Valoref

ENVIRONMENTAL PRODUCT DECLARATION OF

RECYCLED REFRACTORY AND CERAMIC GRAINS

EPD of multiple products, based on a representative product
(the list of included products can be viewed p.3)
In accordance with ISO 14025:2006 and EN15804:2021+A2:2019/AC:2021

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
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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.

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TABLE OF CONTENTS

GENERAL INFORMATION 1
Program operator and EPD information 1
PRODUCT INFORMATION 2
Company information 2
PRODUCT DESCRIPTION AND USE 3
LCA CALCULATION INFORMATION 3
CONTENT DECLARATION 7
Product composition 7
LCA RESULTS 8
ENVIRONMENTAL IMPACTS – 1 KG VALORZAC PR/T WITH PACKAGING 10
RESOURCE USE – 1 KG VALORZAC PR/T WITH PACKAGING 11
WASTE CATEGORY & OUTPUT FLOWS – 1 KG VALORZAC PR/T WITH PACKAGING 12
ADDITIONAL MANDATORY GWH-GHG INDICATORS – 1 KG VALORZAC PR/T WITH PACKAGING 13
ADDITIONAL INFORMATION 14
GWP-GHG results for the other products 14
Core environmental results for the other products 15
ELECTRICITY INFORMATION 17
DIFFERENCE VERSUS PREVIOUS VERSIONS OF THE EPD 18
REFERENCES 19

GENERAL INFORMATION

Program operator and EPD information

EPD® program operator	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
Product category rules (PCR)	Construction Products 2019:14, version 1.3.4
PCR review was conducted by	The Technical Committee of the International EPD System. See www.environdec.com 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
EPD® prepared by	Simeng WANG (simeng.wang@saint-gobain.com)
Declaration issued	2024-09-18, valid until: 2029-09-17
Difference versus the previous version of the EPD	This is the first version of the EPD.
Independent verification of the declaration, according to EN ISO 14025:2006	EPD verification by individual verifier
Third party individual verifier	Viktor Hakkarainen (CHM Analytics AB) Viktor.hakkarainen@chm-analytics.com 
Approved by	The International EPD System
Procedure for follow-up of data during EPD validity involves third party individual verifier	Yes ☐ No ☒

EPDs within the same product category but registered in different EPD programs may not be comparable. For two EPDs to be comparable, they shall 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 characterization factors); have equivalent content declarations; and be valid at the time of comparison
The EPD owner has the sole ownership, liability, and responsibility for the EPD.
For further information about comparability, see EN 15804 and ISO 14025

PRODUCT INFORMATION

Company information

Owner of the EPD	Valoref ZI la Croisière 84500 Bollène, France
Description of the organization	Valoref is expert in refractory and technical ceramic waste management and recycling since 1987. Valoref provides comprehensive, end-to-end solutions for managing refractory and ceramic waste, from on-site furnace repairs or demolitions to producing high-quality secondary raw materials. Valoref has grown into an international leader with 4 subsidiaries worldwide. For more information, please visit: https://www.valoref.com/
Name and location of production site	Valoref ZI la Croisière 84500 Bollène, France
Plant certification	ISO 9001:2015 (valid till 2025-10-10)ISO 14001:2015 (valid till 2505-10-10)
Contact	Simeng WANG (simeng.wang@saint-gobain.com)

PRODUCT DESCRIPTION AND USE

Product name	Recycled refractory and ceramic grains
Product identification	**This EPD includes multiple products:** • **Valorzac: 1195, N, PR, T, F, 1711, P, CRB, ER** • **Zircoval: 65R, 65RE, DN, DR, DE, 16CP** • **Val: 40R, 60R, 72R, ZM, Surfacast, GWC** • **Valorchrom: CO, R, F** • **Valorgal: S, CJ** • **Aluval: Dense** • **Valmag: O, V** • **Valmalox: ZR05, ZR20** • **Valorglass:SL** Thus, this EPD is valid for multiple products and the representative product is Valorzac PR/T. This choice of the representative product is based on production volumes.
UN CPC code	UN CPC 89420 - Non-metal waste and scrap recovery (recycling) services, on a fee or contract basis
Product and manufacturing description	Recycled refractory and ceramic grains are secondary raw materials obtained after the mechanical recycling of refractory and ceramic waste. This waste mainly comes from glass furnace demolition. The waste is transported to the plant, where it undergoes several processing steps, including sorting, crushing, and removing contaminants such as iron or glass. Finally, the processed material is packaged.
Potential intended uses	Recycled refractory and ceramic grains are intermediate materials used as input to manufacture new products. For instance, they can be used in the production of new refractory blocks for the glass industry and in ceramic tiles for the construction industry.

