Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021.

Starlike® Crystal

from Litokol

Litokol Lab S.p.A.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0021590
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

1. General information

Address of Programme operator: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com

Product description and use: Translucent epoxy Gel enhanced with recycled crystals microspheres, impermeable, stain-resistant and UV-resistant, for grouting transparent and artistic glass mosaics with joints up to 3 mm in width. Classified as RG according to EN13888.

Owner of the declaration: Litokol Lab S.p.A. – Via Giovanni Falcone 13/1 42048 Rubiera (RE).
Tel. +39 0522 622811 - Fax +39 0522 620150, info@litokol.com
The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.3.4
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006 via: ☒ EPD verification by EPD Process Certification* Third-party verification: Certiquality S.r.l. Via Gaetano Giardino 4, 20123 Milano – Italy, Tel +39 02.80691789, www.certiquality.it Third-party verifier is accredited by: *ACCREDIA, 0013VV rev000* *For EPD Process Certification, an accredited certification body certifies and reviews the management process and verifies EPDs published on a regular basis. For details about third-party verification procedure of the EPDs, see GPI.
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number up to the first two digits) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

2. About the Company

Litokol is the ultimate vision of the future of ceramic and natural stone installation systems. A laboratory for experimentation and advanced research dedicated to innovation, it develops some of the most groundbreaking ceramic installation products in the world, designed to help installers improve their performance on job sites across all continents.

At Litokol, a team of experts has come together, having spent 15 years working in the emerging field of materials science for ceramic installation. This has led to the development of the next generation of Gels that exceed the performance and application limits of traditional adhesives, offering installers a sensory experience never before achieved.

Located in Rubiera, at the heart of the ceramic district, Litokol Village spans a total area of over 52,000 m², of which 27,000 m² are covered, and houses the headquarters, 5 specialized factories, the Litokol Lab with 3 R&D laboratories, the Training Center and the Litokol Academy Pro.

With a thirty-year history of innovation in the ceramic installation sector and applied chemistry in construction, Gian Luca Sghedoni - sole shareholder and CEO of Litokol since late 2024 – embodies a tradition of uncompromising quality. Today, in Litokol's laboratories, intelligent Gel based on cutting-edge science, are developed to provide innovative, sustainable, and high-performance solutions designed with the installer in mind. All Litokol products are guaranteed by unique quality systems within the industry.

3. Product description

3.1 Product description and use

Starlike® Crystal is an ultimate two-component translucent epoxy-Gel grout. Part A consists in a mix of epoxy resins with different molecular weights, under proprietary license, recycled Swarovski® glass microbeads and specific organic additives. Component B consists in a next-generation non-corrosive polymeric linker.
Once mixed together, the two components form a creamy and fluid mix, which is also suitable for vertical application with no dripping. Once set, the product reaches very high performance levels in terms of mechanical strength and chemical resistance.
The unique translucent coloration of Starlike® Crystal allows the product applied in the joints to "absorb" the color of the transparent glass tiles, thereby changing according to their color.
Unlike other epoxy grouts on the market, the catalyst (Part B) is labelled only as an irritant, it is neither corrosive nor hazardous for the environment, the user can therefore rely on a very safe product to work with. Extremely easy application and cleaning, even compared to normal cementitious grouts, bacteriostatic product which prevents the growth of fungi and molds. Suitable for applications with severe operating conditions such as swimming pools, hammams and jacuzzis. Product exempt from restrictions for road, sea, air and rail transport.

Products with very low volatile organic compound (VOC) emission rate, comply with class EC1PLUS according to the EMICODE protocol and class A+ (Émission dans l’air intérieur - French Regulations). The particular fineness of the glass micro spheres makes it possible to obtain extremely smooth and compact finishes.

3.2 Technical data

Technical data are given in Table 1.

Table 1 - Technical information.

