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ENVIRONMENTAL PRODUCT DECLARATION

Extruded Polystyrene (XPS)
Thermal Insulation Products

In accordance with ISO14025:2006 and EN 15804:2012+A2:2019

EPD REGISTRATION NUMBER
S-P-09837

PUBLICATION DATE
2023-07-21

REVISION DATE (Version 1.1)
2023-08-02

DATE OF VALIDITY
2028-07-20

PROGRAM
The International EPD® System
www.environdec.com

PROGRAM OPERATOR
EPD International AB

UN CPC
369: Other
plastic products.

EPD®
ENVIRONMENTAL PRODUCT DECLARATION
ECO PLATFORM
EPD
VERIFIED

PROGRAM INFORMATION

PROGRAM OPERATOR

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Product Category Rules (PCR):	CEN Standard EN 15804 serves as the Core Product Category Rules (PCR) PCR 2019:14 Construction products version 1.11 (EN 15804:A2)
LCA accountability:	SustChem Technical Consulting S.A. www.sustchem.gr
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:	☒ EPD verification by individual verifier
Third-party verification:	Prof. Vladimír Kočí Šárecká 5,16000, Prague 6 - Czech Republic www.lcastudio.cz
Approved by:	The International EPD® system
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.
The EPD is for multiple products
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'S PROFILE

Styropan S.A., a prominent Greek industrial company founded in 1982 specializes in the production of a vast portfolio of insulation products, such as :

- Thermal Insulation boards for expanded, graphite expanded and extruded polystyrene
- Building materials (Geofoam)
- Special parts and ready-made decoration solutions (e.g. moldings, rosettes, 3D wall panels etc.)

Styropan's vision and priority, is providing effective solutions to enable environmental sustainability and human prosperity.

STYROPAN AND SUSTAINABILITY

For many years, Styropan applies such practices that relate to sustainable development support and continuously aims to reduce the impact of its activity on the environment, through conscious choices across its supply chain.

Indicatively but not exclusively such practices include:

- At a corporate level: Implementation of an Environmental Management system certified according to the **ISO 14001: 2015 standard.**
- At a product level: Polystyrene insulation products that have **very low thermal conductivity coefficient value (λ)** and reduce the total energy consumption of the building.

PRODUCT INFORMATION

Styropan XPS extruded polystyrene is a synthetic material that has gained global recognition and is extensively used in various construction applications. XPS products find applications in various parts of a building, ranging from foundations to roofs.

XPS PRODUCTS	
XPS ETICS	XPS R&F (Roof & Floor)
XPS HCS (High Compressive Strength)	XPS Wall
XPS PR (for Pitched roofs)	XPS WS
XPS DP (Doors & Panels)	

CPC Code
The Central Product Classification code 369 has been used. The specific code applies for other plastic products

Styropan XPS extruded polystyrene stands out from other insulation materials due to its distinct properties:
• It is environmentally friendly, containing a portion of recycled raw materials.
• It possesses high mechanical strength, making it capable of withstanding heavy loads. This feature is especially important for areas like terraces, floors, and industrial facilities.
• It exhibits extremely low water absorption, making it ideal for insulating materials used in applications such as underground walls and inverted or green roofs.
• It has a very low thermal conductivity coefficient, which minimizes heat transfer between the building and its surroundings. This characteristic ensures optimal thermal comfort with minimal energy consumption.
• It is fully recyclable and does not contain harmful substances like chlorofluorocarbons (CFCs), hydro-chlorofluorocarbons (HCFCs), or hydro-fluorocarbons (HFCs).
• It demonstrates excellent adhesion to concrete or mortars and can be manufactured without the extrusion skin. It can also be produced with an embossed, rhomboidal surface, as seen in the Styropan XPS ETICS EMB variant.

PRODUCT INFORMATION

MATERIAL CONTENT OF THE FINAL XPS PRODUCTS (IN WEIGHT %)

XPS Type	STYROPAN XPS Products
Expandable Polystyrene	>90%
Blowing Agents	>9%
Additives	<0.5%