LCA CALCULATION INFORMATION

Declared unit (DU)	1 kg of recycled refractory and ceramic grains and its delivery packaging
Reference service life (RSL)	Not applicable for this product
Time representativeness	Data collected representative of the 2023 production
Geographical coverage	The geographical scope of this EPD is global. It is valid for products manufactured in Bollène plant (France).
Database (s) and LCA software used	**Databases:** EcoInvent v3.9.1 cut-off by classification and Managed LCA Content 2023.2 databases **LCA software:** LCA for Experts version 10.7.1
Calculation methods	Potential environmental impacts are calculated following EN 15804:2012 +A2:2019 based on EF 3.1.
Data quality	Data quality assessment made based on the Product Environmental Footprint Category Rules. Through an arithmetic average based on the GWP-GHG results, the total score of the LCA is 8.4 which is considered fair.
Allocation procedures	Allocation has mainly been solved by subdivision. However, for some flows we did a mass allocation: • For diesel used for heating and packaging we did a mass allocation as those flows are linked to the product mass. • For water consumption, wastewater, electricity for heating and non-process waste, although revenue differences between products would justify economic allocation, mass allocation was chosen for several reasons. Electricity for heating, water, and non-process waste are tied to human activities. These elements were included for a conservative approach, despite being minor contributors to GWP-GHG impact. Additionally, the primary value of the products is generated during the crushing and grinding stages, which can be tied to the mass of waste input, which is fairly consistent for all products. Performing economic allocation would require extensive data but provide minimal precision gains, as these flows contribute less than 1% to the total GWP-GHG for Valorzac PR/T.
Cut-off rules	Data for elementary flows to and from the product system contributing to a minimum of 95% of the declared environmental impact have been included.
System boundaries	Cradle-to-gate with options (A1-A3 + A5) A1 raw materials supply includes waste and packaging manufacturing.

	A2 upstream transportation includes transportation of the waste and packaging to the plant. A3 manufacturing includes the production and consumption of energy during the manufacturing of the products. As the packaging contains >5% biogenic carbon, module A5 has been included only for balancing out the emission of this carbon. The polluter pays principle and the modularity principle have been followed.
Excluded lifecycle stages	The scope of this study is cradle-to-gate (A1-A3) as the products fulfils the three conditions below, as required by the PCR: • **The product is physically integrated with other products in subsequent life-cycle process so they cannot be physically separated from them at end of life.** • **The product or material is no longer identifiable at end-of-life as a result of a physical or chemical transformation process.** • **The product or material does not contain biogenic carbon.** Indeed, Valoref recycled grains are intermediate business-to-business materials whose life cycle and disposal are depending mainly on further processing. Recycled grains are primarily used as raw materials to produce new ceramic tiles or refractory blocks for use in glass furnaces. The production of these materials involves a fusion or sintering process, where all inputs are melted together and become indistinguishable from one another. Thus, it is not possible to make appropriate assumptions for downstream processes.
Main assumptions	• The demolition phase is excluded from the scope of this LCA, as the end-of-waste status is considered to occur after demolition. Consequently, the demolition process is attributed to the main product. However, the transportation of waste from the demolition site to our manufacturing facility is included in the assessment. The end-of-waste status is determined to be post-demolition at the site. • All the recycled refractory and ceramic grains are made from 100% post-consumer waste mainly coming from glass furnace demolition. The post-consumer waste comes with no environmental burden. • For the transportation parameters (payload, empty returns, type of truck), due to lack of data, we used the default parameters from Ecotransit 2024 methodological report. • For the energy accounting, we chose option B as described in the PCR Construction Products 2019:14, version 1.3.4.

