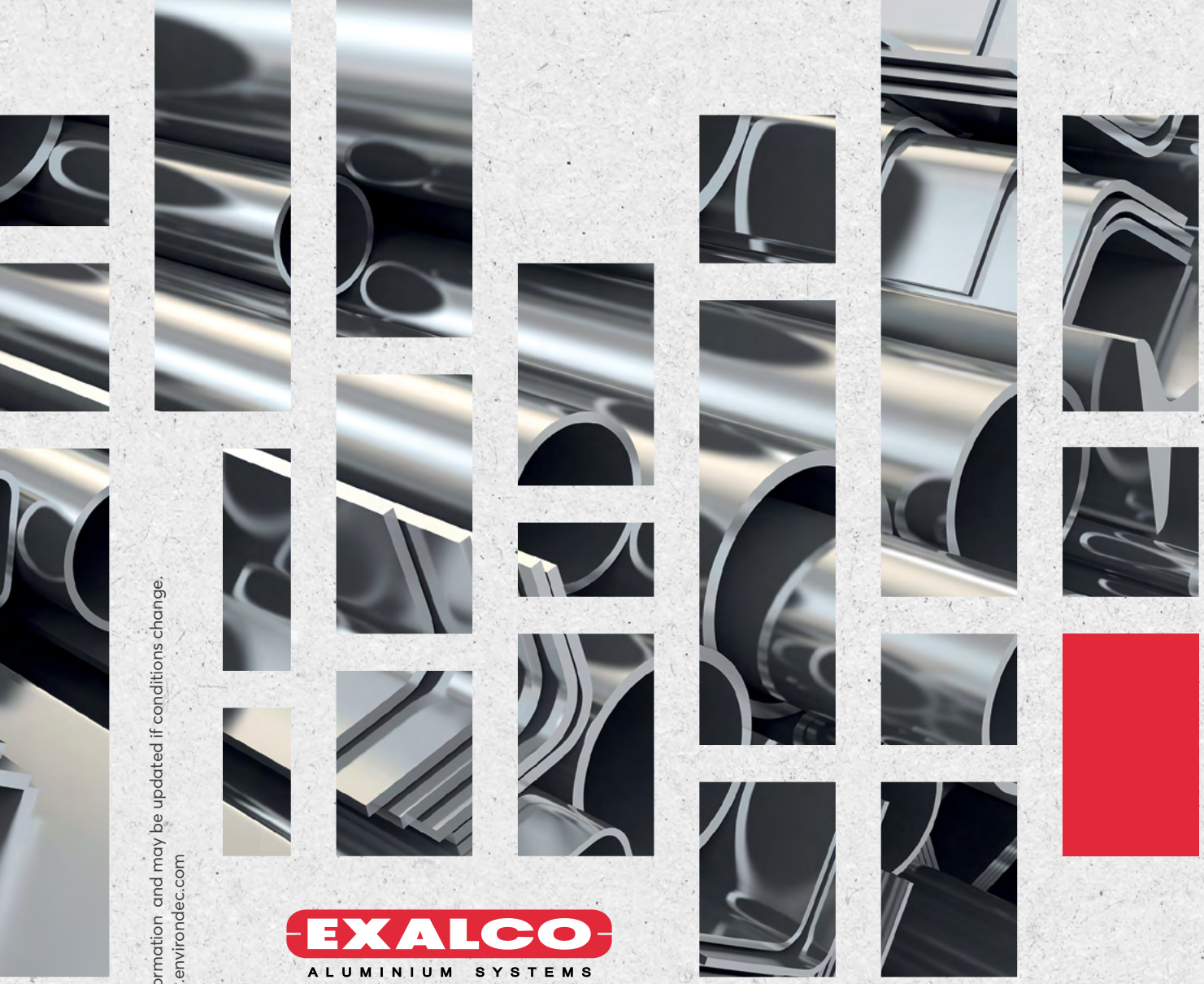


EXALCO
ALUMINIUM SYSTEMS

ENVIRONMENTAL PRODUCT DECLARATION

of EXTRUDED Aluminium Profiles by EXALCO S.A.

EPD PROGRAM	The international EPD System, https://environdec.com
PROGRAM OPERATOR	EPD INTERNATIONAL AB
CPC CODE	41532, Bars, rods and profiles, of aluminium
EPD REGISTRATION No	S-P-08991
PUBLICATION DATE	2023-04-07
VALID UNTIL	2028-04-06.
GEOGRAPHICAL SCOPE	Global

ECO PLATFORM EPD VERIFIED

EPD®

In accordance with **ISO 14025:2006 & EN 15804:A2+2019**. 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

COMPANY INFORMATION

EXALCO S.A. Aluminium Industry was founded in 1973 with headquarters in Larissa. As an integral part of the Greek Aluminium History, the company's name is linked with the tradition, experience, development and quality of its products and services.

Exalco is an integrated industrial unit producing aluminium profiles of various shapes, having the capability to cover customer needs for applications within Architecture, Construction, Decoration, and the Industry. Management and employees are focused on the continuous improvement of processes and services by providing quality products to customers in respect to social and environmental responsibility. Through the years, **EXALCO** has developed an extended sales network in domestic and foreign markets while holding a leading position in the globally respected Hellenic Aluminium Extrusion Industry.