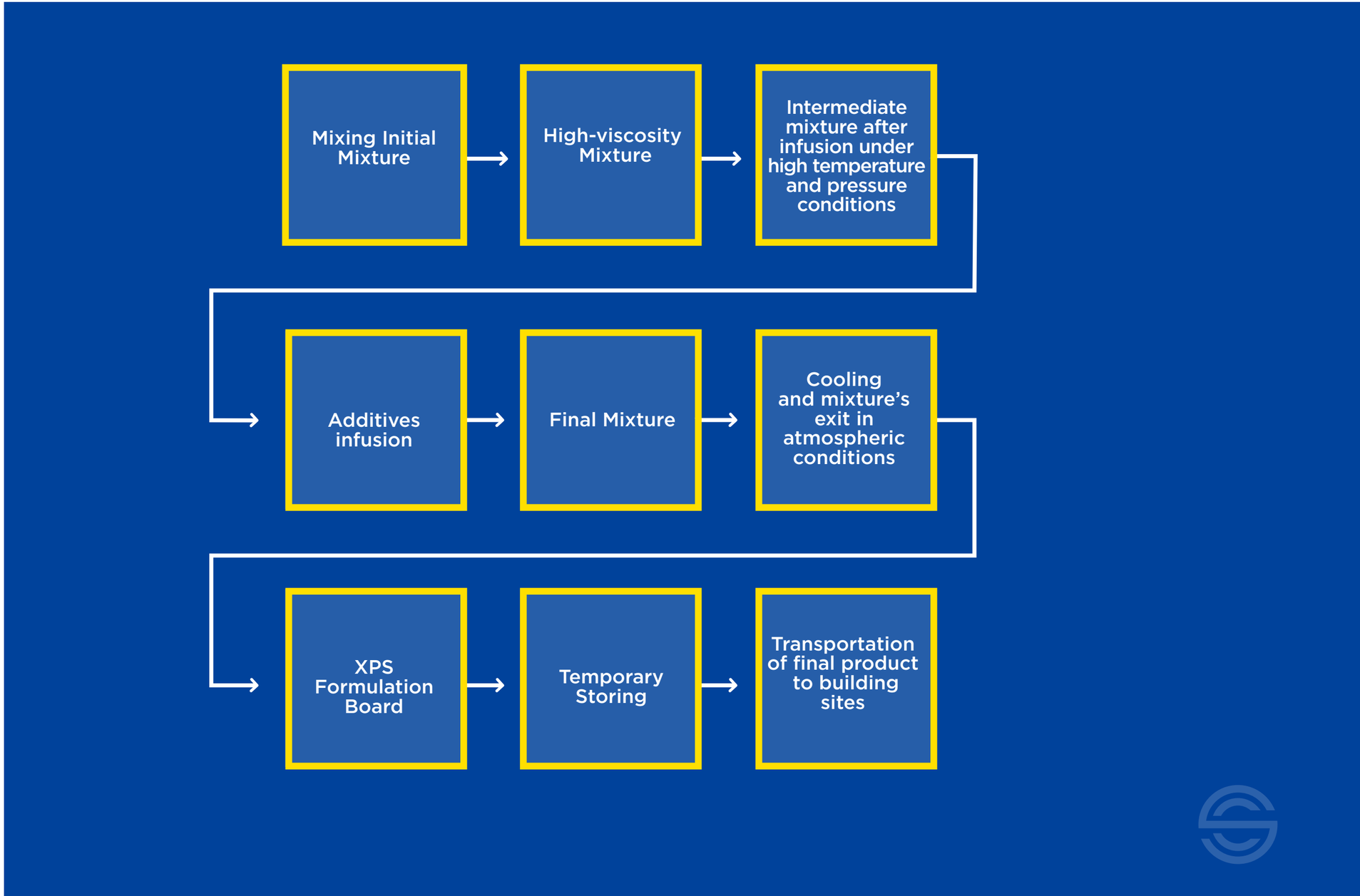
STYROPAN XPS ETICS is used as reference product and serves as a benchmark. Conversion factors, outlined below, are available for converting Potential Environmental Impact to different nominal densities of XPS products.

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations that exceed 0.1% of the total weight are present in the examined systems.

TECHNICAL SPECIFICATIONS XPS ETICS

Description	Unit	Value
Thermal conductivity λ_D 10°C	W/m*K	0.033
Thermal Resistance R (30 mm width)	m^2K/W	0.90
Thermal Resistance R (50 mm width)	m^2K/W	1.50
Thermal Resistance R (80 mm width)	m^2K/W	2.35
Thermal Resistance R (100 mm width)	m^2K/W	2.90
Compression strength for 10% deformation σ_{10}	KPa	200-300

MANUFACTURING PROCESS



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LCA INFORMATION

Declared Unit
1 m2 of XPS ETICS with 33mm thickness, R-value of 1K*m2/W

System Boundaries
This LCA study follows a “cradle-to-grave and module D” approach. Therefore, the defined system boundaries include modules A1-A3, A4-A5, B, C and D.

