared by	ENVIROMETRICS Ltd www.envirometrics.gr
Procedure for follow-up during EPD validity involves third party 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 programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

COMPANY INFORMATION

FIBRAN S.A. was founded in Greece, Thessaloniki, in 1974. Ever since, FIBRAN S.A. has been designing and manufacturing products and solutions for the thermal insulation, acoustic insulation and fire protection in building, industrial and marine applications. Since 1995, it plays a leading role as a producer of insulation materials both in Greece and in Europe.

Today, FIBRAN has 6 production units, utilizing the latest technology for the manufacture of insulation products (Extruded Polysterene, Stone wool and Expanded Polysterene), as well as Gypsum Boards.

In Greece, in the industrial plant located in the Village of Terpni, Serres, FIBRAN produces stonewool insulation products with the brand name FIBRANgeo and extruded polysterene products with the brand name FIBRANxps. Other extruded polysterene production units are located in Portugal, Bulgaria and Slovenia. In Italy, FIBRAN has invested in the production of gypsum products (gypsum boards and bagged products), as well as in the distribution of insulation, waterproofing and dry construction materials. Finally, in North Macedonia, FIBRAN produces expanded polysterene.

Purpose of FIBRAN products and solutions is to bring energy efficiency in building, industrial and marine applications.

PRODUCT DESCRIPTION

FIBRANgeo is the commercial name of Mineral Wool (Stone Wool) as produced in Terpni, Serres, Greece and supplied by FIBRAN S.A.. It is a natural fibrous material for insulation against heat, cold, fire and sound. FIBRANgeo is made from stone raw materials, such as amphibolite, dolomite and bauxite. The product is used in industrial and building applications, such as insulation of pipes, roofs, pilotis, ceilings, dry construction, walls and floors.

A typical material composition along with technical specification are presented below:

Material	Composition (%)
Minerals	>95
PUF resin	<5
Additives	< 0,5

Technical Specifications

Density (kg/m ³)	30 - 200
Thermal conductivity, W/mK	0.033-0.039
Reaction to fire (BS EN 13501-1:2002)	A1 (non-combustible)

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations are present in the FIBRAN's products, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt). None of the raw materials used in production belong to the Authorization List - Annex XIV, to the Restriction List - Annex XVII and to the SVHC Candidate List of December 2019, of REACH regulation.

This EPD covers the products listed in the table below:

Products			
B-030	B-051	BP-30	CORE BL
B-040	B-571	BP-40	CORE BP
B-050	B-002	BP-50	TBP-080
B-060	R-040	BP-HD	TBP-090
B-070	R-050	BP- 70	TBP-001
B-570	R-560	BP-80	Roccia D
B-080	R-080	BP-001	Roccia TOP
B-090	R-001	BP-ETICS	Roccia K8
B-001	R-021	BP-ETICSplus	Roccia K8 PLUS
B-021			

All the possible facings are included. Those are (YM) black glass veil, (YA) white glass veil, (AL) aluminium and (KO) stitched wire net. Also, (XA) paper craft, (AX) aluminium craft and (BIT) bitumen primer are included, but FIBRANgeo with those facings does not have A1 reaction to fire classification.

The total recycling content is between 15% to 65%.

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

Declared unit	The declared unit is 1 m ² of FIBRANgeo with $\lambda=0.033-0.039$ W/mK. The thickness is 30 mm and the density 100 kg/m ³ .
Reference service life (RSL)	At least 50 years (as long as the lifetime of the building in which it is installed)
Product group classification	UN CPC 3799 'Non-metallic mineral products n.e.c.'
Goal and Scope	This EPD evaluates the environmental impacts of the production of 1 m ² of FIBRANgeo with $\lambda=0.033-0.039$ W/mK. from Cradle to grave and module D
System Boundary	Cradle to grave and module D (A + B + C + D)
Cut-Off Rules	For this LCA study, 1% cut off rule applies.
Background Data	The most recent version of Ecoinvent database (V3.7) was used as a source of background data.
Data Quality	Data on raw materials, transportation, energy, waste and water is collected by FIBRAN S.A.
Time representiveness	All primary data used in this study is for the entire year 2019.
Geographical Scope	Worldwide
Allocations	There are no co-products in the production of FIBRANgeo manufactured by FIBRAN. Hence, there was no need for co-product allocation.
LCA software	openLCA v. 1.10.3

SYSTEM BOUNDARIES

Product stage			Construction stage		Use stage							End of life stage				Resource recovery stage
Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	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	X

Description of the system boundary (X = Included in the study, MNA = Module Not Assessed)

PRODUCT STAGE

Product stage include raw material supply, transportation and manufacturing.

A1: Raw Material Supply

Production starts with raw materials supply mainly. The raw materials are natural stone, PUF resin and additives. Also, in this stage included the production of the packaging materials (polyethylene film, paper labels and wood pallets).

