

Environmental Product Declaration



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

Aluminium Ingot

from

Aluminium Bahrain



Programme:

Programme operator:

Type of EPD:

EPD registration number:

Version date:

Validity date:

The International EPD System, www.environdec.com

EPD International AB

EPD of single product from manufacturer (Aluminium Bahrain)

EPD-IES-0025467:001

2025-11-12

2030-11-11

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



GENERAL INFORMATION

Programme Information	
Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	support@environdec.com

Product Category Rules (PCR)
CEN standard EN 15804:2012+A2:2019/AC:2021 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 2.0.1 Published on 2025.06.05. UN CPC - 4153
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Rob Rouwette, Co-chair: Noa Meron. The review panel may be contacted via support@environdec.com .

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
☒ Individual EPD verification without a pre-verified LCA/EPD tool Third-party verifier: Prabodha Acharya, Independent verifier, Mumbai, India. prabodha.acharya@gmail.com
Approved by: 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.

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) 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.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: ALUMINIUM BAHRAIN B.S.C.

Address: Building 150 Road 94, Block 951, King Hamad Highway, Askar, Bahrain

Contact:

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Mobile: +973 - 66737158

Address and contact information of the LCA practitioner commissioned by the EPD owner:

Dr. Rajesh Kumar Singh, VP Consulting, Sphera Solutions,
707 Meadows, Sahar Plaza, Andheri East, Mumbai, India- 400059

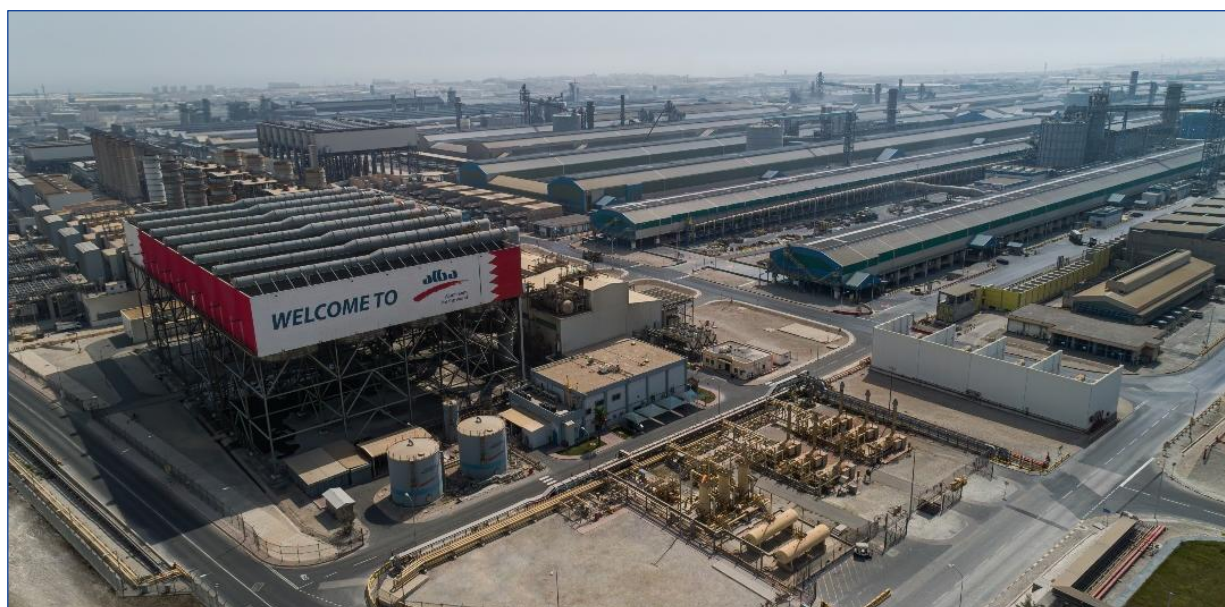
Description of the organisation:

At plus-1.62 million metric tonnes per annum (MTPA) (2024), Alba stands as the world's largest aluminium smelter operating on one site, backed by a proud 50-year legacy in operational excellence, safety, and environmental stewardship.