Reference Service Life
Reference Service Life of the products and based on the European Standard EN 13164 for thermal insulation products, a minimum service life of 50 years when used in buildings is assumed. This standard takes into account the expected durability and performance of insulation materials under normal conditions

Time Representativeness
January 2022 – December 2022

Geographical Scope
Europe

EPD TYPE
Specific

SOFTWARE
GaBi ts version 10.6.0.110

DATABASE
Ecoinvent 3.8.1 & Professional 2021

DESCRIPTION OF EXAMINED MODULES

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource Recovery Stage
	Raw material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling potentials
Modules	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	EU27	EU27	GR	EU27									EU27				EU27
Specific data used	>80%			>80%		-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	From 0% to +64.00%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

* The variations ranges correspond to the differences in GWP-GHG indicator results in A1-A3 between the reference (XPS ETICS) and XPS R&F and XPS HCS respectively respectively.

DESCRIPTION OF EXAMINED MODULES

A1: Raw Material Extraction/Production

Module A1 includes the production of all raw materials, and utilities required for the manufacturing process of mortars,

A2: Transport to Styropan's Facilities

Module A2 includes the transportation to Styropan's manufacturing plant of all raw materials and components used for the formation of the examined products.

A3: Manufacturing

Module A3 depicts the environmental impact potentials attributed to all processes taking place at the manufacturing plant of Styropan.

A4: Finished Products Transport

Module A4 includes the transportation of the system components to construction sites. Actual data of distances of sites locations have been considered.

A5: Construction Installation

XPS products is manually installed, requiring only mixing them with water. A wastage of 5% is assumed during product's installation. Water consumption is in accordance with the respective Technical Data Sheets (TDS).

B1-B7: Use phase

XPS products do not require maintenance, repair, replacement or refurbishment during use in standard conditions and in case that it is properly installed. No consumption of energy or water is taking place during use phase of building.

C1: Deconstruction/Demolition

Regarding deconstruction/demolition, a scenario has been developed since no actual data are available. More specifically, it has been considered that an excavator (diesel, 100kW) is used.

C2: XPS Waste Transport

A nominal distance of 100 km is assumed for the transport of XPS waste from building demolition to disposal facilities (Truck 12-14 tons).

C3: XPS Waste Processing

The whole quantity of XPS waste is disposed and hence no process is included in Module C3

C4: Disposal

The whole quantity of XPS waste is lead to landfilling

D: Reuse, Recovery, Recycling Potential

Module D covers the net benefits arising from the substitution of primary raw materials (polystyrene, paper, PE) with secondary, depicted as credits from waste recovery processes (sorting-shredding) in Modules A3 and A5.

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CONVERSION FACTORS

The LCA Results can be adjusted to include other types of XPS (with an R-Value=1) by utilizing the conversion factors provided in the table. The thickness required to achieve an R-Value of 1 for different XPS types is also indicated. Additionally, the results section includes the Potential Environmental Impacts of XPS PR, aside from the reference product, to showcase the application of the conversion factors.

ENVIRONMENTAL IMPACTS CONVERSION FACTORS FOR XPS PRODUCTS

XPS Type	XPS DP	XPS ETICS	XPS HCS	XPS PR	XPS R&F	XPS WALL	XPS WS
Thickness corresponding to R=1 m² K/W	33	33	38	33	33	33	33
Conversion factors for XPS products	0.157	1.000	0.876	0.357	1.000	1.000	1.000

CONTENT INFORMATION

RAW MATERIAL PRODUCT COMPONENTS	Weight, kg/m²
Primary Polystyrene Granulate	0.7351
Secondary Polystyrene Granulate	0.0387
Pentane	0.0387
Blowing Agents	0.0781
TOTAL	**0.8563**
PACKAGING MATERIALS	**Weight, kg/m²**
Polyethylene Film	0.0109
Paper Labels	0.0001
TOTAL	**0.0110**
OUTPUT PRODUCT	**Weight, kg/m²**
1m² XPS ETICS with 33mm thickness, R-value of 1K*m²/W.	**1.0834**

The variation in the final product quantity compared to its original composition can be attributed to the evaporation of pentane that occurs during the swelling process.