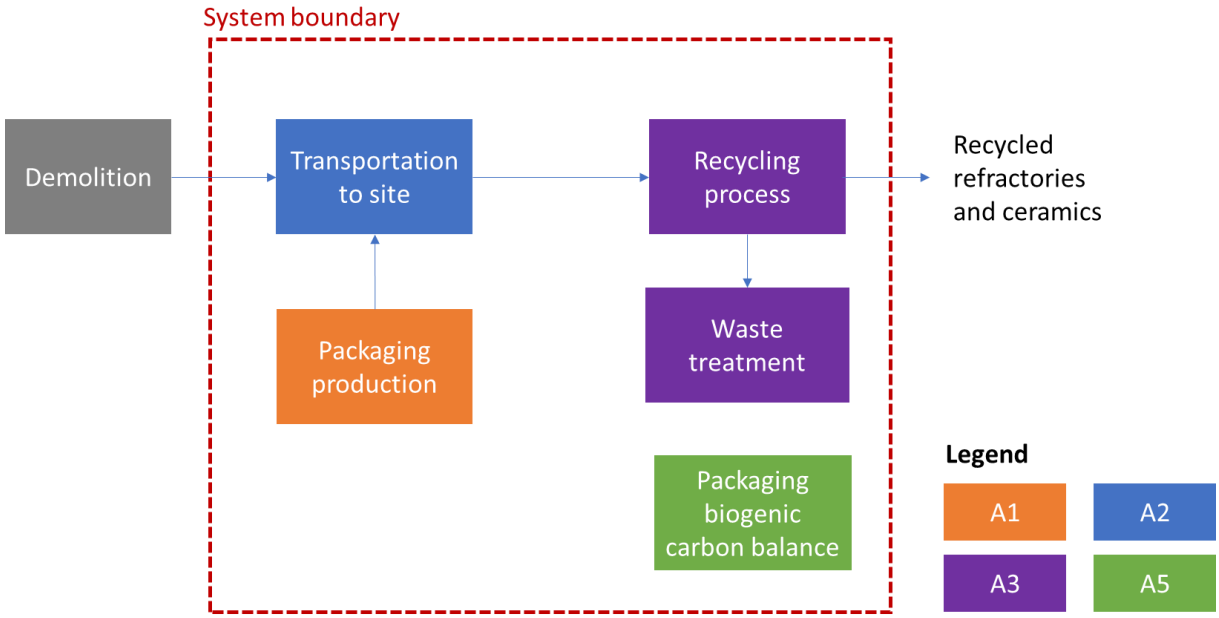

Figure 1: *System boundary*

CONTENT DECLARATION

Product composition

PRODUCT COMPONENTS	WEIGHT (kg)	POST-CONSUMER MATERIALS (weight % of product)	RANGES	BIOGENIC MATERIALS (weight % and kg C/kg)
Recycled refractory and ceramic grains	1.0	100%	100%	0
TOTAL	**1.0**	**100%**	**100%**	**0**
PACKAGING MATERIALS	**WEIGHT (kg)**	**WEIGHT (% versus the product)**	**RANGES[1]**	**BIOGENIC MATERIALS (kg C/DU)**
Big bag	0.001	0.14%	NA	0
Pallet	0.010	1.0°%	NA	0.004
Plastic film	0.001	0.08	NA	0
TOTAL	**0.012**	**1.22%**	**NA**	**0.004**

The content declaration above is **based on the representative product Valorzac PR/T but it is valid for all the products covered by this EPD**. Indeed, the waste used for all the products are post-consumer waste.

There is no recycled content in the packaging and there is no biogenic carbon content in the product.

The product is not classified as hazardous according to the CPL regulation.
The product does not contain any materials / substances hazardous to health and environment (carcinogenic, mutagenic or toxic to reproduction, allergic, PBT, vPvB).
The production and products are in line with the Regulation (EC) No 1907/2006 with its amendment regulation 2020/878 of the European parliament and of the council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
The product does not contain any materials on the Candidate List of Substances of Very High Concern (SVHC) by the European Reach Regulation at a concentration greater than 0.1% by mass.

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

[1] No ranges for packaging as all the products have the same packaging.

LCA RESULTS

As specified in EN 15804:2012+A2:2019 based on EF 3.1 the environmental impacts declared and reported using the baseline characterization factors are from the ILCD. An additional indicator for Global Warming Potential-Greenhouse Gas Emissions has been added to fulfil requirements of the PCR Construction Products 2019:14.

Specific data has been supplied by the plant, and background data come from Managed LCA Content 2023.2 and EcoInvent v3.9.1 cut-off by classification databases.