A2: Transportation

Some of the raw materials are locally sourced while others are transported from different countries in Europe and Turkey with lorry 16-32 tonnes.

A3: Manufacturing

Manufacturing processes include all the production activities within the plant with all the associated impacts.

These include:

1. Melting of raw material in electric furnace
2. Fiberization in spinner
3. Resin polymerization in polymerization furnace
4. Cutting, edge & facing addition
5. Packaging
6. Storing

The emissions of the upstream electricity used in this stage and modelled as Greece electricity residual mix are 601,4 g CO₂eq/kWh, according to Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA) Report for "Residual Energy Mix 2019" for Greece.

CONSTRUCTION STAGE

Construction stage includes transportation from the factory to the final user and installation in the building.

A4: Transportation

The transportation concerns either to reseller close to the final user either the final user. For this stage an average distance of 500 km delivered by lorry 16-32 tonnes was assumed.

A5: Installation

FIBRANgeo is installed in the building manually. No ancillary material, water or other resource used in this stage. However, Waste materials on the building site before waste processing, generated by the product's installation, should be included. It is assumed that 5% waste of the material generated from the product installation which is transported to landfill by lorry 16-32 tonnes over a distance of 50 km.

USE-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**

FIBRANgeo does not require maintenance, repair, replacement or refurbishment during use in standard conditions and if correctly applied. Also, after installation, FIBRANgeo does not use energy or water during use of the building. As a result, the environmental impacts for use stage is zero.

Note that in this stage, potential energy savings are excluded

END OF LIFE STAGE

The end-of-life stages begins with the deconstruction and demolition of entire building in which FIBRANgeo is installed and then they are transferred for recycling and disposal. Though it is possible the 100% recycling of the mineral phase of the mineral wool, this does not happen because of not developing the appropriate separation process of the different materials yet.

C1: De-construction, demolition

The environmental impact is assumed to be very small and can be neglected since the de-construction and/or dismantling of insulation products take part of the demolition of the entire building.

C2: Transport to waste processing

The product is assumed to be 100% landfilled as it is. Hence, a distance of 50 km by lorry 16-32 tonnes from construction/demolition sites to disposal sites has been chosen as a conservative assumption.

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

The environmental impacts are zero since the product is considered to be landfill without reuse, recovery or recycling.

C4: Disposal

The product is assumed to be 100% landfilled.

BENEFITS AND LOADS BEYOND THE PRODUCT SYSTEM BOUNDARY IN INFORMATION MODULE D

Module D consists of avoided burdens related to the potential reuse and/or recycling of the product after its end-of-life stage. Since the product is only disposed, there are no benefits deriving from the reuse or recycling of the product after its end-of-life stage, and neither any energy recovery from incinerating the packaging materials.

ENVIRONMENTAL PERFORMANCE INDICATORS

The environmental performance indicators are shown in the following tables for the declared unit of 1m² at 30 mm thickness (0.030 m³). For stages A1-A3 the results are aggregated.

ENVIRONMENTAL IMPACTS PER 1 m² of FIBRANgeo

ENVIRONMENTAL IMPACTS	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	4,28E+00	2,58E-01	1,66E-02	0,00E+00	0,00E+00	2,47E-02	0,00E+00	2,58E-01	0,00E+00
GWP-fossil	kg CO2 eq	4,27E+00	2,58E-01	1,66E-02	0,00E+00	0,00E+00	2,47E-02	0,00E+00	2,58E-01	0,00E+00
GWP-biogenic	kg CO2 eq	8,59E-03	8,69E-05	1,29E-05	0,00E+00	0,00E+00	8,32E-06	0,00E+00	8,69E-05	0,00E+00
GWP-luluc	kg CO2 eq	3,37E-03	8,75E-05	8,11E-06	0,00E+00	0,00E+00	8,38E-06	0,00E+00	8,75E-05	0,00E+00
GWP-GHG¹	kg CO2 eq	4,27E+00	2,58E-01	1,66E-02	0,00E+00	0,00E+00	2,47E-02	0,00E+00	2,58E-01	0,00E+00
ODP	kg CFC-11 eq	4,16E-07	5,90E-08	2,16E-09	0,00E+00	0,00E+00	5,65E-09	0,00E+00	5,90E-08	0,00E+00
AP	mol H+ eq	2,13E-02	1,29E-03	6,07E-05	0,00E+00	0,00E+00	1,24E-04	0,00E+00	1,29E-03	0,00E+00
EP-freshwater	kg PO4 ⁻³ eq	1,59E-02	5,35E-05	5,66E-06	0,00E+00	0,00E+00	5,13E-06	0,00E+00	5,35E-05	0,00E+00
EP-freshwater²	kg P eq	5,18E-03	1,75E-05	1,85E-06	0,00E+00	0,00E+00	1,67E-06	0,00E+00	1,75E-05	0,00E+00
EP-marine	kg N eq	3,64E-03	4,51E-04	2,29E-05	0,00E+00	0,00E+00	4,32E-05	0,00E+00	4,51E-04	0,00E+00
EP-terrestrial	mol N eq	2,87E-02	4,92E-03	2,12E-04	0,00E+00	0,00E+00	4,71E-04	0,00E+00	4,92E-03	0,00E+00
POCP	kg NMVOC eq	9,46E-03	1,40E-03	6,39E-05	0,00E+00	0,00E+00	1,34E-04	0,00E+00	1,40E-03	0,00E+00
ADPe	kg Sb eq	7,34E-05	7,18E-06	3,18E-07	0,00E+00	0,00E+00	6,87E-07	0,00E+00	7,18E-06	0,00E+00
ADPf	MJ	7,98E+01	3,94E+00	2,08E-01	0,00E+00	0,00E+00	3,78E-01	0,00E+00	3,94E+00	0,00E+00
WDP	m ³ eq	4,71E-01	5,82E-03	9,29E-04	0,00E+00	0,00E+00	5,58E-04	0,00E+00	5,82E-03	0,00E+00