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LIFE CYCLE ASSESSMENT INFORMATION

Cut-off Criteria

All major raw materials, elements and the essential energy required are included within the system boundaries. Data for elementary flows to and from the product system contributing to minimum of 99% of the declared environmental impacts are included in the study. A flow that has been omitted from the modelling of the studied system is the evaporation of the pentane since the total potential environmental impacts in relation to the GWP occurring from the specific stream is less than 0.5% of the total GWP of the modelled system and thus considered negligible. Additionally, omission of the production of certain additives used in the formulation of XPS products, due to absence of relevant datasets. Similarly, in this cases this processes depict less than 1% of the total inflows.

Allocations, Assumptions and Limitations

• Styropan's production processes yield no commercial by-products, and thus, there is no need for by-product allocation in the manufacturing process. Thus, there is no need for by-product allocation in the manufacturing process

• A nominal distance of 100 km from the various construction sites was taken into account in relation to the transportation of PE and paper waste to sorting facilities and the transportation of collected XPS waste to treatment facilities.

• Multimodal transportation takes place (Truck and Vessel). A truck with a payload of 9,3 tonnes, total gross weight 12-14 tonnes EURO 6 and utilization factor 0,51 and an inland vessel with a payload of 3.500 tonnes, total gross weight 2.275 tonnes and utilization factor 0,65 are considered to be used.

• a 100% of XPS waste is assumed to be disposed to landfilling

Background data and data quality

For all processes, primary data are collected and provided by Styropan. Data related to material and energy flows of the defined system, are acquired from the company developing the EPD and data related to life cycle impacts resulted from calculations based on widely used and trust-worthy databases.

Regarding electricity consumption, the Greek residual electricity mix has been considered, when modelling the electricity consumption used to produce XPS products.

Regarding modules C1-C4 and D no actual data were available and hence specific scenarios were developed based on bibliography and the most common industry practices. However, these scenarios are based on accurate and area representative datasets available either in Professional 2021 or Ecoinvent 3.8.1. Thus, these data are expected to be of high quality too.

The LCA software GaBi ts version 10.6.0.110 is used for inventory and impact assessment calculations.

Comparability

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.

This EPD and PCR 2019:14 "Construction products" v.1.11 are available on the website of the International EPD® System (www.environdec.com).

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ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 m² XPS ETICS, Thickness 33 mm, R-value of 1 K*m²/W

Core Environmental Impact Indicators		Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential – total	GWP-total	kg CO_2 eq.	2.785E+00	8.736E-03	3.202E-04	0.00E+00	6.424E-04	1.265E-02	0.000E+00	7.377E-02	-6.064E-01
Global Warming Potential – fossil	GWP-fossil	kg CO_2 eq.	2.767E+00	8.676E-03	3.086E-04	0.00E+00	6.664E-04	1.256E-02	0.000E+00	7.448E-02	-6.022E-01
Global Warming Potential – biogenic	GWP-biogenic	kg CO_2 eq.	1.613E-02	-1.099E-05	9.632E-06	0.00E+00	-2.920E-05	-1.604E-05	0.000E+00	-7.775E-04	-4.025E-03
Global Warming Potential – land use and land use change	GWP-luluc	kg CO_2 eq.	1.876E-03	7.119E-05	2.002E-06	0.00E+00	5.257E-06	1.030E-04	0.000E+00	6.228E-05	-1.583E-04
Global Warming Potential – GHG(1)	GWP-GHG	kg CO_2 eq.	2.768E+00	8.747E-03	3.106E-04	0.00E+00	6.716E-04	1.267E-02	0.000E+00	7.455E-02	-6.023E-01
Ozone Depletion Potential	ODP	kg CFC 11 eq.	2.198E-08	1.111E-18	2.556E-11	0.00E+00	8.202E-20	1.607E-18	0.000E+00	1.797E-16	-8.275E-13
Acidification Potential	AP	Mole of H+ eq.	5.601E-03	1.368E-05	1.161E-06	0.00E+00	3.165E-06	1.220E-05	0.000E+00	2.232E-04	-8.270E-04
Eutrophication Potential – freshwater	EP-freshwater	kg P eq.	1.177E-04	2.581E-08	4.066E-08	0.00E+00	1.906E-09	3.734E-08	0.000E+00	1.376E-05	-7.983E-07
Eutrophication Potential – freshwater	EP-freshwater	kg $PO4^{-3}$ eq.	3.614E-04	7.924E-08	1.248E-07	0.00E+00	5.851E-09	1.146E-07	0.000E+00	4.224E-05	-2.451E-06
Eutrophication Potential – marine	EP-marine	kg N eq.	1.194E-03	5.402E-06	3.711E-07	0.00E+00	1.488E-06	3.837E-06	0.000E+00	5.061E-05	-2.366E-04
Eutrophication Potential – terrestrial	EP-terrestrial	mol N eq.	1.279E-02	6.207E-05	4.013E-06	0.00E+00	1.647E-05	4.630E-05	0.000E+00	5.551E-04	-2.546E-03
Photochemical Oxidant Formation Potential	POCP	kg NMVOC eq.	4.221E-03	1.532E-05	1.106E-06	0.00E+00	4.185E-06	1.054E-05	0.000E+00	1.619E-04	-8.909E-04
Abiotic Depletion Potential – elements(2)	ADPe	kg Sb eq.	3.492E-06	6.618E-10	5.551E-10	0.00E+00	4.888E-11	9.576E-10	0.000E+00	5.126E-09	-8.173E-08
Abiotic Depletion Potential. fossil resources(2)	ADPf	MJ net calorific value	7.460E+01	1.157E-01	4.494E-03	0.00E+00	8.546E-03	1.674E-01	0.000E+00	1.086E+00	-2.088E+01
Water Deprivation Potential(2)	WDP	m^3 world eq. deprived	2.785E+00	8.736E-03	3.202E-04	0.00E+00	6.424E-04	1.265E-02	0.000E+00	7.377E-02	-6.064E-01