All emissions to air, water, and soil, and all materials and energies used have been included. Personnel-related processes, such as transportation of employees to and from work were excluded from the following results. While we excluded infrastructure and capital goods (e.g., our own building) from our scope, those elements can be included in some of the datasets used in the study (e.g., infrastructure at the raw materials manufacturing location).

The results of this LCA are**:**

- **based on a representative product: Valorzac PR/T**
- **to a declared unit of 1kg of recycled refractory and ceramic grains, plus its delivery packaging.**

Important elements regarding the results:

- Estimated impact results are only relative statements that do not indicate impact category endpoints, exceeding threshold values, safety margins, or risks.

- The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

- As the GWP-biogenic of the packaging is >5% of the GWP-total, the balancing of biogenic CO_2 for packaging materials are reported within module A5. Module A5 has been included only for balancing out the biogenic CO2 from the packaging.

System boundaries (X=included. MND=module not declared)

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-recovery
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	EU, GLO	EU, GLO	FR	-													

Specific data used	21%
Variation products	-75/+51%
Variation sites	0%

The variation in GWP-GHG between the products exceeds 10%. This difference arises because the LCA results are very small, making even slight differences between products appear significant. In this specific case, fluctuations are influenced by factors such as the transportation distances due to waste sourcing.

However, we opted to group these products together because they are all raw materials intended for the production of either new refractories or ceramics and sharing the same production processes. Additionally, many of these products originate from the same waste batch. After sorting, different material flows from the batch can lead to a variety of product ranges.

ENVIRONMENTAL IMPACTS – 1 KG VALORZAC PR/T WITH PACKAGING

	Environmental indicators	A1	A2	A3	Total A1-A3	A5	Total A1-A3 + A5[2]
	Climate Change [kg CO2 eq.]	-6.60E-03	1.72E-01	1.21E-01	**2.87E-01**	1.50E-02	**3.02E-01**
	Climate Change (fossil) [kg CO2 eq.]	8.39E-03	1.71E-01	1.21E-01	**3.00E-01**	0.00E+00	**3.00E-01**
	Climate Change (biogenic) [kg CO2 eq.]	-1.50E-02	1.86E-04	9.09E-05	**-1.47E-02**	1.50E-02	**2.76E-04**
	Climate Change (land use change) [kg CO2 eq.]	1.98E-05	5.79E-04	6.10E-04	**1.21E-03**	0.00E+00	**1.21E-03**
	Ozone depletion [kg CFC-11 eq.]	9.68E-11	1.80E-14	1.09E-09	**1.19E-09**	0.00E+00	**1.19E-09**
	Acidification terrestrial and freshwater [Mole of H+ eq.]	3.88E-05	3.36E-03	4.24E-04	**3.82E-03**	0.00E+00	**3.82E-03**
	Eutrophication freshwater [kg P eq.]	2.25E-06	2.55E-07	2.30E-05	**2.55E-05**	0.00E+00	**2.55E-05**
	Eutrophication marine [kg N eq.]	9.24E-06	8.60E-04	1.27E-04	**9.97E-04**	0.00E+00	**9.97E-04**
	Eutrophication terrestrial [Mole of N eq.]	9.60E-05	9.44E-03	1.34E-03	**1.09E-02**	0.00E+00	**1.09E-02**
	Photochemical ozone formation – human health [kg NMVOC eq.]	4.25E-05	2.37E-03	4.77E-04	**2.89E-03**	0.00E+00	**2.89E-03**
	Resource use, mineral and metals [kg Sb eq.] [3]	4.48E-08	9.52E-09	7.75E-08	**1.32E-07**	0.00E+00	**1.32E-07**
	Resource use, energy carriers [MJ][3]	2.33E-01	2.15E+00	2.32E+00	**4.71E+00**	0.00E+00	**4.71E+00**
	Water scarcity [m³ world equiv.][3]	3.92E-03	1.23E-03	1.26E-02	**1.77E-02**	0.00E+00	**1.77E-02**

[2] A1-A3 + A5 is included as a summary of the results as A5 only contains balancing of biogenic carbon in the packaging
[3] **Disclaimer**: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator

RESOURCE USE – 1 KG VALORZAC PR/T WITH PACKAGING

	Resource use indicators	A1	A2	A3	Total A1-A3	A5	Total A1-A3 + A5[4]
	Use of renewable primary energy (PERE) [MJ]	2.46E-01	7.14E-02	2.92E-01	**6.09E-01**	0.00E+00	**6.09E-01**
	Primary energy resources used as raw materials (PERM) [MJ]	1.70E-01	0.00E+00	0.00E+00	**1.70E-01**	0.00E+00	**1.70E-01**
	Total use of renewable primary energy resources (PERT) [MJ]	4.16E-01	7.14E-02	2.92E-01	**7.79E-01**	0.00E+00	**7.79E-01**
	Use of non-renewable primary energy (PENRE) [MJ]	1.70E-01	2.25E+00	2.32E+00	**4.73E+00**	0.00E+00	**4.73E+00**
	Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	9.75E-02	0.00E+00	0.00E+00	**9.75E-02**	0.00E+00	**9.75E-02**
	Total use of non-renewable primary energy resources (PENRT) [MJ]	2.67E-01	2.25E+00	2.32E+00	**4.83E+00**	0.00E+00	**4.83E+00**
	Input of secondary material (SM) [kg]	2.07E+00	0.00E+00	0.00E+00	**2.07E+00**	0.00E+00	**2.07E+00**
	Use of renewable secondary fuels (RSF) [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 (NRSF) [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
	Use of net fresh water (FW) [m3]	9.13E-05	8.70E-05	5.83E-04	**7.61E-04**	0.00E+00	**7.61E-04**

[4] A1-A3 + A5 is included as a summary of the results as A5 only contains balancing of biogenic carbon in the packaging

WASTE CATEGORY & OUTPUT FLOWS – 1 KG VALORZAC PR/T WITH PACKAGING

	Waste category & output flows	A1	A2	A3	Total A1-A3	A5	Total A1-A3 + A5[5]
	Hazardous waste disposed (HWD) [kg]	2.54E-07	6.04E-12	2.62E-01	**2.62E-01**	0.00E+00	**2.62E-01**
	Non-hazardous waste disposed (NHWD) [kg]	4.39E-03	1.92E-04	6.61E-02	**7.07E-02**	0.00E+00	**7.07E-02**
	Radioactive waste disposed (RWD) [kg]	1.76E-07	4.90E-06	2.29E-04	**2.34E-04**	0.00E+00	**2.34E-04**
	Components for re-use (CRU) [kg]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
	Materials for Recycling (MFR) [kg]	0.00E+00	0.00E+00	8.10E-01	**8.10E-01**	0.00E+00	**8.10E-01**
	Material for Energy Recovery (MER) [kg]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
	Exported electrical energy (EEE) [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
	Exported thermal energy (EET) [MJ]	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**

[5] A1-A3 + A5 is included as a summary of the results as A5 only contains balancing of biogenic carbon in the packaging

ADDITIONAL MANDATORY GWH-GHG INDICATORS – 1 KG VALORZAC PR/T WITH PACKAGING

	Environmental indicators	A1	A2	A3	Total A1-A3	A5	Total A1-A3 + A5[6]
	Climate Change [kg CO2 eq.]	8.43E-03	1.72E-01	1.21E-01	**3.02E-01**	0.00E+00	**3.02E-01**

[6] A1-A3 + A5 is included as a summary of the results as A5 only contains balancing of biogenic carbon in the packaging

ADDITIONAL INFORMATION

GWP-GHG results for the other products

RANGE	PRODUCT	Conversion factor for GWP-GHG
VALORZAC	1195	1,51
	N	0,74
	1711	0,68
	PR/T	1,00
	F	0,93
	P	0,64
	CRB	0,53
	ER	0,68
ZIRCOVAL	65R/65RE	0,53
	DN	1,29
	DR/DE	1,41
	16 CP	0,26
VALORCHROM	CO	0,73
	R/F	0,99
VALORGAL	S	0,68
	CJ	0,50
VAL	40R	0,50
	60R	0,53
	72R	0,68
	ZM	0,50
	Surfacast	0,68
	GWC	0,50
ALUVAL	Dense	0,51
VALMAG	O/V	0,53
VALMALOX	ZR05/ZR20	0,68
VALORGLASS	SL	0,53