The plants (62.800m^2) at privately owned land of 174.000m^2 are located in Larissa, Greece and include:

Production of aluminium profiles:

- Six extrusion presses of 1.100t, 1.600t, 1.750t, 2.200t, 2.300t and 2.840t with an annual production capacity of 60.000t of aluminium profiles.

Surface treatments for aluminium profiles:

- Anodising unit with an annual capacity of 6.000t.
- Vertical and horizontal powder coating units with an annual production capacity of 19.000t.
- Sublimation "wood effect" unit with an annual production capacity of 4.000t.

To obtain standard high quality of products and services **EXALCO** implements a certified Quality Management System according to **ISO 9001:2015**. Moreover, for the Construction sector **EXALCO** implements a Factory Production Control System (FPC) according to **EN 15088: 2005** complying with requirements for **CE Marking of Construction Products Directive (R305/2011)**.

To meet Environmental requirements as set by Domestic and European Regulations, including waste management and recycling, energy saving and minimising the carbon footprint, **EXALCO** implements a certified Environmental Management System according to ISO 14001:2015 and an Energy Management System according to **ISO 50001:2018**.

Focusing on the human aspect, **EXALCO** implements a certified Occupational Health and Safety Management System according to **ISO 45001:2018**.

Regarding the aluminium profiles surface treatment quality, **EXALCO** is certified with Qualicoat, Qualideco and Qualanod.

PRODUCT INFORMATION

The declared unit of the study is 1 kg of extruded aluminium profiles. This is an average EPD, since for these aluminium profiles, the weighted average results of the two production units (Koulouri and Nikaia) are presented. Aluminium profiles are used in multiple sectors:

- Building architecture, construction and decoration (windows, doors, curtain walls, partition walls, façade systems, shading systems, pergolas, railing systems, etc).
- Industrial applications (flatbars, symmetrical and asymmetrical angles, solid and hollow pipes, customed drawings).
- Profiles for mounting systems of photovoltaic panels and other types of RES.

Category	Value
Melting range	585-650 °C
Thermal Conductivity	180-220 W/m*K
Modulus of elasticity	70 GPa
Modulus of Rigidity	26,1 GPa
Poisson's Ratio	0,33

Physical properties for aluminium profiles

Alloy EN AW	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	AL
6060	0,30-0,60	0,10-0,30	0,10	0,10	0,35-0,60	0,05	0,10	0,10	Rest
6063	0,20-0,60	0,35	0,10	0,10	0,45-0,90	0,10	0,15	0,10	Rest
6005A	0,50-0,90	0,35	0,30	0,50	0,40-0,70	0,30	0,20	0,10	Rest
6082	0,70-1,30	0,50	0,10	0,40-1,00	0,60-1,20	0,25	0,20	0,10	Rest
6101A	0,30-0,70	0,40	0,05	-	0,40-0,90	-	-	-	Rest
6101B	0,30-0,60	0,10-0,30	0,05	0,05	0,35-0,60	-	0,10	-	Rest
6106	0,30-0,60	0,35	0,25	0,05-0,20	0,40-0,80	0,20	0,10	-	Rest

Chemical composition (%) of aluminium alloys (according to **EN 573-3**)

Alloy Description	Temper	Wall Thickness t (mm)	Rm min (Mpa)	Rp 0.2 min (Mpa)	A min %	A 50mm min %	HBW (Brinell)
EN-AW 6060 AlMgSi0.5	T4	≤25	120	60	16	14	50
	T5	≤5	160	120	8	6	60
		5<t≤25	140	100	8	6	60
	T6	≤5	190	150	8	6	70
		5<t≤25	170	140	8	6	70
	T64	≤15	180	120	12	10	60
	T66	≤5	215	160	8	6	75
		5<t≤25	195	150	8	6	75
EN-AW 6063 AlMg0.7Si	T4	≤25	130	65	14	21	50
	T5	≤3	175	130	8	6	65
		2<t≤25	160	110	7	5	65
	T6	≤10	215	170	8	6	75
		10<t≤25	195	160	8	6	75
	T64	≤15	180	120	12	10	65
	T66	≤10	245	200	8	6	80
		10<t≤25	225	180	8	6	80
EN-AW 6005A AlSiMg	T4 OPEN	≤25	180	90	15	13	50
	T6 OPEN	≤5	270	225	8	6	90
		5<t≤10	260	215	8	6	85
		10<t≤25	250	200	8	6	85
	T4 HOLLOW	≤10	180	90	15	19	50
	T6 HOLLOW	≤5	255	215	8	6	85
		5<t≤10	250	200	8	6	85
EN-AW 6082 AlSiMgMn	T4	≤25	205	110	14	12	70
	T5	≤5	270	230	8	6	90
	T6	≤5	290	250	8	6	95
		5<t≤25	310	260	10	8	95
EN-AW 6101A AlMgSi(A)	T6	≤50	200	170	10	8	70
EN-AW 6101B AlMgSi(B)	T6	≤15	215	160	8	6	70
	T7	≤15	170	120	12	10	60
EN-AW 6106 AlMgSiMn	T6	≤10	250	200	8	6	75

Mechanical properties of profiles (according to **EN 755-2**)

Category	Composition
Aluminium billets*	100%
Composition ranges for aluminium profiles	

*Billets derived from the recycled aluminium account for 26% in the Nikaia plant and 24% in the Koulouri plant.