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ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/1 m2 of XPS ETICS, Thickness 33 mm, R-value=1 K*m2/W

Resource Use Indicators		Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ. net calorific value	3.893E+00	6.458E-03	2.354E-04	0.000E+00	4.769E-04	9.345E-03	0.000E+00	7.883E-02	-3.237E+00
Use of renewable primary energy resources used as raw materials	PERM	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total use of renewable primary energy resources	PERT	MJ. net calorific value	3.893E+00	6.458E-03	2.354E-04	0.000E+00	4.769E-04	9.345E-03	0.000E+00	7.883E-02	-3.237E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ. net calorific value	7.464E+01	1.159E-01	4.497E-03	0.000E+00	8.557E-03	1.677E-01	0.000E+00	1.086E+00	-1.934E+01
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total use of non-renewable primary energy resources	PENRT	MJ. net calorific value	7.464E+01	1.159E-01	4.497E-03	0.000E+00	8.557E-03	1.677E-01	0.000E+00	1.086E+00	-1.934E+01
Use of secondary material	SM	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of renewable secondary fuels	RSF	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of non-renewable secondary fuels	NRSF	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of net fresh water	FW	m^3	1.597E-02	7.392E-06	6.864E-07	0.000E+00	5.459E-07	1.070E-05	0.000E+00	1.001E-05	-2.988E-03

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ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 m2 of XPS ETICS, Thickness 33 mm, R-value=1 K*m2/W

			A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Waste Indicators		**Unit**									
Hazardous waste disposed	HWD	kg	8.387E-09	5.839E-12	8.939E-14	0.000E+00	4.312E-13	8.449E-12	3.824E-11	1.954E-10	-2.127E-09
Non-hazardous waste disposed	NHWD	kg	1.589E-02	1.721E-05	2.635E-07	0.000E+00	1.271E-06	2.491E-05	6.826E-03	1.036E+00	-4.903E-03
Radioactive waste disposed	RWD	kg	2.665E-04	1.402E-07	2.146E-09	0.000E+00	1.035E-08	2.028E-07	1.219E-05	1.261E-05	-7.069E-05
Output Flows		**Unit**									
Components for re-use	CRU	kg	2.704E-01	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Material for recycling	MFR	kg	3.781E-03	0.000E+00	1.099E-02	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Materials for energy recovery	MER	kg	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	5.61E-01	0.000E+00	0.000E+00
Exported energy	EE	MJ	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Additional Environmental Impact Indicators		**Unit**									
Particulate matter emissions	PM	Disease incidence	8.600E-08	2.321E-10	1.445E-11	0.00E+00	3.582E-11	7.310E-11	9.753E-10	2.187E-09	-5.643E-09
Ionizing radiation human(3)	IRP	kBq U235 eq.	7.870E-02	2.006E-05	1.890E-05	0.00E+00	1.482E-06	2.903E-05	1.936E-03	1.809E-03	-7.404E-03
Eco-toxicity. freshwater(2)	ETP-fw	CTUe	3.661E+01	8.363E-02	4.071E-03	0.00E+00	6.177E-03	1.210E-01	9.660E-02	1.032E+00	-1.186E+01
Human toxicity. cancer effects(2)	HTP-c	CTUh	8.974E-10	1.688E-12	1.440E-13	0.00E+00	1.246E-13	2.442E-12	1.036E-11	4.624E-11	-2.558E-10
Human toxicity. non-cancer effects(2)	HTP-nc	CTUh	3.916E-08	8.929E-11	3.496E-12	0.00E+00	7.495E-12	1.263E-10	3.352E-10	3.874E-09	-1.167E-08
Land use related impacts/Soil quality(2)	SQP	dimensionless	3.250E+00	3.974E-02	2.433E-03	0.00E+00	2.935E-03	5.750E-02	6.005E-02	7.387E-02	-3.660E-01