Technical information	
UN CPC code	351 Paints and varnishes and related products
UNI EN 13888 Classification	RG
Product representativeness	The LCA is conducted on the most produced/sold packaging: 2,5kg bucket. Starlike® Crystal is produced in 2 different production plants in Rubiera but only the one of Via Grassi is considered for the LCA evaluation since more than 98% of total amounts come from there.
Physical form	Paste
GEV Emicode classification	EC1 Plus

3.3 Base materials / Ancillary materials

The average composition of 1 kg of product, including packaging materials, is reported in Table 2.

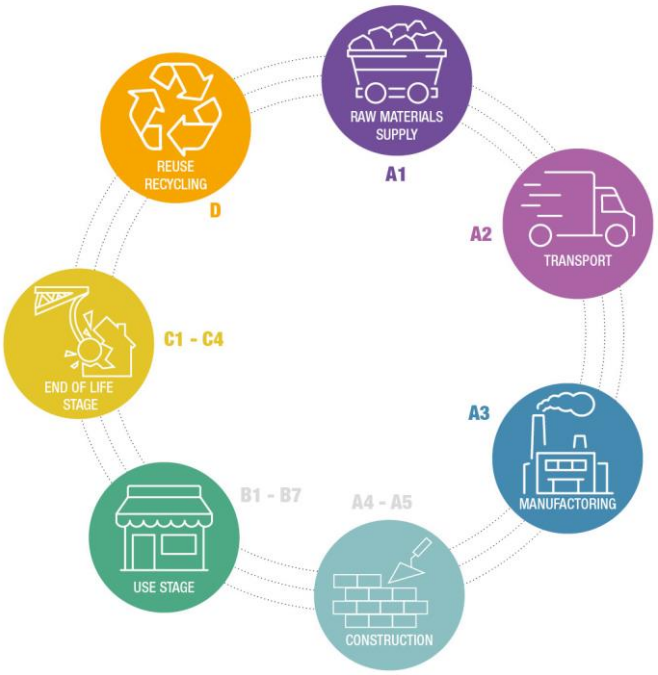
Table 2- Content declaration of product and relative packaging.

Product composition	Weight %	Post consumer recycled material, weight %	Biogenic material, % and kg C/declared unit
Organic binders	10-15	0	0
Fillers	70-80	> 70	0
Additives	5-10	0	0
Hardener	5-10	0	0

Packaging materials	Weight %	Recycled material, kg/declared unit	Biogenic material, kg C/declared unit
Plastic bucket	7	0,031	0
Plastic bag and film	< 1	0	0
Wooden pallet	5,5	0	0,027

Litokol products do not contain SVHC (Substances of Very High Concern). No additives used are classed as substances of concern on the REACH Candidate List published by the European Chemicals Agency.

3.4 Manufacture



Raw materials are purchased from external suppliers and stored, depending on type and amount, in silos or shelving in the warehouse.
The production consists of a discontinuous mixing process in which the majority of materials are weighted automatically, only minor ingredients are added manually.
After the mixing process the product is packaged automatically and stored on wooden pallets in the warehouse.
Energy sources of the electricity from grid used in manufacturing processes and its climate impact is the Italian residual mix 0,641 kg CO2 eq./kWh using the GWP GHG indicator (AIB report 2023).

3.5 Reference service life

The use phase is not included in the system boundary, the reference service life is therefore not specified.

3.6 End of life

At the end of life, the product is classified as C&D waste and, in accordance with the European Directive 2008/98/CE, a recycling ratio of 70% is considered. The remaining 30% is landfilled. Packaging wastes are recycled following the recycling rates listed in the Annex C, developed in the context of the European Commission Environmental Footprint methodology, available at the link https://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml

3.7 Further information

Further information can be found on the TDS (technical data sheet) on Litokol website www.litokol.com

4. System Boundary

The system boundary is from *cradle to gate with modules C1-C4 and module D*. It covers the Product stage (raw material supply as A1; transport up to the factory gate as A2; manufacturing as A3), as well as the End of life stage (de-construction and demolition as C1; transport to waste processing as C2; waste processing for reuse, recovery and/or recycling as C3; disposal as C4). Module D contains benefits and loads beyond the system boundary, due to the recycling process of the product and its packaging.
The system boundaries in tabular form for all modules are shown in the Table 3 below.