No substance in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" exceeds 0.1% wt in the final products.

SYSTEM BOUNDARIES

The scope of the study is set to be Cradle-to-gate with modules C+D. The systems boundaries are strictly referred to the manufacturing plants of Koulouri and Nikaia and are described in more detail below:

BOUNDARIES

X= Included, ND= Module Not Declared

	Product stage			**Construction stage**		**Use stage**							**End-of-life stage**				**Resource recovery stage**
	Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	Disposal	Reuse-Recovery-Recycling-potential
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	EU	EU	GR										EU	EU	EU	EU	EU
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

A1: RAW MATERIAL SUPPLY

The production starts with the material supply. This module includes the mining and pretreatment processes before production (processing of raw materials, generation of electricity and fuels required for the manufacturing, and recycling process of secondary materials). Primary and secondary aluminium billets are the main raw materials charged in the extrusion line.

A2: TRANSPORTATION OF RAW MATERIALS TO THE MANUFACTURER

Transportation is relevant to the delivery of raw materials from the supplier to the gate of the manufacturing plant. Aluminium billets and other raw materials are transported to the manufacturing site from Greece and other countries, all over the Europe. Trucks, vessels for sea transportation and trains are the main transportation means.

A3: MANUFACTURING

The manufacturing process starts with the extrusion, in which aluminium billets (primary and secondary) are forced to flow through a shaped opening in the die to be moulded into aluminium profiles. Extruded profiles emerge as an elongated piece with the same profile as the die opening.

C1: DE-CONSTRUCTION AND DEMOLITION

The deconstruction and demolition of the product take place with the demolition of the building or other construction. As a result, this stage concerns the impact arising from the diesel consumption of heavy vehicles during the demolition process. The specific diesel consumption is taken as 0,239 MJ/kg of material according to JRC TECHNICAL REPORT "Model for Life Cycle Assessment (LCA) of buildings".

C2: TRANSPORTATION TO WASTE PROCESSING

Transportation of the discarded product either to the recycling site or to landfills for final disposal. As a conservative assumption, a distance of 100 km of transportation to waste processing sites is assumed.

C3: WASTE PROCESSING FOR REUSE, RECOVERY AND/OR RECYCLING

According to the European Aluminium Association, above 90% of the aluminium for building applications is being recycled. For the study, it was assumed that 90% of the aluminium is being recycled at the end-of-life of the products while the rest 10% is being disposed of/landfilled. 90% of the aluminium of the product is recycled, by the remelting process.