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ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 m2 of XPS PR, Thickness 33 mm, R-value=1 K*m2/W

Core Environmental Impact Indicators		Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential – total	GWP-total	kg CO_2 eq.	9.945E-01	3.120E-03	1.144E-04	0.000E+00	2.294E-04	4.518E-03	0.000E+00	2.635E-02	-2.166E-01
Global Warming Potential – fossil	GWP-fossil	kg CO_2 eq.	9.881E-01	3.099E-03	1.102E-04	0.000E+00	2.380E-04	4.486E-03	0.000E+00	2.660E-02	-2.151E-01
Global Warming Potential – biogenic	GWP-biogenic	kg CO_2 eq.	5.761E-03	-3.925E-06	3.440E-06	0.000E+00	-1.043E-05	-5.729E-06	0.000E+00	-2.777E-04	-1.437E-03
Global Warming Potential – land use and land use change	GWP-luluc	kg CO_2 eq.	6.700E-04	2.543E-05	7.150E-07	0.000E+00	1.878E-06	3.679E-05	0.000E+00	2.224E-05	-5.654E-05
Global Warming Potential – GHG[1]	GWP-GHG	kg CO_2 eq.	9.887E-01	3.124E-03	1.109E-04	0.000E+00	2.399E-04	4.524E-03	0.000E+00	2.662E-02	-2.151E-01
Ozone Depletion Potential	ODP	kg CFC 11 eq.	7.851E-09	3.968E-19	9.129E-12	0.000E+00	2.929E-20	5.739E-19	0.000E+00	6.418E-17	-2.955E-13
Acidification Potential	AP	Mole of H+ eq.	2.000E-03	4.886E-06	4.146E-07	0.000E+00	1.130E-06	4.357E-06	0.000E+00	7.971E-05	-2.953E-04
Eutrophication Potential – freshwater	EP-freshwater	kg P eq.	4.204E-05	9.218E-09	1.452E-08	0.000E+00	6.807E-10	1.334E-08	0.000E+00	4.914E-06	-2.851E-07
Eutrophication Potential – freshwater	EP-freshwater	kg $PO4^{-3}$ eq.	1.291E-04	2.830E-08	4.458E-08	0.000E+00	2.090E-09	4.094E-08	0.000E+00	1.509E-05	-8.753E-07
Eutrophication Potential – marine	EP-marine	kg N eq.	4.263E-04	1.929E-06	1.325E-07	0.000E+00	5.314E-07	1.370E-06	0.000E+00	1.808E-05	-8.450E-05
Eutrophication Potential – terrestrial	EP-terrestrial	mol N eq.	4.567E-03	2.217E-05	1.433E-06	0.000E+00	5.882E-06	1.654E-05	0.000E+00	1.983E-04	-9.092E-04
Photochemical Oxidant Formation Potential	POCP	kg NMVOC eq.	1.507E-03	5.471E-06	3.950E-07	0.000E+00	1.495E-06	3.764E-06	0.000E+00	5.782E-05	-3.182E-04
Abiotic Depletion Potential – elements[2]	ADPe	kg Sb eq.	1.247E-06	2.364E-10	1.983E-10	0.000E+00	1.746E-11	3.420E-10	0.000E+00	1.831E-09	-2.919E-08
Abiotic Depletion Potential. fossil resources[2]	ADPf	MJ net calorific value	2.664E+01	4.132E-02	1.605E-03	0.000E+00	3.052E-03	5.979E-02	0.000E+00	3.879E-01	-7.457E+00
Water Deprivation Potential[2]	WDP	m^3 world eq. deprived	9.945E-01	3.120E-03	1.144E-04	0.000E+00	2.294E-04	4.518E-03	0.000E+00	2.635E-02	-2.166E-01

ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/1 m2 of XPS PR, Thickness 31mm, R-value=1 K*m2/W

Resource Use Indicators		Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ. net calorific value	1.390E+00	2.306E-03	8.407E-05	0.000E+00	1.703E-04	3.338E-03	0.000E+00	2.815E-02	-1.681E-01
Use of renewable primary energy resources used as raw materials	PERM	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total use of renewable primary energy resources	PERT	MJ. net calorific value	1.390E+00	2.306E-03	8.407E-05	0.000E+00	1.703E-04	3.338E-03	0.000E+00	2.815E-02	-1.681E-01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ. net calorific value	2.666E+01	4.139E-02	1.606E-03	0.000E+00	3.056E-03	5.989E-02	0.000E+00	3.879E-01	-7.461E+00
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Total use of non-renewable primary energy resources	PENRT	MJ. net calorific value	2.666E+01	4.139E-02	1.606E-03	0.000E+00	3.056E-03	5.989E-02	0.000E+00	3.879E-01	-7.461E+00
Use of secondary material	SM	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of renewable secondary fuels	RSF	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of non-renewable secondary fuels	NRSF	MJ. net calorific value	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Use of net fresh water	FW	m^3	5.704E-03	2.640E-06	2.451E-07	0.000E+00	1.950E-07	3.821E-06	0.000E+00	3.575E-06	-1.067E-03

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ENVIRONMENTAL PERFORMANCE INDICATORS

Extruded Polystyrene (XPS) Thermal Insulation Products

POTENTIAL ENVIRONMENTAL IMPACTS/ 1 m2 of XPS PR, Thickness 33 mm, R-value=1 K*m2/W

			A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Waste Indicators		**Unit**									
Hazardous waste disposed	HWD	kg	2.996E-09	2.085E-12	3.193E-14	0.00E+00	1.540E-13	3.018E-12	0.000E+00	6.979E-11	-7.596E-10
Non-hazardous waste disposed	NHWD	kg	5.677E-03	6.146E-06	9.411E-08	0.00E+00	4.539E-07	8.896E-06	0.000E+00	3.700E-01	-1.751E-03
Radioactive waste disposed	RWD	kg	9.517E-05	5.007E-08	7.664E-10	0.00E+00	3.696E-09	7.243E-08	0.000E+00	4.504E-06	-2.525E-05
Output Flows		**Unit**									
Components for re-use	CRU	kg	2.704E-01	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Material for recycling	MFR	kg	3.800E-03	0.000E+00	1.100E-02	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Materials for energy recovery	MER	kg	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Exported energy	EE	MJ	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Additional Environmental Impact Indicators		**Unit**									
Particulate matter emissions	PM	Disease incidence	3.071E-08	8.289E-11	5.161E-12	0.00E+00	1.279E-11	2.611E-11	0.000E+00	7.811E-10	-2.015E-09
Ionizing radiation human(3)	IRP	kBq U235 eq.	2.811E-02	7.164E-06	6.750E-06	0.00E+00	5.293E-07	1.037E-05	0.000E+00	6.461E-04	-2.644E-03
Eco-toxicity. freshwater(2)	ETP-fw	CTUe	1.308E+01	2.987E-02	1.454E-03	0.00E+00	2.206E-03	4.321E-02	0.000E+00	3.686E-01	-4.234E+00
Human toxicity. cancer effects(2)	HTP-c	CTUh	3.205E-10	6.029E-13	5.143E-14	0.00E+00	4.450E-14	8.721E-13	0.000E+00	1.651E-11	-9.136E-11
Human toxicity. non-cancer effects(2)	HTP-nc	CTUh	1.399E-08	3.189E-11	1.249E-12	0.00E+00	2.677E-12	4.511E-11	0.000E+00	1.384E-09	-4.168E-09
Land use related impacts/Soil quality(2)	SQP	dimensionless	1.161E+00	1.419E-02	8.689E-04	0.00E+00	1.048E-03	2.054E-02	0.000E+00	2.638E-02	-1.307E-01