A cornerstone of the Bahrain's economy, Alba produces high-quality aluminium, including standard and value-added products, which are exported to over 280 customers globally. With sales' offices in Europe (Zurich), Asia (Singapore), and a subsidiary in the U.S., Alba is a reliable partner on the world stage. The Company is also dually listed on Bahrain Bourse and London Stock Exchange. Since its inception, Alba has invested into numerous environment, sustainable and socio-economic development projects that have had a positive impact on the society. Alba's first-of-its-kind US\$37.5 million zero-waste Spent Pot Lining Treatment Plant, Power Station 5 Block 4 Project, and the upcoming +6 MW Solar Farm Project are tangible initiatives aligned with Bahrain's Net Zero Carbon Targets by 2060. In a significant step towards its ESG goals, particularly its commitment to a circular economy and secondary aluminium, Alba introduced EternAl™, its new line of low-carbon aluminium products in May 2025, offering two product series with multiple variations to meet diverse customer needs: one featuring recycled content, and the other integrating verified in-house carbon offsets.

Additionally, Alba demonstrates its commitment to responsible manufacturing through certifications like IATF 16949 (automotive quality), ISO 22301 (business continuity management), ASI Performance and Chain of Custody Standards, and a top 1% Platinum sustainability rating from EcoVadis.

For more details, please visit Alba's official website: [Home - Aluminium Bahrain \(Alba\)](https://www.alba.com.bh)



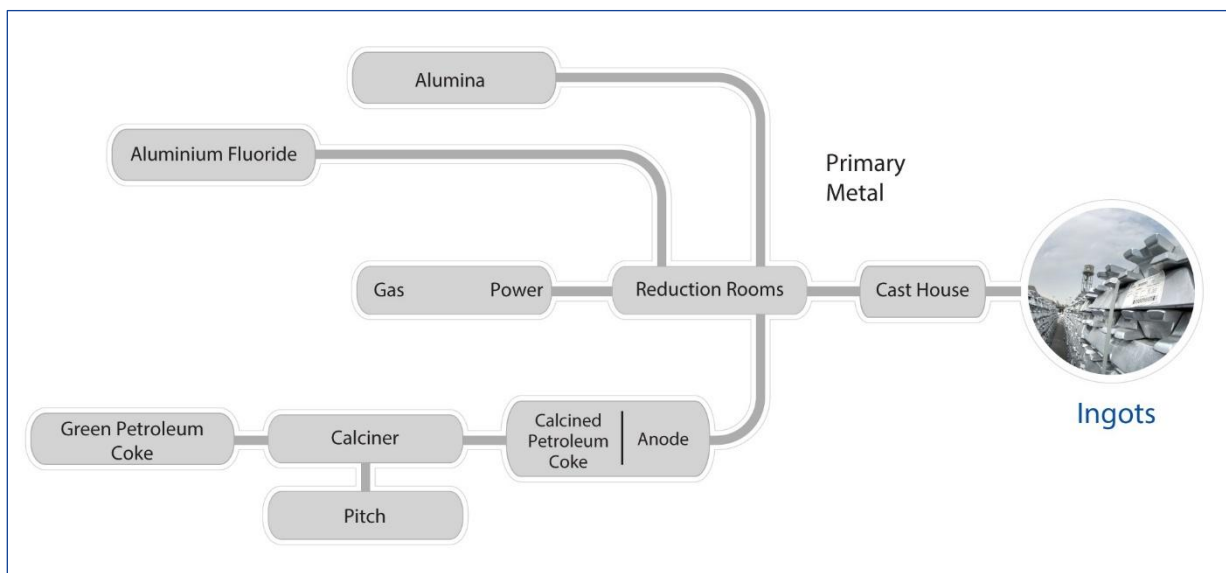
PRODUCT INFORMATION

Product name: Aluminium Ingot

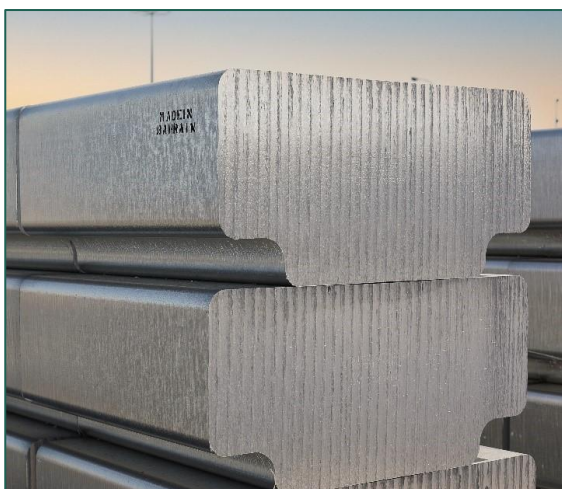
Product description and identification: Primary Foundry Alloy Ingots are produced using state-of-the-art casting and metal treatment systems, exceeding the most stringent of quality requirements. A range of alloying elements such as AlSi7Mg (A356.2), AlSi11-13, AlSi10Mn, AlSi7Mg (Mn, Cu) and AlSi3 are used to produce variety of ingots (10 kg standard ingot, 22 kg standard ingot, properzi ingot and T-ingots). They are mainly used by the automotive industry for manufacturing high quality wheels and other automotive casting components. Other applications include general purpose and electrical castings and for steel coating applications.