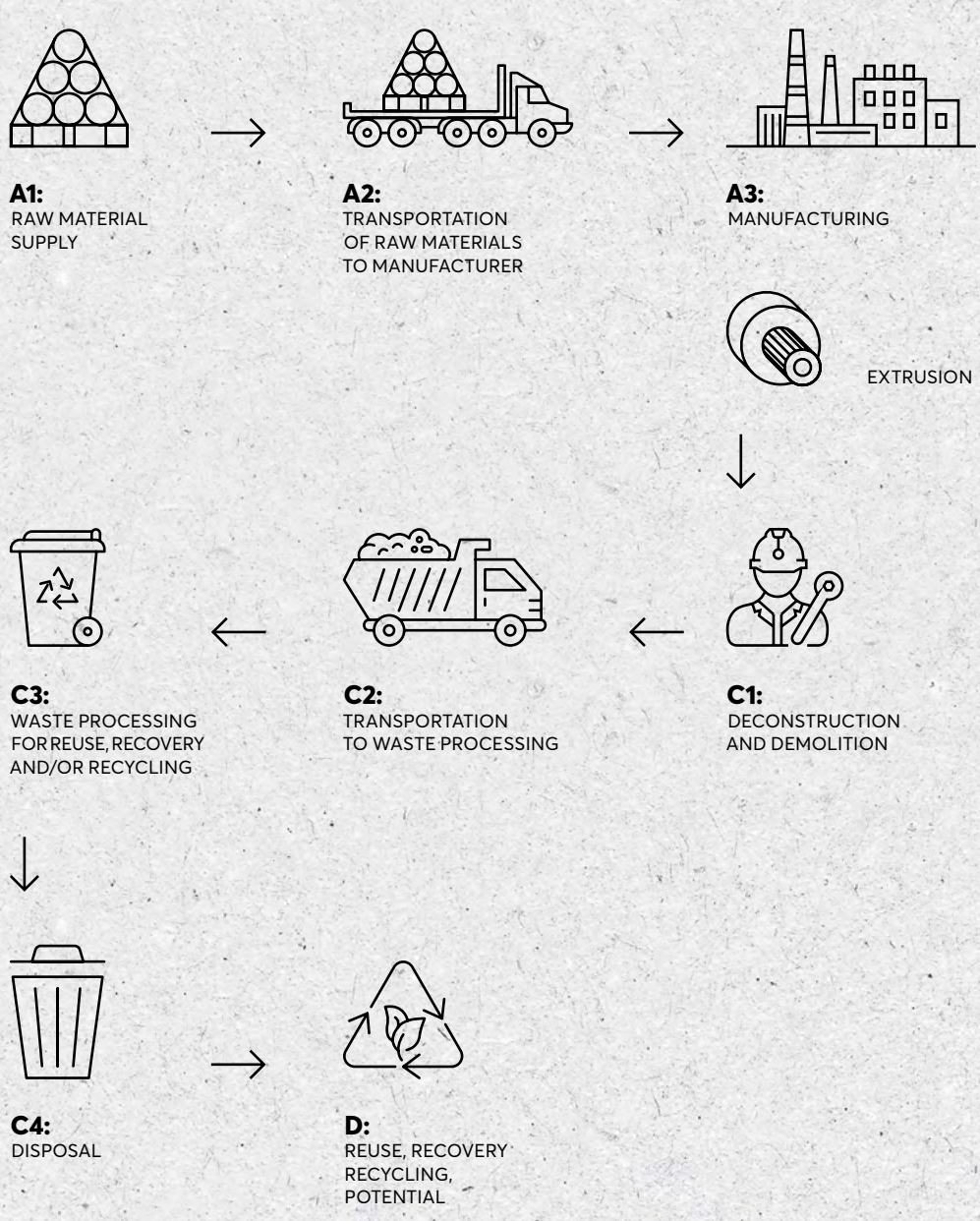
C4: DISPOSAL

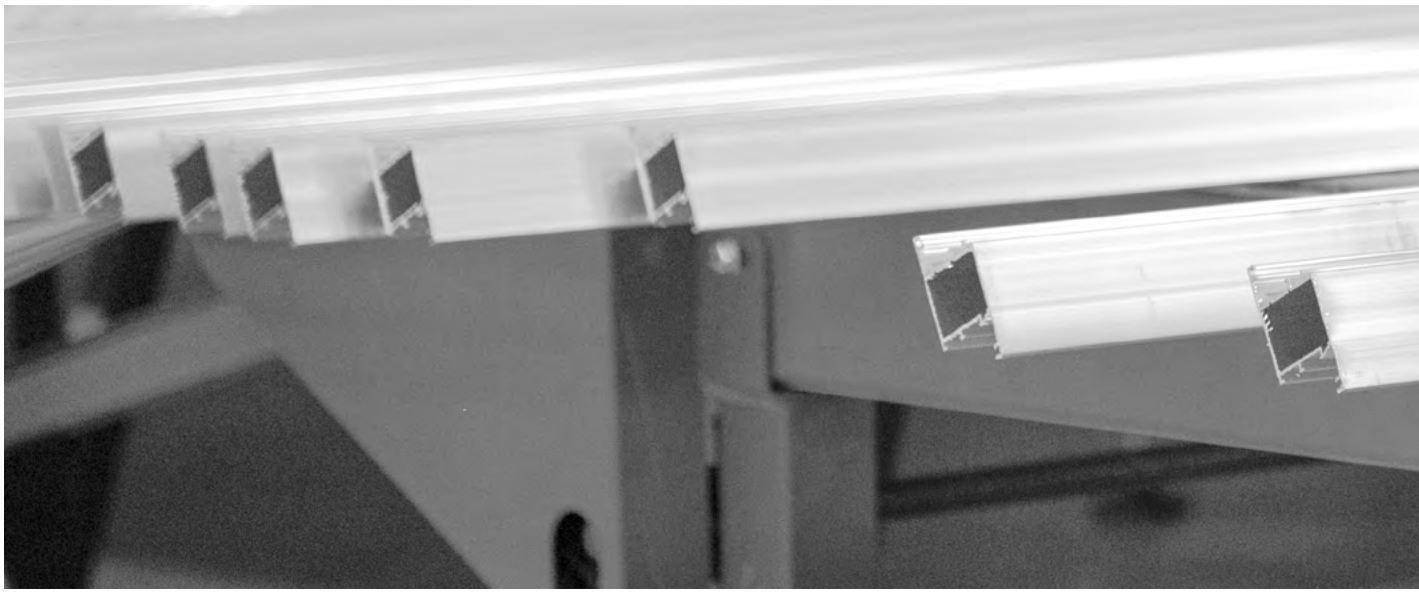
As it is mentioned above, 10% of aluminium included is assumed to be landfilled.

D: REUSE - RECOVERY - RECYCLING - POTENTIAL

Module D consists of avoided burdens related to the potential reuse and/or recycling of the product after its end-of-life stage. The reuse/recycling rates of all components of the final product are referred to above, while the recycled content of aluminium in the feed is 26% and 24% in the two units.