Table 1: Conversion factor for GWP-GHG results for all products

Core environmental results for the other products

	MAX	MIN
Climate Change [kg CO2 eq.]	50,78%	-73,60%
Climate Change (fossil) [kg CO2 eq.]	51,25%	-73,70%
Climate Change (biogenic) [kg CO2 eq.]	27,13%	-72,80%
Climate Change (land use change) [kg CO2 eq.]	25,50%	-54,93%
Ozone depletion [kg CFC-11 eq.]	0,00%	-20,70%
Acidification terrestrial and freshwater [Mole of H+ eq.]	170,03%	-92,64%
Eutrophication freshwater [kg P eq.]	0,33%	-20,06%
Eutrophication marine [kg N eq.]	164,38%	-92,66%
Eutrophication terrestrial [Mole of N eq.]	164,87%	-93,04%
Photochemical ozone formation - human health [kg NMVOC eq.]	156,59%	-88,87%
Resource use, mineral and metals [kg Sb eq.]	3,92%	-17,28%
Resource use, energy carriers [MJ]	30,61%	-66,63%
Water scarcity [m³ world equiv.]	1,34%	-22,40%

Table 2: Core environmental results variation

	VALORZAC								ZIRCOVAL				VALORCHROM	
	1195	N	1711	PR/T	F	P	CRB	ER	65R/65RE	DN	DR/DE	16 CP	CO	R/F
Climate Change [kg CO2 eq.]	1,51	0,74	0,68	1,00	0,93	0,64	0,53	0,68	0,53	1,29	1,41	0,26	0,73	0,99
Climate Change (fossil) [kg CO2 eq.]	1,51	0,73	0,67	1,00	0,93	0,64	0,52	0,67	0,53	1,29	1,42	0,26	0,73	0,99
Climate Change (biogenic) [kg CO2 eq.]	0,65	1,23	1,17	1,00	0,95	1,14	1,04	1,17	1,05	0,48	0,73	0,27	1,27	0,70
Climate Change (land use change) [kg CO2 eq.]	0,58	1,23	1,13	1,00	0,91	1,09	1,12	1,13	1,13	0,53	0,71	0,51	1,25	0,71
Ozone depletion [kg CFC-11 eq.]	0,86	1,00	0,86	1,00	0,86	0,80	0,84	0,86	0,85	1,00	1,00	0,84	0,96	0,94
Acidification terrestrial and freshwater [Mole of H+ eq.]	2,70	0,14	0,13	1,00	0,96	0,12	0,09	0,13	0,09	1,74	2,24	0,07	0,14	1,11
Eutrophication freshwater [kg P eq.]	0,85	1,00	0,86	1,00	0,86	0,81	0,85	0,86	0,85	0,99	1,00	0,84	0,97	0,93
Eutrophication marine [kg N eq.]	2,64	0,16	0,15	1,00	0,96	0,14	0,10	0,15	0,10	1,94	2,23	0,07	0,16	1,16
Eutrophication terrestrial [Mole of N eq.]	2,65	0,16	0,15	1,00	0,96	0,14	0,09	0,15	0,09	1,95	2,24	0,07	0,16	1,16
Photochemical ozone formation - human health [kg NMVOC eq.]	2,57	0,21	0,19	1,00	0,95	0,18	0,13	0,19	0,13	1,75	2,16	0,11	0,20	1,11
Resource use, mineral and metals [kg Sb eq.]	0,97	0,97	0,88	1,00	0,90	0,84	0,87	0,88	0,87	1,00	1,04	0,83	0,95	0,95
Resource use, energy carriers [MJ]	1,31	0,81	0,70	1,00	0,88	0,62	0,56	0,70	0,57	1,23	1,31	0,33	0,74	1,05
Water scarcity [m³ world equiv.]	0,88	0,99	0,85	1,00	0,86	0,78	0,84	0,85	0,85	0,98	1,01	0,78	0,94	0,97

Table 3: Conversion factor for core environmental impact for Valorzac, Zircoval and Valorchrom range