UN CPC code: 4153 - Semi-finished products of aluminium or aluminium alloys

Manufacturing process: Alumina, the primary raw material, undergoes electrolysis in Alba's reduction pots to produce molten aluminium. This liquid metal is then tapped and transported to the cast house, where it is blended with aluminium scrap and alloying elements to achieve the required composition. The hot metal mixture is subsequently cast into various forms, with Ingot being one of the key final products.



Name and location of production site: ALUMINIUM BAHRAIN B.S.C. Askar, Bahrain



CONTENT DECLARATION

Product content	Mass, in %	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/ declared unit
Aluminium	88 - 97	0	0	0
Pre Consumer Scrap	0 - 1.0	0	0	0
Alloying elements	3 - 12	0	0	0
Total	100	0	0	0

The packaging materials listed below are specified per declared unit : 1000 kg of Ingot.

Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/ declared unit
Plastic Strap	0.28	0.03	0
Total	0.28	0.03	0

Products do not contain any substances that can be included in "Candidate List of Substances of Very High Concern for Authorization" and raw materials used are not part of the EU REACH regulation



LCA INFORMATION

Declared unit: 1 tonne of Aluminium Ingot

Reference service life: NA

Time representativeness: The collection of foreground data refers to January 2023 to December 2023.

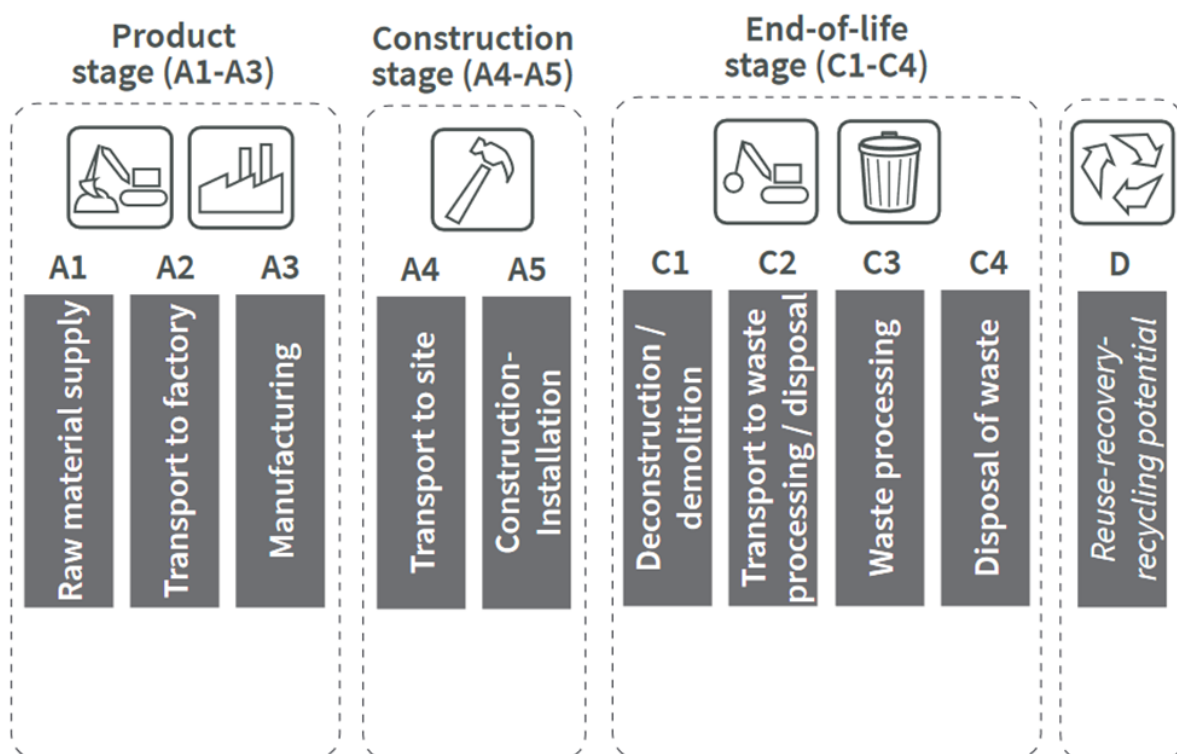
Geographical scope: The product is manufactured in Bahrain, while the raw material and end of life is considered as global