FLOW DIAGRAM





LCA INFORMATION

Declared unit: The declared unit is 1 kg of aluminium profiles. Weighted average results of the two production units (Koulouri and Nikaia) are presented.

Goal and Scope: This EPD evaluates the environmental impacts of the production of 1 kg of aluminium profiles from Cradle to gate (A1-A3) with modules C1-C4 + D.

Cut-off rules: The cut-off criteria adopted is as stated in "**EN 15804:2012+A2:2019**". Where there is insufficient data or data gaps for a unit process, the cut-off criteria are 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass. The cut-off rule was applied in some packaging materials wastes (paperboard, plastic films, wood and metal strips). The total mass of the excluded flows accounts for approximately 0,5% of the total mass.

Allocations: Allocation rules have been performed in accordance with the requirements of **ISO 14044:2006**. Wherever possible, the allocation was avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes. Where allocation cannot be avoided, the inputs and outputs of the system are partitioned between its different products or functions in a way that reflects the underlying physical or economic relationships between them.

According to **EN 15804:2012+A2:2019**, allocation in relation to economic values shall be applied when the difference in the amount of revenue earned by the original producer for each of the co-products is high (greater than 25%). When the contribution to the overall revenue is 1 % or less, it is regarded as very low and the impacts from the co-product production can be neglected. For extruded profiles, the allocation was applied to packaging materials based on the mass of the final products.

Assumptions & data quality: For raw materials transportation, a EURO5 lorry 16-32 metric tons were utilised for road transportation and a bulk carrier for dry goods for sea transportation.

- For module C1, the specific diesel consumption for demolition is taken as 0,239 MJ/kg of material according to JRC TECHNICAL REPORT "Model for Life Cycle Assessment (LCA) of buildings"
- For module C2, s a conservative assumption, a distance of 100km of transportation to waste processing sites is assumed.
- For modules C3+C4, according to the European Aluminium Association, 90% of the aluminium for building applications is being recycled while the rest 10% is being disposed of/landfilled.

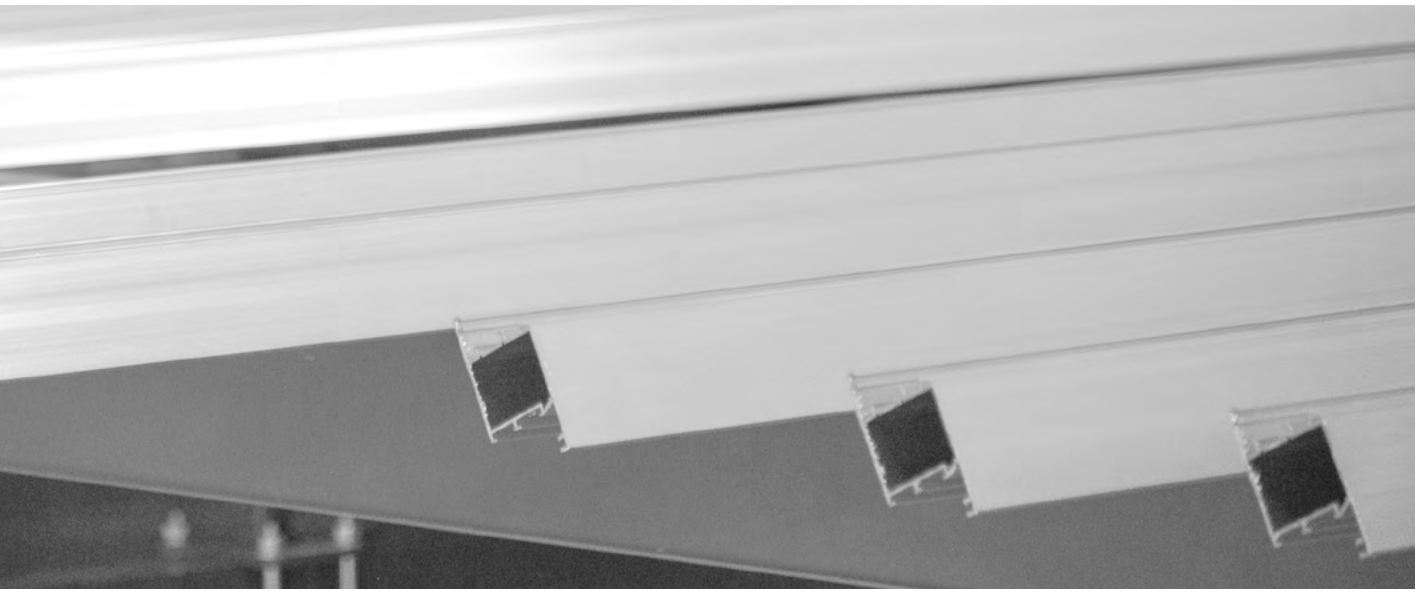
ISO 14044 was applied in terms of data collection and quality requirements. The impact of the production of raw materials recovered from Ecoinvent database v.3.9.1. The data concerning all input and output streams were provided by EXALCO S.A. and they were extracted from the company's ERP system (ATLANTIS), Energy Management Systems (for electricity and natural gas), invoices and electronic waste registry.