¹ This indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product. with characterization factors (CFs) based on IPCC (2013)

²Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq.

RESOURCE USE PER 1 m² of FIBRANgeo

RESOURCE USE	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	MJ	5,99E+00	5,30E-02	6,30E-03	0,00E+00	0,00E+00	5,07E-03	0,00E+00	5,30E-02	0,00E+00
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	5,99E+00	5,30E-02	6,30E-03	0,00E+00	0,00E+00	5,07E-03	0,00E+00	5,30E-02	0,00E+00
PENRE	MJ	7,62E+01	4,17E+00	2,15E-01	0,00E+00	0,00E+00	4,00E-01	0,00E+00	4,17E+00	0,00E+00
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	7,62E+01	4,17E+00	2,15E-01	0,00E+00	0,00E+00	4,00E-01	0,00E+00	4,17E+00	0,00E+00
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m ³	4,71E-01	5,82E-03	9,29E-04	0,00E+00	0,00E+00	5,58E-04	0,00E+00	5,82E-03	0,00E+00

OUTPUT FLOWS AND WASTE CATEGORIES PER 1 m² of FIBRANgeo

OUTPUT FLOWS AND WASTE CATEGORIES	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	kg	4,67E-05	1,02E-05	3,71E-07	0,00E+00	0,00E+00	9,80E-07	0,00E+00	1,02E-05	0,00E+00
NHWD	kg	2,57E-01	1,88E-01	1,59E-01	0,00E+00	0,00E+00	1,80E-02	0,00E+00	1,88E-01	0,00E+00
RWD	kg	2,62E-04	2,69E-05	1,05E-06	0,00E+00	0,00E+00	2,58E-06	0,00E+00	2,69E-05	0,00E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ADDITIONAL ENVIRONMENTAL IMPACTS PER 1 m² of FIBRANgeo

ADDITIONAL	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PM	Disease incidence	8,37E-08	1,84E-08	1,01E-09	0,00E+00	0,00E+00	1,77E-09	0,00E+00	1,84E-08	0,00E+00
IR	kBq U235 eq	7,24E-01	2,05E-02	1,08E-03	0,00E+00	0,00E+00	1,97E-03	0,00E+00	2,05E-02	0,00E+00
EF	CTUe	2,38E+00	6,90E-01	4,35E-02	0,00E+00	0,00E+00	6,61E-02	0,00E+00	6,90E-01	0,00E+00
HT-c	CTUh	6,15E-08	5,26E-09	1,21E-09	0,00E+00	0,00E+00	5,04E-10	0,00E+00	5,26E-09	0,00E+00
HT-nc	CTUh	3,77E-07	3,76E-08	1,80E-09	0,00E+00	0,00E+00	3,60E-09	0,00E+00	3,76E-08	0,00E+00
LU	Dimensionless	1,67E+01	3,96E+00	2,41E-01	0,00E+00	0,00E+00	3,79E-01	0,00E+00	3,96E+00	0,00E+00

RESULTS INTERPRETATION

As can be seen in Figure 1, the life cycle environmental impacts of FIBRANgeo are mainly dominated by Product Stage (A1-A3) following by Transportation of product (A4).