Table 3 – System boundaries chosen for the LCA (X-module included in LCA. MND – module not included).

	Product Stage			**Construction Stage**		**Use Stage**							**End of life Stage**				**Resource Recovery Stage**
	Raw material supply	**Transport**	**Manufacturing**	**Transport**	**Construction installation**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Operational energy use**	**Operational water use**	**De-construction demolition**	**Transport**	**Waste processing**	**Disposal**	**Reuse- Recovery- Recycling- potential**
MODULE	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Module declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	IT EU Global		IT	-	-	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

5. LCA information

The main LCA information and assumptions are reported in Table 4.

Table 4 – LCA main information

LCA main information	
Functional unit/ declared unit	The declared unit is 1 kg of product with the packaging.
System boundaries	Cradle to gate with module C1-C4 and module D.
Cut-off rules and allocations	According to ISO 14040 and 14044, allocation by physical properties (mass) is used to calculate the contribution of products and co-products. All raw materials and all the essential energy are included. Packaging materials with an amount below 0,1% on weight were not considered (labels, thermal tapes, adhesive tape, etc). General cut-off criteria are given in standard EN 15804:2012+A2:2019/AC:2021 Clause 6.3.6. In agreement with these criteria, infrastructure of the manufacturing plant and personnel associated activities are excluded from the study.
Assumptions	For some chemicals, additives and packaging materials generic data have been used. Proxy data are used to model the demolition stage C1, in which all is considered as mixed construction waste. A default value of distance (100 km) and mean of transportation is used for C2 stage, transport to waste processing. Since there is no waste processing at the end of life, module C3 is not applicable. The disposal stage C4 includes landfilling 30% of the product and the residual packaging material that is not recycled. Module D is applied to 70% recycled ratio of the product and to the main recovered packaging materials.
Background data	All primary product data was provided by Litokol Lab S.p.A. All secondary data was retrieved using SimaPro 9.6 software, with Ecoinvent 3.10 database.
Data quality	Primary data collected from Litokol Lab S.p.A. Rubiera plant, referred to year 2023, arise from internal documents in order to have an evaluation of the life cycle as representative of the actual production as possible. Generic data have been obtained from Ecoinvent 3.10 database using the most updated datasets. Quality level concerning datasets used in the EPD can be considered as “very good” or “good” according to Annex E of the EN 15804 (current version).

6. Environmental performance

The following tables show the environmental impacts per declared unit for the categories recommended by the EPD's General Programme Instruction (ver 4.0 03/21) and the ones indicated in PCR 2019:14 version 1.3.4 for Construction Products and services.

<table>
<tr>
<td> </td>
<td>Climate Change
Global Warming Potential is referred to the emission and presence of greenhouse gases (GHGs) such as CO2, NO2, CH4, etc.) in the atmosphere. GHGs contribute in increasing the temperature of the planet
GWP total is the sum of three factors
• GWP fossil
• GWP biogenic
• GWP land use and land change</td>
<td> </td>
<td>Photochemical Ozone Formation
Reactions that occur mainly in cities and industrial area where high amounts of volatile organic compounds and nitrogen oxides are present. These compounds can react if energy from sunrays is transferred to them forming ozone.</td>
</tr>
<tr>
<td> </td>
<td>Ozone Depletion
The ozone layer is a filter able to block the UV radiation of sunrays. The depletion of the layer is mainly afflicted by means of particularly reactive molecules such as CFC.
The Ozone depletion potential is referred to this phenomena</td>
<td> </td>
<td>Depletion of Abiotic Resources, minerals and metals
Consumption of non-renewable resources, thereby lowering their availability for future generations</td>
</tr>
<tr>
<td> </td>
<td>Acidification
Production and emission of some oxides such as NOX and SOX is the main cause of the decreasing of pH in rain which have obvious negative effects for natural eco-system but also for buildings and in general man-made environments</td>
<td> </td>
<td>Depletion of Abiotic Resources, fossil fuels
Consumption of non-renewable resources, thereby lowering their availability for future generations</td>
</tr>
<tr>
<td> </td>
<td>Eutrophication
The enrichment of waters and continental surfaces with nutrients determines unbalance in natural eco-systems causing negative effects such as decreased biodiversity of fauna and flora.
Eutrophication potential is described by three factors:
• EP, freshwater: aquatic freshwater
• EP, marine: aquatic marine
• EP, terrestrial</td>
<td> </td>
<td>Water Use
It consists in the deprivation of water associated with the potential of not having the water needs satisfied</td>
</tr>
</table>