Regarding electricity mix, the latest (2021) national residual electricity mix, as published in DAPEEP SA was utilised. The emission factor for natural gas is provided from the National Inventory Report of 2022 for Greece. Background data for these stages are retrieved from Ecoinvent v.3.9.1.

Geographical Scope: Worldwide

Time representativeness: Data obtained refers to the year 2021.

Software used: OpenLCA v.1.11.0



ENVIRONMENTAL PERFORMANCE

Environmental impacts	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	6,99E+00	2,37E-02	1,88E-02	1,69E-02	3,93E-03	-4,69E+00
GWP-fossil	kg CO2 eq	6,69E+00	2,37E-02	1,88E-02	1,69E-02	3,92E-03	-4,56E+00
GWP-biogenic	kg CO2 eq	3,07E-02	2,99E-06	5,43E-06	2,00E-05	9,73E-06	-2,00E-02
GWP-luluc	kg CO2 eq	1,44E-01	2,67E-06	9,14E-06	1,01E-05	4,21E-06	-1,08E-01
GWP-GHG[1]	kg CO2 eq	6,88E+00	2,36E-02	3,69E-03	1,68E-02	3,91E-03	-4,65E+00
ODP	kg CFC-11 eq	2,05E-07	3,77E-10	4,10E-10	3,65E-10	4,51E-11	-1,37E-07
AP	mol H+ eq	4,44E-02	2,20E-04	6,14E-05	9,04E-05	2,50E-05	-2,93E-02
EP-freshwater	kg P eq	3,99E-03	7,28E-07	1,32E-06	2,28E-06	1,16E-06	-2,64E-03
EP-marine	kg N eq	6,57E-03	1,02E-04	2,11E-05	3,29E-05	6,49E-06	-4,08E-03
EP-terrestrial	mol N eq	6,15E-02	1,11E-03	2,23E-04	3,52E-04	6,92E-05	-3,70E-02
POCP	kg NMVOC eq	2,54E-02	3,28E-04	9,17E-05	1,28E-04	2,29E-05	-1,61E-02
ADPe	kg Sb eq	4,31E-05	8,49E-09	6,19E-08	4,77E-08	8,38E-09	-8,97E-06
ADPf	MJ	1,05E+02	3,13E-01	2,69E-01	2,90E-01	5,64E-02	-7,08E+01
WDP[2]	m^3 eq	1,16E+01	8,06E-04	1,42E-03	-7,92E-03	1,78E-03	-8,53E+00

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

[2] The results of this environmental impact indicator of ADPf, ADPe and WDP shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

ENVIRONMENTAL PERFORMANCE

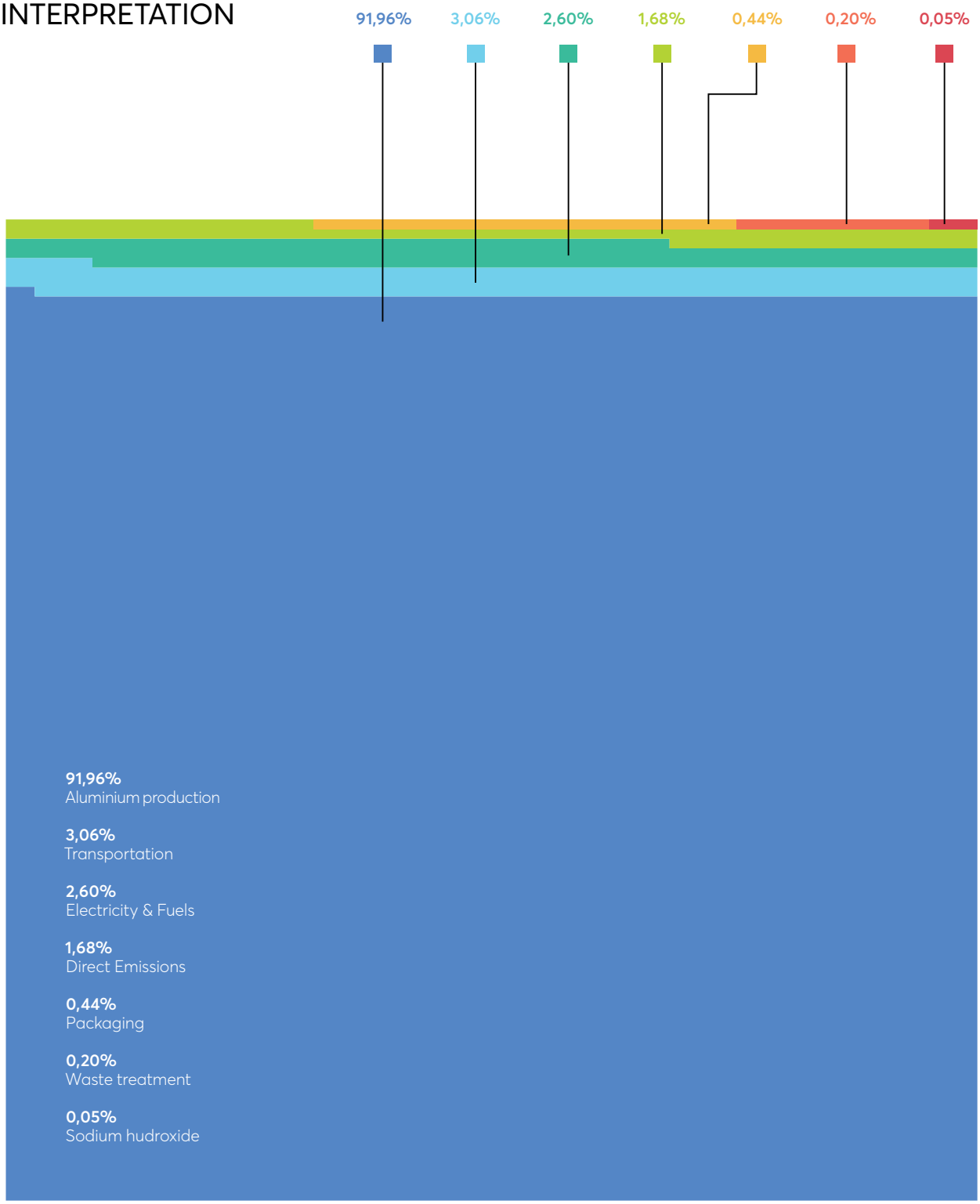
Resource use	Unit	A1 - A3	C1	C2	C3	C4	D
PERE	MJ	3,99E+01	1,77E-03	4,14E-03	5,72E-03	3,77E-03	-2,85E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	3,99E+01	1,77E-03	4,14E-03	5,72E-03	3,77E-03	-2,85E+01
PENRE	MJ	1,03E+02	3,11E-01	2,67E-01	2,88E-01	5,59E-02	-6,95E+01
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,03E+02	3,11E-01	2,67E-01	2,88E-01	5,59E-02	-6,95E+01
SM	kg	1,72E-01	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	2,69E-01	1,88E-05	3,32E-05	-1,84E-04	4,14E-05	-1,99E-01