Database(s) and LCA software used: The background data has been taken from the latest available Sphera Managed LCA Content 2024.2 using Sphera's LCA for Experts (LCA FE) software, version 10.9.

Description of system boundaries:

The system boundary of the EPD is, Cradle to gate with options, modules C1-C4 and module D. The optional module are A4 and A5.

Reference package used: EN 15804 reference package based on EF 3.1.



Module A1 to A3:

The product stage includes provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage. The LCA is based on actual production data of aluminium ingots at the plant, covering the period from January to December 2023. It includes raw materials such as liquid metal, pre-consumer scrap, and alloying elements used during that year. Avoided emissions associated with scrap use have not been considered in this assessment.

- **Electricity:** The GHG-GWP impact for electricity used for manufacturing is 0.453 kg CO₂ eq./kWh. The electricity mix is comprised of 97% electricity from its in-house natural gas-based power plant and 3% electricity from grid (100% natural gas).

Module A4:

The transportation of the manufactured ingot from the Alba facility to customers worldwide is calculated based on the weighted average distance, via truck and ship transport.

Module A5:

The installation stage includes the treatment of packaging materials used. The plastic used in packaging is landfilled.

Module C1-C4:

Within this EPD, the modules C1-C4 are included. These modules consider the dismantling of the considered product (C1), the transportation of the dismantled components to their End of Life (EoL) destination (C2), the waste processing for recovery or recycling (C3) as well as the disposal (C4). In this study, end-of-life (EoL) treatment has been considered based on a scenario where 90% of the aluminium scrap is recovered and recycled, while the remaining 10% is landfilled. Additionally, the scenario analyses were conducted to evaluate the environmental impacts of two waste management strategies: 100% scrap recycling and 100% landfill disposal.

The following consideration were accounted in the end-of-life stage based on the PCR (2019:14 v 2.0.1) Construction products:

Module	Consideration
C1- Demolition and Deconstruction of Product	1.1 kWh of diesel consumption for one tonne of product demolition
C2 -Transportation to waste processing site	80 km of transportation distance to waste processing site
C3 - Waste processing	1.8 kWh of diesel & 2.2 kWh of electricity for loading, unloading and mechanical sorting

Module D:

Module D includes all the declared benefits and loads from net flows leaving the product system that has not been allocated as co-products and that has passed the end-of-waste state in the form of reuse, recovery and/or recycling potential. The benefits arising due to recovery/recycling of aluminium are also included in module D.

Cut-off criteria:

The environmental impact of the product studied has been assessed by considering all significant processes, materials, and emissions. The production of capital equipment, facilities, and infrastructure required for manufacture has not been considered.

Allocation:

No co-product or multi-input allocation occurs in the product foreground system. Allocation of background data (energy and material) taken from Sphera Managed LCA Content (MLC 2024.2 databases is documented online at <https://lcadatabase.sphera.com/>.

Scrap inputs (externally sourced pre-consumer scrap), are considered 'burden-free' in the product stage (A1-A3) since net scrap approach was used in the End-of-Life stage. Net scrap substitution approach was applied for the end of life calculation.

Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Distribution/ installation stage		Use stage							End-of-life stage				Beyond product life cycle
	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
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO		BH	GLO									GLO				GLO
Share of primary data	68.98%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

(X-Modules Declared and ND-Modules not declared)

Data quality assessment and declaration:

The data quality assessment was conducted in accordance with EN 15804:2012+A2:2019, Annex E. The evaluation criteria were based on Temporal Representativeness (TiR), Geographical Representativeness (GeR), and Technological Representativeness. Based on this assessment, no data was found as poor or very poor in quality.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of product	Collected data	EPD owner	2023	Primary data	16.61%
Generation of electricity used in manufacturing of product	Database	Sphera MLC 2024.2	2023	Primary data	49.89%
Transport of raw material to manufacturing site	Database	Sphera MLC 2024.2	2023	Primary data	2.48%
Total share of primary data, of GWP-GHG results for A1-A3					68.98%

Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that does not capture all relevant aspects of data quality. The indicator is not comparable across product categories.