	VALORGAL		VAL						ALUVAL	VALMAG	VALMALOX	VALORGLASS
	S	CJ	40R	60R	72R	ZM	Surfacast	GWC	Dense	O/V	ZR05/ZR20	SL
Climate Change [kg CO2 eq.]	0,68	0,50	0,50	0,53	0,68	0,50	0,68	0,50	0,51	0,53	0,68	0,53
Climate Change (fossil) [kg CO2 eq.]	0,67	0,50	0,50	0,53	0,68	0,50	0,68	0,50	0,51	0,53	0,68	0,53
Climate Change (biogenic) [kg CO2 eq.]	1,17	1,02	1,02	1,05	1,17	0,98	0,36	1,03	1,00	1,05	1,18	1,05
Climate Change (land use change) [kg CO2 eq.]	1,13	1,09	1,09	1,12	1,13	1,06	0,45	1,09	1,09	1,12	1,13	1,12
Ozone depletion [kg CFC-11 eq.]	0,86	0,79	0,79	0,84	0,86	0,84	0,86	0,79	0,85	0,84	0,86	0,84
Acidification terrestrial and freshwater [Mole of H+ eq.]	0,13	0,09	0,09	0,09	0,13	0,09	0,67	0,09	0,09	0,09	0,13	0,09
Eutrophication freshwater [kg P eq.]	0,86	0,80	0,80	0,85	0,86	0,85	0,85	0,80	0,85	0,85	0,86	0,85
Eutrophication marine [kg N eq.]	0,15	0,09	0,09	0,10	0,15	0,10	0,75	0,09	0,10	0,10	0,15	0,10
Eutrophication terrestrial [Mole of N eq.]	0,15	0,09	0,09	0,09	0,15	0,09	0,75	0,09	0,09	0,09	0,15	0,09
Photochemical ozone formation - human health [kg NMVOC eq.]	0,19	0,13	0,13	0,13	0,19	0,13	0,71	0,13	0,13	0,13	0,19	0,13
Resource use, mineral and metals [kg Sb eq.]	0,88	0,83	0,83	0,87	0,88	0,86	0,86	0,83	0,87	0,87	0,88	0,87
Resource use, energy carriers [MJ]	0,70	0,50	0,50	0,56	0,70	0,54	0,68	0,50	0,56	0,56	0,70	0,56
Water scarcity [m³ world equiv.]	0,86	0,78	0,78	0,84	0,86	0,83	0,81	0,78	0,84	0,84	0,86	0,84

Table 4: Conversion factor for core environmental impact for Valorgal, Val, Aluval, Valmag, Valmalox and Valorglass range

ELECTRICITY INFORMATION

<table>
<tr><th>TYPE OF INFORMATION</th><th>DESCRIPTION</th></tr>
<tr><td>Location</td><td>Representative of Bollène (France) for the 2023 production year.</td></tr>
<tr><td>Geographical representativeness description</td><td>France residual mix
<table>
<tr><th>Source</th><th>%</th></tr>
<tr><td>Nuclear</td><td>72,86</td></tr>
<tr><td>Natural gas</td><td>14,94</td></tr>
<tr><td>Hard coal</td><td>5,40</td></tr>
<tr><td>Photovoltaics</td><td>2,66</td></tr>
<tr><td>Wind</td><td>1,44</td></tr>
<tr><td>Biomass</td><td>1,15</td></tr>
<tr><td>HFO</td><td>1,20</td></tr>
<tr><td>Hydro</td><td>0,32</td></tr>
<tr><td>Geothermal</td><td>0,02</td></tr>
<tr><td>Lignite</td><td>0,01</td></tr>
<tr><td>Biogas</td><td>0,00</td></tr>
<tr><td>Coal gases</td><td>0,00</td></tr>
<tr><td>Peat</td><td>0,00</td></tr>
<tr><td>Solar_thermal</td><td>0,00</td></tr>
<tr><td>Waste (Waste-to-Energy)</td><td>0,00</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Grid losses</td><td>6,85</td></tr>
</table></td></tr>
<tr><td>Reference year</td><td>Residual Electricity mix split: Association of Issuing Bodies (AIB), 2022, version 1.0, dated 2023-06-01
Background data: Managed LCA content 2023.2</td></tr>
<tr><td>GWP-GHG results</td><td>0.16 kgCO2eq./kWh</td></tr>
</table>

DIFFERENCE VERSUS PREVIOUS VERSIONS OF THE EPD

This is the first version of the EPD.

REFERENCES

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

2 ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines

3 EPD International (2017) General Program Instructions for the International EPD® System. Version 4.0, 2021-03-29, www.environdec.com.

4 ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures

5 International EPD System PCR 2019:14 Construction Products version number 1.3.4, dated 2024-04-30.

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

7 Ecotransit, Environmental Methodology and Data Update 2024, dated 2024-02- 23.

8 LCA report for recycled refractory and ceramic grains, dated 2024-08-16.