Output flows and waste categories	Unit	A1 - A3	C1	C2	C3	C4	D
HWD	kg	2,75E-03	2,09E-06	1,70E-06	1,57E-06	1,85E-07	-1,67E-04
NHWD	kg	1,99E+00	4,45E-04	1,30E-02	7,63E-01	1,05E-01	-8,14E-01
RWD	kg	4,54E-04	3,40E-08	8,67E-08	1,03E-07	5,97E-08	-3,27E-04
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Additional impacts	Unit	A1 - A3	C1	C2	C3	C4	D
PM	Disease incidence	4,98E-07	6,13E-09	1,50E-09	3,15E-09	3,89E-10	-3,44E-07
IRP[3]	kBq U235 eq	1,72E+00	1,47E-04	3,57E-04	4,21E-04	2,45E-04	-1,23E+00
ETP-FW	CTUe	2,97E+01	1,48E-01	1,32E-01	1,30E+00	8,28E-01	-1,74E+01
HTP-c	CTUh	2,03E-08	7,28E-12	8,58E-12	2,31E-11	3,55E-12	-1,47E-08
HTP-nc	CTUh	2,18E-07	5,10E-11	1,89E-10	1,53E-10	4,64E-11	-1,36E-07
SQP	dimensionless	1,76E+01	2,09E-02	1,59E-01	3,59E-01	6,92E-02	-4,64E+00

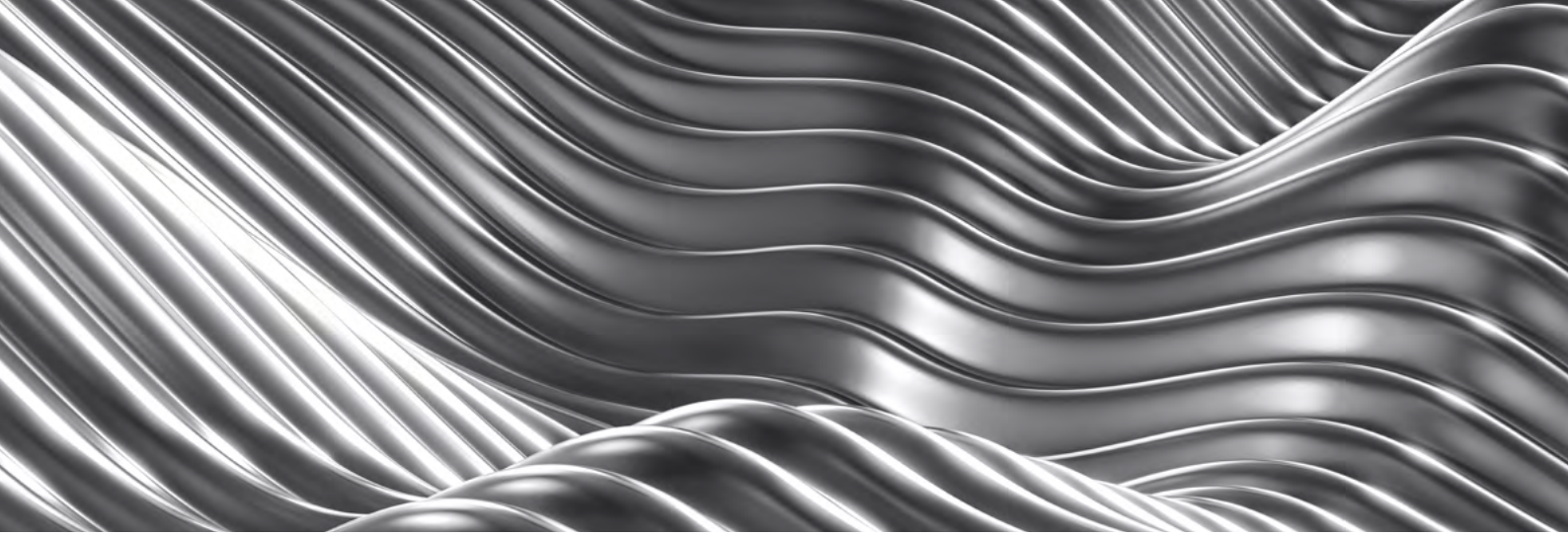
[3] Ionizing radiation potential (IRP) impact category deals mainly with the eventual impact of low dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, or occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and some construction materials is also not measured by this indicator.