ENVIRONMENTAL PERFORMANCE

The environmental performance of the Declared unit of 1 tonne of Aluminium Ingot reported below using the parameters and units as specified in PCR 2019:14 v2.0.1. 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. The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3). The scenarios included are currently in use and are representative of one of the most probable alternatives.

Mandatory impact category indicators according to EN 15804+A2:2019

Environmental Impacts for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.16E+04	1.38E+02	3.01E+00	4.20E-01	7.67E+00	3.64E+02	1.52E+00	-9.90E+03
GWP-fossil	kg CO ₂ eq.	1.15E+04	1.38E+02	5.43E-02	4.19E-01	7.36E+00	3.63E+02	1.50E+00	-9.89E+03
GWP-biogenic	kg CO ₂ eq.	1.52E+01	1.88E-01	2.96E+00	1.13E-03	3.14E-01	1.14E-01	1.03E-02	-1.22E+01
GWP-luluc	kg CO ₂ eq.	1.20E+00	4.55E-03	3.71E-05	2.63E-05	2.90E-04	3.79E-01	8.98E-03	-9.06E-01
ODP	kg CFC ₁₁ eq.	8.07E-09	1.05E-11	3.42E-13	4.73E-15	2.92E-13	1.66E-09	4.04E-12	-2.17E-12
AP	mol H ⁺ eq.	3.08E+01	2.54E+00	5.22E-04	3.75E-03	3.65E-02	1.32E+00	1.06E-02	-5.82E+01
EP-freshwater	kg P eq.	1.95E-03	3.66E-05	5.48E-06	8.73E-08	1.11E-06	3.33E-04	3.40E-06	-2.25E-03
EP-marine	kg N eq.	8.84E+00	1.08E+00	1.52E-04	1.92E-03	1.81E-02	5.63E-01	2.74E-03	-1.22E+01
EP-terrestrial	mol N eq.	9.68E+01	1.18E+01	2.16E-03	2.10E-02	1.99E-01	6.16E+00	3.01E-02	-1.34E+02
POCP	kg NMVOC eq.	2.57E+01	2.95E+00	4.21E-04	5.29E-03	3.64E-02	1.55E+00	8.37E-03	-3.52E+01
ADP-minerals & metals*	kg Sb eq.	1.58E-03	3.00E-06	3.71E-09	9.38E-09	1.09E-07	3.75E-05	9.70E-08	-5.80E-04
ADP-fossil*	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	5.81E+03	1.97E+01	-1.30E+05
WDP*	m ³	7.58E+02	2.50E-01	3.31E-01	4.92E-04	1.30E-02	1.51E+01	1.71E-01	-2.34E+02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; 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; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

* 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 limited experienced with the indicator.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	1.16E+04	1.38E+02	5.45E-02	4.20E-01	7.36E+00	3.63E+02	1.50E+00	-9.89E+03

Resource use indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	9.89E+03	8.06E+00	3.17E+01	9.59E-03	2.96E-01	4.42E+02	3.45E+00	-1.24E+03
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
PERT	MJ	9.89E+03	8.06E+00	3.17E+01	9.59E-03	2.96E-01	4.42E+02	3.45E+00	-1.24E+03
PENRE	MJ	1.62E+05	1.62E+03	9.83E+00	5.39E+00	1.02E+02	5.81E+03	1.97E+01	-1.30E+05
PENRM	MJ	9.05E+00	0.00E+00	-9.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	5.81E+03	1.97E+01	-1.30E+05
SM	kg	1.11E+01	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
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
FW	m ³	1.80E+01	9.97E-03	7.80E-03	3.10E-05	4.30E-04	6.40E-01	5.23E-03	-6.42E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy 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 non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8.24E-06	5.03E-08	4.42E-10	1.19E-10	1.57E-09	1.50E-05	4.92E-09	-4.83E-05
Non-hazardous waste disposed	kg	3.00E+02	1.55E-01	2.79E-01	1.24E-03	6.10E-03	1.50E+02	1.00E+02	-3.22E+03
Radioactive waste disposed	kg	3.67E-01	1.85E-03	4.00E-05	5.18E-06	2.75E-05	1.91E-01	2.08E-04	-3.10E-01

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 CO₂ is set to zero.