For the impact categories, the estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

It is recommended to use the results of modules A1-A3 considering the results of module C.

The environmental impacts indicators are assessed with EN 15804 reference package based on EF 3.1.

Table 5 - LCA results of potential environmental impact - mandatory indicators according to EN 15804 referred to declared unit.

Impact Category	Unit	A1-A3	C1	C2	C3	C4	D
Climate change (total)	kg CO_2 eq	1,84E+00	4,38E-03	1,21E-02	0,00E+00	6,52E-02	-2,34E-02
Climate change - Fossil	kg CO_2 eq	1,83E+00	4,38E-03	1,21E-02	0,00E+00	6,72E-02	-3,01E-02
Climate change - Biogenic	kg CO_2 eq	3,24E-03	4,78E-07	6,27E-06	0,00E+00	-2,07E-03	6,68E-03
Climate change – Land use and LU change	kg CO_2 eq	6,89E-03	3,80E-07	4,16E-06	0,00E+00	2,30E-06	2,80E-07
Ozone depletion	kg CFC11 eq	5,76E-08	6,70E-11	2,44E-10	0,00E+00	1,09E-10	-1,03E-08
Acidification	mol H+ eq	6,37E-03	3,95E-05	4,81E-05	0,00E+00	3,44E-05	-9,64E-05
Eutrophication, freshwater	kg P eq	4,09E-04	1,28E-07	8,26E-07	0,00E+00	1,02E-06	-1,34E-06
Eutrophication, marine	kg N eq	1,37E-03	1,83E-05	1,80E-05	0,00E+00	2,45E-05	-1,39E-05
Eutrophication, terrestrial	mol N eq	1,38E-02	2,01E-04	1,96E-04	0,00E+00	1,49E-04	-2,11E-04
Photochemical ozone formation	kg NMVOC eq	6,93E-03	5,98E-05	7,59E-05	0,00E+00	4,89E-05	-2,01E-04
Resource use, minerals and metals	kg Sb eq	1,17E-05	1,56E-09	3,28E-08	0,00E+00	1,01E-08	-2,82E-07
Resource use, fossils	MJ	7,60E+00	2,32E-03	1,45E-02	0,00E+00	9,81E-03	-1,47E-02
Water use	m^3 depriv.	4,80E-01	1,24E-04	8,38E-04	0,00E+00	3,21E-03	-2,67E-02

*Disclaimer: the results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is a limited experience with the indicator.

Table 6 - LCA results of Global Warning Potential – Green House Gas GWP-GHG.

Impact Category	Unit	A1-A3	C1	C2	C3	C4	D
Climate change GWP-GHG[1]	kg CO_2 eq	1,85E+00	4,38E-03	1,21E-02	0,00E+00	6,73E-02	-2,76E-02

[1]This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Table 7 - LCA indicators describing resource use.