INTERPRETATION



Contribution of each stream in the GWP indicator

As it is presented above, aluminium production contributes the most to the production of extruded aluminium profiles, accounting for 91,96%. Production of electricity and fuels is responsible for 2,60% of the total global warming impact while transportation of raw materials contributes 3,06%. On-site emissions from natural gas combustion add up 1,68%. Other factors, such as packaging and waste treatment, are of minor importance with 0,44% and 0,20%, respectively.



PROGRAMME RELATED INFORMATION

Programme:	The International EPD System
Address:	Box 210 60, SE-100 31, Stockholm, Sweden
Website:	www.environdec.com
Email:	info@environdec.com

Accountabilities for PCR, LCA and third-party verification
Product Category Rules (PCR)
PCR 2019:14 v.1.2.5 Construction products. EPD System. Date 2022-11-01. Valid until 2024-12-20
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

Life Cycle Assessment (LCA)		
LCA Accountability: ENVIROMETRICS Business Consultants & Engineers	**ENVIROMETRICS S.A.**	
	3 Kodrou str., 152 32, Athens, Greece	
	email: info@envirometrics.gr	www.envirometrics.gr

Owner of the EPD: EXALCO ALUMINIUM SYSTEMS	**EXALCO Aluminium systems S.A.**	
	5th klm. Old Nat. Rd Larissa-Athens, PC 415 00, Greece	
	info@exalco.gr	https://www.exalco.gr

Third party verification:	
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:	
Third party verification: LCA Studio	Prof. Vladimír Kočí, PhD, LCA Studio, Czech Republic
Procedure for follow-up during EPD validity involves third party verifier ☐ Yes / ☒ No	

ADDITIONAL INFORMATION

The EPD does not give information on the release of dangerous substances to the soil, water and indoor air because the horizontal standards on measurement of the release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

The EPD owner has the sole ownership, liability, and responsibility of the EPD.

EPDs within the same product category but registered in different EPD programmes 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.

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- **PCR 2019:14** v.1.2.5 Construction products. EPD System. Date 2022-11-01. Valid until 2024-12-20
- **EN 15804:2012+A2:2019/AC**, Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
- **ISO 14020:2000** Environmental labels and declarations - General principles
- **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
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- **ENVIRONMENTAL PROFILE REPORT** - Life - Cycle inventory data for aluminium production and transformation processes in Europe, European Aluminium Association, February 2018
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LIST OF ABBREVIATIONS

GWP-total	Global Warming Potential total
GWP-fossil	Global Warming Potential fossil
GWP-biogenic	Global Warming Potential biogenic
GWP-luluc	Global Warming Potential land use and land use change
ODP	Ozone Depletion Potential
AP	Acidification Potential
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication Potential fraction of nutrients reaching marine end compartment
EP- terrestrial	Eutrophication potential, Accumulated Exceedance
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADPe	Abiotic depletion potential for non-fossil resources
ADPf	Abiotic depletion potential for fossil resources
WDP	Water use
PERE	Use of renewable primary energy excluding resources used as raw materials
PERM	Use of renewable primary energy resources used as raw materials
PERT	Total use of renewable primary energy resources
PENRE	Use of non-renewable primary energy excluding resources used as raw materials
PENRM	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water
HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed
CRU	Components for re-use
MFR	Materials for recycling
MER	Materials for energy recovery
EE	Exported Energy
PM	Particulate matter emissions
IRP	Ionizing radiation, human health
ETP-FW	Ecotoxicity, freshwater
HTP-c	Human toxicity, cancer
HTP-nc	Human toxicity, non-cancer
SQP	Land use related impacts/Soil quality

EXALCO
ALUMINIUM SYSTEMS

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