Output flow indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	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
Material for recycling	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
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Additional indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	4.21E-04	6.73E-05	3.63E-09	3.08E-08	2.04E-07	1.00E-05	1.33E-07	-8.93E-04
Ionising radiation, human health	kBq U235 eq.	3.45E+01	2.55E-01	6.33E-03	3.46E-04	2.26E-03	3.04E+01	2.41E-02	-4.97E+01
Ecotoxicity, freshwater	CTUe	2.49E+04	1.21E+03	6.99E-01	5.64E+00	9.98E+01	6.57E+02	1.50E+01	-2.10E+04
Human toxicity, cancer	CTUh	9.94E-07	2.18E-08	3.46E-11	1.24E-10	1.63E-09	3.49E-08	2.69E-10	-6.28E-06
Human toxicity, non-cancer	CTUh	4.37E-05	6.91E-07	1.74E-09	4.76E-09	3.85E-08	7.34E-07	1.04E-08	-4.97E-05
Land Use	Pt	4.12E+04	5.73E+00	2.42E-01	1.13E-02	1.81E-01	5.64E+02	5.44E+00	-1.21E+03

Additional LCA results based on 100% recycling scenario in EoL for the product:

Mandatory impact category indicators according to EN 15804+A2:2019

Environmental Impacts for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.16E+04	1.38E+02	3.01E+00	4.20E-01	7.67E+00	4.04E+02	0.00E+00	-1.10E+04
GWP-fossil	kg CO ₂ eq.	1.15E+04	1.38E+02	5.43E-02	4.19E-01	7.36E+00	4.04E+02	0.00E+00	-1.10E+04
GWP-biogenic	kg CO ₂ eq.	1.52E+01	1.88E-01	2.96E+00	1.13E-03	3.14E-01	1.26E-01	0.00E+00	-1.36E+01
GWP-luluc	kg CO ₂ eq.	1.20E+00	4.55E-03	3.71E-05	2.63E-05	2.90E-04	4.21E-01	0.00E+00	-1.01E+00
ODP	kg CFC ₁₁ eq.	8.07E-09	1.05E-11	3.42E-13	4.73E-15	2.92E-13	1.84E-09	0.00E+00	-2.41E-12
AP	mol H ⁺ eq.	3.08E+01	2.54E+00	5.22E-04	3.75E-03	3.65E-02	1.47E+00	0.00E+00	-6.48E+01
EP-freshwater	kg P eq.	1.95E-03	3.66E-05	5.48E-06	8.73E-08	1.11E-06	3.70E-04	0.00E+00	-2.51E-03
EP-marine	kg N eq.	8.84E+00	1.08E+00	1.52E-04	1.92E-03	1.81E-02	6.25E-01	0.00E+00	-1.36E+01
EP-terrestrial	mol N eq.	9.68E+01	1.18E+01	2.16E-03	2.10E-02	1.99E-01	6.85E+00	0.00E+00	-1.49E+02
POCP	kg NMVOC eq.	2.57E+01	2.95E+00	4.21E-04	5.29E-03	3.64E-02	1.72E+00	0.00E+00	-3.92E+01
ADP-minerals & metals*	kg Sb eq.	1.58E-03	3.00E-06	3.71E-09	9.38E-09	1.09E-07	4.17E-05	0.00E+00	-6.45E-04
ADP-fossil*	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	6.46E+03	0.00E+00	-1.44E+05
WDP*	m ³	7.58E+02	2.50E-01	3.31E-01	4.92E-04	1.30E-02	1.68E+01	0.00E+00	-2.60E+02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; 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; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

* 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 limited experience with the indicator.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG ²	kg CO ₂ eq.	1.16E+04	1.38E+02	5.45E-02	4.20E-01	7.36E+00	4.04E+02	0.00E+00	-1.10E+04

² 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 CO₂ is set to zero.