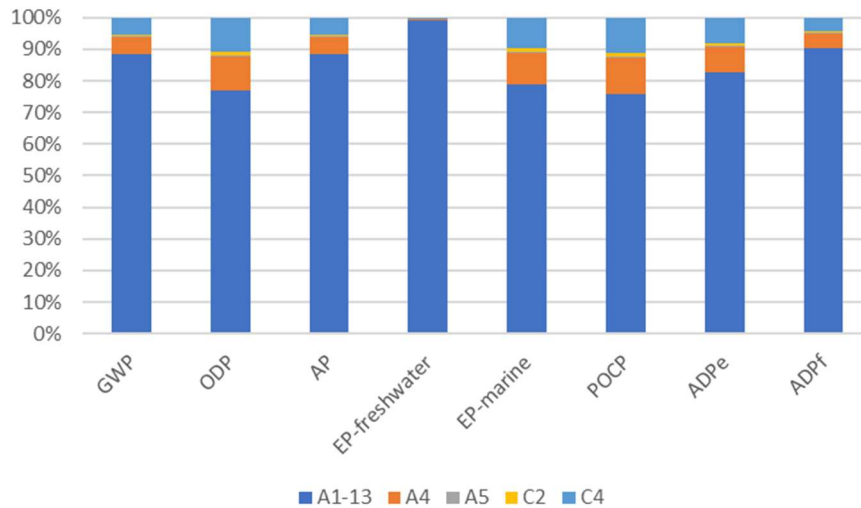


Figure 1 Contribution of each stage of Life cycle of FIBRANgeo in environmental impacts

Since the production phase (A1-A3) is responsible for over 80% of the Global Warming Potential indicator, it is very important to be studied in more detail. In Figure 2, it is presented how the different sectors of production stage (A1-A3) contribute to the Global warming Potential. It seems that more than 60% is due to electricity generation while the production of raw materials is almost 22%.

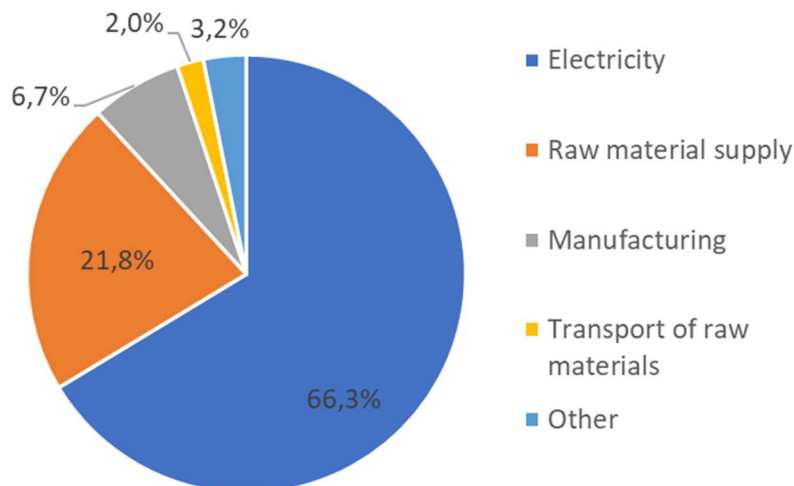


Figure 2 Contribution of each stage of A1-A3 in Global Warming Potential

The high contribution of electricity generation in Global warming, is owing to the higher residual energy mix for Greece, 601,4 gCO₂eq/kwh, compared to the majority of European countries.

IMPACTS FOR DIFFERENT THICKNESS AND DENSITY

This EPD covers FIBRANgeo products in the range of density between 30 and 200 kg/m³ and the range of thicknesses between 20 mm and 400 mm. The impacts listed in tables above concerns the product with λ in the range of 0,033-0,039 W/mK for thickness 30 mm and density 100 kg/m³. To determine the impacts for products with different density and thickness, a conversion factor (A) shall be multiplied with each impact category. The conversion factor (A) is calculated by:

$$A = \frac{\rho \cdot S}{3}$$

Where:

- ρ = density of the product [kg/m³]
- S = product thickness [m]

REFERENCES

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Version 3.01, 2019-09-18

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Ecoinvent, www.Eco-invent.org

Residual Energy Mix 2019 *from Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA)*

LIST OF ABBREVIATIONS

GWP-total	Global Warming Potential total
GWP-fossil	Global Warming Potential fossil
GWP-biogenic	Global Warming Potential biogenic
GWP-luluc	Global Warming Potential land use and land use change
ODP	Ozone Depletion Potential
AP	Acidification Potential
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication Potential fraction of nutrients reaching marine end compartment
EP-terrestrial	Eutrophication potential, Accumulated Exceedance
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADPe	Abiotic depletion potential for non-fossil resources
ADPf	Abiotic depletion potential for fossil resources
WDP	Water use
PERE	Use of renewable primary energy excluding resources used as raw materials
PERM	Use of renewable primary energy resources used as raw materials

PERT	Total use of renewable primary energy resources
PENRE	Use of non-renewable primary energy excluding resources used as raw materials
PENRM	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water
HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed
CRU	Components for re-use
MFR	Materials for recycling
MER	Materials for energy recovery
EE	Exported Energy