Impact Category	Unit	A1-A3	C1	C2	C3	C4	D
Primary en res, Ren, TOTAL	MJ	1,76E+00	3,52E-04	2,79E-03	0,00E+00	1,79E-03	5,81E-03
Primary en res, Ren, Raw material	MJ	3,07E-02	0,00E+00	0,00E+00	0,00E+00	-2,15E-02	-9,21E-03
Primary en res, Ren, Energy carrier	MJ	1,73E+00	3,52E-04	2,79E-03	0,00E+00	2,33E-02	1,50E-02
Primary en res, Non-ren, TOTAL	MJ	7,61E+00	2,32E-03	1,45E-02	0,00E+00	9,82E-03	-1,48E-02
Primary en res, Non-ren, Raw material	MJ	2,52E+00	0,00E+00	0,00E+00	0,00E+00	-1,85E+00	-6,78E-01
Primary en res, Non-ren, Energy carrier	MJ	5,09E+00	2,32E-03	1,45E-02	0,00E+00	1,86E+00	6,63E-01
Use of secondary material	kg	7,68E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m^3	3,16E-01	3,25E-05	1,81E-04	0,00E+00	1,46E-04	-6,48E-03

Table 8 - LCA results of waste categories and output flows referred to the declared unit.

Impact Category	Unit	A1-A3	C1	C2	C3	C4	D
Non-hazardous waste	kg	1,83E-01	3,50E-05	1,50E-02	0,00E+00	3,33E-01	3,89E-03
Hazardous waste	kg	4,85E-04	3,96E-07	1,16E-06	0,00E+00	6,46E-07	-2,57E-05
Radioactive waste	kg	3,09E-05	6,30E-09	5,29E-08	0,00E+00	3,01E-08	2,78E-07
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	4,22E-03	0,00E+00	0,00E+00	0,00E+00	8,29E-01	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

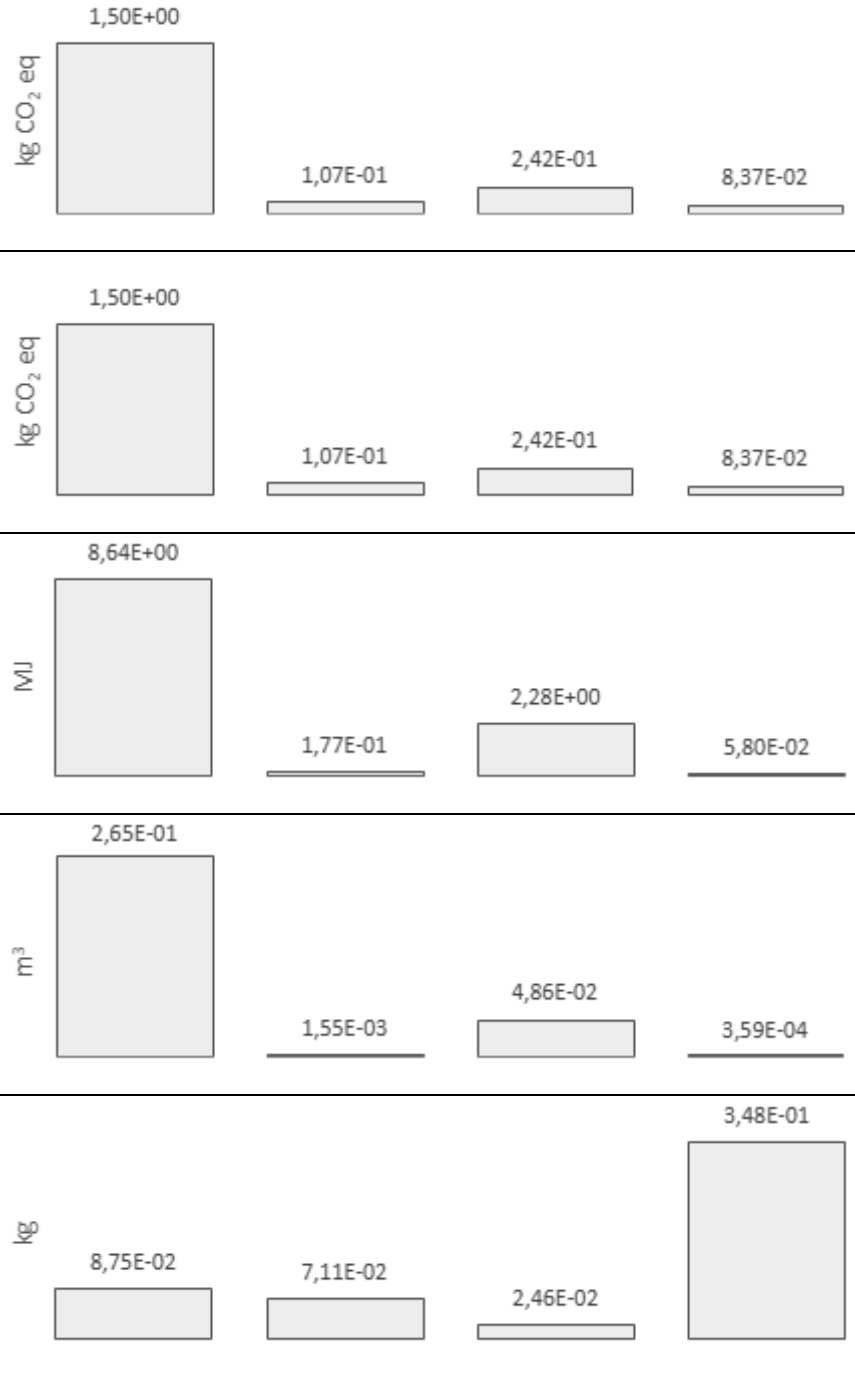
Table 9 - Information on biogenic carbon content[2] at the factory gate referred to the declared unit.