Resource use indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	9.89E+03	8.06E+00	3.17E+01	9.59E-03	2.96E-01	4.91E+02	0.00E+00	-1.38E+03
PERM	MJ	3.15E+01	0.00E+00	-3.15E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	9.92E+03	8.06E+00	2.14E-01	9.59E-03	2.96E-01	4.91E+02	0.00E+00	-1.38E+03
PENRE	MJ	1.62E+05	1.62E+03	9.83E+00	5.39E+00	1.02E+02	6.46E+03	0.00E+00	-1.44E+05
PENRM	MJ	9.05E+00	0.00E+00	-9.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	6.46E+03	0.00E+00	-1.44E+05
SM	kg	1.11E+01	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
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
FW	m ³	1.80E+01	9.97E-03	7.80E-03	3.10E-05	4.30E-04	7.12E-01	0.00E+00	-7.14E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy 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 non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8.24E-06	5.03E-08	4.42E-10	1.19E-10	1.57E-09	1.67E-05	0.00E+00	-5.37E-05
Non-hazardous waste disposed	kg	3.00E+02	1.55E-01	2.79E-01	1.24E-03	6.10E-03	1.66E+02	0.00E+00	-3.59E+03
Radioactive waste disposed	kg	3.67E-01	1.85E-03	4.00E-05	5.18E-06	2.75E-05	2.12E-01	0.00E+00	-3.45E-01

Output flow indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	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
Material for recycling	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
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Additional indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	4.21E-04	6.73E-05	3.63E-09	3.08E-08	2.04E-07	1.12E-05	0.00E+00	-9.93E-04
Ionising radiation, human health	kBq U235 eq.	3.45E+01	2.55E-01	6.33E-03	3.46E-04	2.26E-03	3.39E+01	0.00E+00	-5.53E+01
Ecotoxicity, freshwater	CTUe	2.49E+04	1.21E+03	6.99E-01	5.64E+00	9.98E+01	7.30E+02	0.00E+00	-2.34E+04
Human toxicity, cancer	CTUh	9.94E-07	2.18E-08	3.46E-11	1.24E-10	1.63E-09	3.88E-08	0.00E+00	-6.98E-06
Human toxicity, non-cancer	CTUh	4.37E-05	6.91E-07	1.74E-09	4.76E-09	3.85E-08	8.16E-07	0.00E+00	-5.54E-05
Land Use	Pt	4.12E+04	5.73E+00	2.42E-01	1.13E-02	1.81E-01	6.27E+02	0.00E+00	-1.35E+03

Additional LCA results based on 100% landfill scenario in EoL for the product:

Mandatory impact category indicators according to EN 15804+A2:2019

Environmental Impacts for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.16E+04	1.38E+02	3.01E+00	4.20E-01	7.67E+00	0.00E+00	1.50E+01	-7.60E-01
GWP-fossil	kg CO ₂ eq.	1.15E+04	1.38E+02	5.43E-02	4.19E-01	7.36E+00	0.00E+00	1.48E+01	-7.57E-01
GWP-biogenic	kg CO ₂ eq.	1.52E+01	1.88E-01	2.96E+00	1.13E-03	3.14E-01	0.00E+00	1.02E-01	-3.64E-03
GWP-luluc	kg CO ₂ eq.	1.20E+00	4.55E-03	3.71E-05	2.63E-05	2.90E-04	0.00E+00	8.88E-02	-2.37E-04
ODP	kg CFC ₁₁ eq.	8.07E-09	1.05E-11	3.42E-13	4.73E-15	2.92E-13	0.00E+00	4.00E-11	-4.84E-14
AP	mol H ⁺ eq.	3.08E+01	2.54E+00	5.22E-04	3.75E-03	3.65E-02	0.00E+00	1.05E-01	-2.34E-03
EP-freshwater	kg P eq.	1.95E-03	3.66E-05	5.48E-06	8.73E-08	1.11E-06	0.00E+00	3.37E-05	-7.83E-06
EP-marine	kg N eq.	8.84E+00	1.08E+00	1.52E-04	1.92E-03	1.81E-02	0.00E+00	2.71E-02	-1.06E-03
EP-terrestrial	mol N eq.	9.68E+01	1.18E+01	2.16E-03	2.10E-02	1.99E-01	0.00E+00	2.98E-01	-1.06E-02
POCP	kg NMVOC eq.	2.57E+01	2.95E+00	4.21E-04	5.29E-03	3.64E-02	0.00E+00	8.28E-02	-2.70E-03
ADP-minerals & metals*	kg Sb eq.	1.58E-03	3.00E-06	3.71E-09	9.38E-09	1.09E-07	0.00E+00	9.60E-07	-3.82E-08
ADP-fossil*	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	0.00E+00	1.95E+02	-1.23E+01
WDP*	m ³	7.58E+02	2.50E-01	3.31E-01	4.92E-04	1.30E-02	0.00E+00	1.69E+00	-4.91E-02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; 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; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

* 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 limited experience with the indicator.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG ³	kg CO ₂ eq.	1.16E+04	1.38E+02	5.45E-02	4.20E-01	7.36E+00	0.00E+00	1.48E+01	-7.57E-01

³ 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 CO₂ is set to zero.