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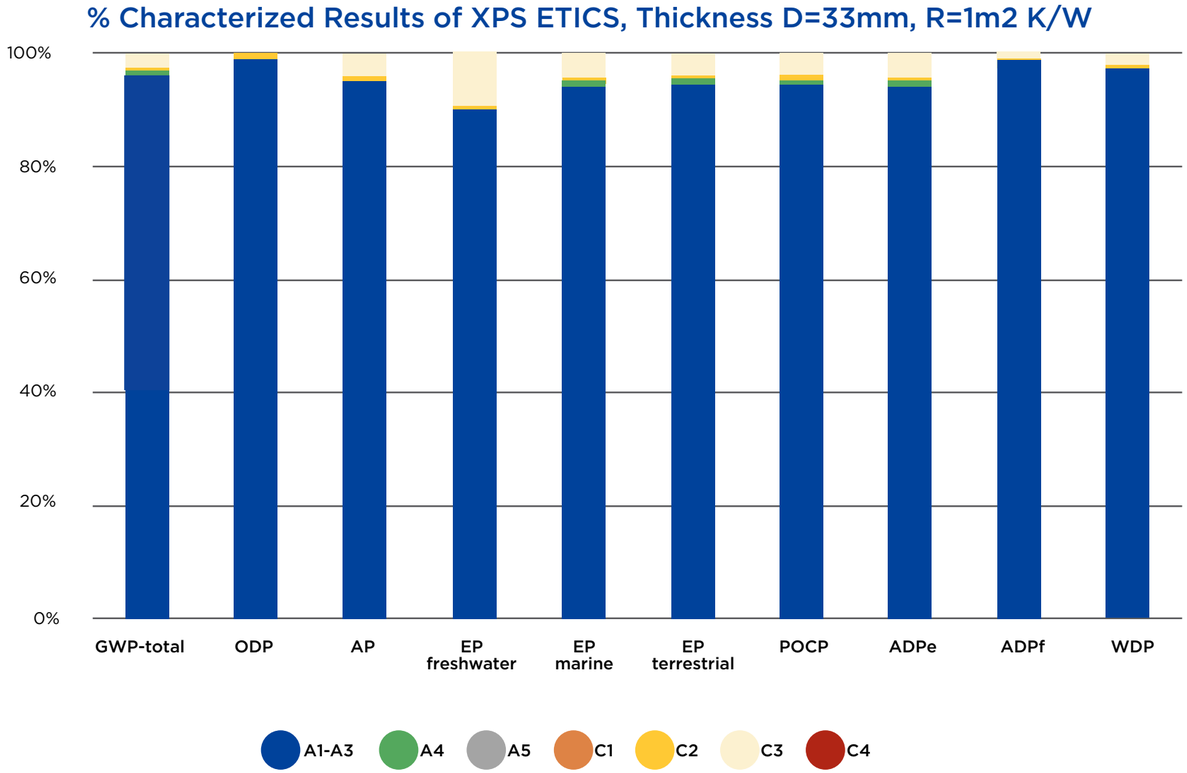
INTERPRETATION

The following figure represents the contribution of each examined module (A1-A3, A4, A5 & C1-C4) on the core environmental impact indicators formation using the results of the representative product in the form of a normalized dominance analysis as depicted in the following diagram. Each column represents the different life cycle modules examined within the defined system boundary.
It can be clearly depicted that the majority of the analyzed impact categories are mainly influenced by modules A1-A3.

The Global Warming Potential - total in relation to the production of 1 m2 of XPS ETICS with 33 mm thickness, R-value of 1 K*m2/W, potential emissions released are attributed almost exclusively to Module A1 and the production of raw materials by more than 95% of the total emissions

The cumulative effect on Eutrophication Potential for manufacturing 1 m2 of XPS ETICS with a thickness of 33mm and an R-value of 1 K*m2/W is attributed to the extraction and production of raw materials utilized in the formation of XPS products, accounting for nearly 90% of the total emissions.

% Life Cycle Modules Contribution



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- International EPD® System, General Program Instructions for the International EPD System, version 3.01
- ISO 14025:2006 - Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14040:2006 - Environmental management – Life Cycle assessment – Principles and framework
- ISO 14044:2006 - Environmental management – Life Cycle assessment – Requirements and guidelines
- The International EPD® System – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. www.environdec.com
- ISO 14020:2000 – Environmental Labels and Declarations – General Principles
- Sphera – GaBi Product Sustainability software – www.sphera.com
- Reference Service Life – BS EN 13164:2012+A1:2015 " Thermal insulation products for buildings"
- Residual Energy Mix 2021 from Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA)

DIFFERENCES VERSUS PREVIOUS VERSIONS: Corrected product name

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