Indicator	Unit	
Biogenic carbon content in product	Kg C	0,00E+00
Biogenic carbon content in accompanying packaging	Kg C	2,74E-02

[2]Note: 1 Kg biogenic carbon is equivalent to 44/12 kg CO_2.

The images below shows the impact of each life cycle stage on 5 important parameters, giving, clear view of the contribution of each stage to the overall environmental impacts of the product.

Environmental Impact	Raw Material Supply [A1]	Transport [A2]	Manufacturing [A3]	End of Life [C]
Global Warming	1,50E+00	1,07E-01	2,42E-01	8,37E-02
Non-Renewable Resources Consumption [1]	1,50E+00	1,07E-01	2,42E-01	8,37E-02
Energy Consumption [2]	8,64E+00	1,77E-01	2,28E+00	5,80E-02
Water Consumption [3]	2,65E-01	1,55E-03	4,86E-02	3,59E-04
Waste Production [4]	8,75E-02	7,11E-02	2,46E-02	3,48E-01



[1] Primary en res, Non-ren, Energy carrier. Primary en res, Non-ren, Raw material
[2] Primary en res, Ren, Energy carrier. Primary en res, Ren, Raw material. Primary en res, Non-ren, Energy carrier. Primary en res, Non-ren, Raw material
[3] Net use of fresh water
[4] Non hazardous waste. Hazardous waste. Radioactive waste

7. References

Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations

Ecoinvent, 2021. Swiss Centre for Life Cycle Assessment, supplier of Ecoinvent v3.10 database (www.ecoinvent.ch).

General principles. EPD International (2021) General Programme Instructions for the International EPD® System. Version 4.0

EPD Tool Litokol: Tool EPD Litokol 2023 Rev01

PCR. PCR 2019:14 version 1.3.4 for Construction Products and construction services. IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä. Swedish Wood Preservation Institute, Swedisol, SCDA. Svenskt Limträ AB. SSAB (2019).

Standards:

EN 15804:2012+A2:2019/AC:2021 "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

ISO 14025:2011-10. Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2021. Environmental management – Life cycle assessment – Requirements and guidelines.

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