Resource use indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	9.89E+03	8.06E+00	3.17E+01	9.59E-03	2.96E-01	0.00E+00	3.41E+01	-7.97E+00
PERM	MJ	3.15E+01	0.00E+00	-3.15E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	9.92E+03	8.06E+00	2.14E-01	9.59E-03	2.96E-01	0.00E+00	3.41E+01	-7.97E+00
PENRE	MJ	1.62E+05	1.62E+03	9.83E+00	5.39E+00	1.02E+02	0.00E+00	1.95E+02	-1.23E+01
PENRM	MJ	9.05E+00	0.00E+00	-9.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.62E+05	1.62E+03	7.78E-01	5.39E+00	1.02E+02	0.00E+00	1.95E+02	-1.23E+01
SM	kg	1.11E+01	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
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
FW	m ³	1.80E+01	9.97E-03	7.80E-03	3.10E-05	4.30E-04	0.00E+00	5.18E-02	-1.46E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy 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 non-renewable primary energy 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	8.24E-06	5.03E-08	4.42E-10	1.19E-10	1.57E-09	0.00E+00	4.87E-08	-1.64E-11
Non-hazardous waste disposed	kg	3.00E+02	1.55E-01	2.79E-01	1.24E-03	6.10E-03	0.00E+00	9.90E+02	-8.18E-03
Radioactive waste disposed	kg	3.67E-01	1.85E-03	4.00E-05	5.18E-06	2.75E-05	0.00E+00	2.06E-03	-6.60E-06

Output flow indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	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
Material for recycling	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
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Additional indicators

Results for 1 tonne of Aluminium Ingot									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	4.21E-04	6.73E-05	3.63E-09	3.08E-08	2.04E-07	0.00E+00	1.32E-06	-1.54E-08
Ionising radiation, human health	kBq U235 eq.	3.45E+01	2.55E-01	6.33E-03	3.46E-04	2.26E-03	0.00E+00	2.38E-01	-1.06E-03
Ecotoxicity, freshwater	CTUe	2.49E+04	1.21E+03	6.99E-01	5.64E+00	9.98E+01	0.00E+00	1.49E+02	-2.24E-01
Human toxicity, cancer	CTUh	9.94E-07	2.18E-08	3.46E-11	1.24E-10	1.63E-09	0.00E+00	2.66E-09	-2.55E-10
Human toxicity, non-cancer	CTUh	4.37E-05	6.91E-07	1.74E-09	4.76E-09	3.85E-08	0.00E+00	1.03E-07	-5.21E-09
Land Use	Pt	4.12E+04	5.73E+00	2.42E-01	1.13E-02	1.81E-01	0.00E+00	5.38E+01	-4.31E+01

ABBREVIATIONS

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
CEN	European Committee for Standardization
CPC	Central product classification
SVHC	Substances of Very High Concern
ND	Not Declared
MJ	Megajoule
kg	Kilogram
m ³	Cubic Meter
NMVOC	Non-Methane Volatile Organic Compounds
Sb eq.	Antimony Equivalents
P eq.	Phosphorus Equivalents
N eq.	Nitrogen Equivalents
CFC-11 eq.	Chlorofluorocarbon-11 Equivalents
CO ₂ eq.	Carbon Dioxide Equivalents

REFERENCES

- General Programme Instructions of the International EPD® System. Version 5.0.
- PCR 2019:14. Construction Products, Version 2.0.1. [Valid upto: 2030-04-07]
- Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; CEN/TR 15941:2010
- EN 15804: EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines.
- LCA FE: LCA FE Software System and Database for Life Cycle Engineering, Sphera Solution Inc, 2024. (<https://sphera.com/solutions/product-stewardship/life-cycle-assessment-software-and-data/managed-lca-content/>)

VERSION HISTORY

Original Version of the EPD, 2025-11-12

