COSMOS ALUMINIUM

ENVIRONMENTAL PRODUCT DECLARATION

ALUMINIUM PROFILES

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019

EPD® ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

EPD REGISTRATION NUMBER	PUBLICATION DATE	DATE OF VALIDITY	PROGRAM	PROGRAM OPERATOR	UN CPC
S-P-07501	2022-12-22	2027-12-21	The International EPD® System www.environdec.com	EPD International AB	41532

PROGRAM INFORMATION

PROGRAM

OPERATOR: EPD International AB
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EPD OWNER

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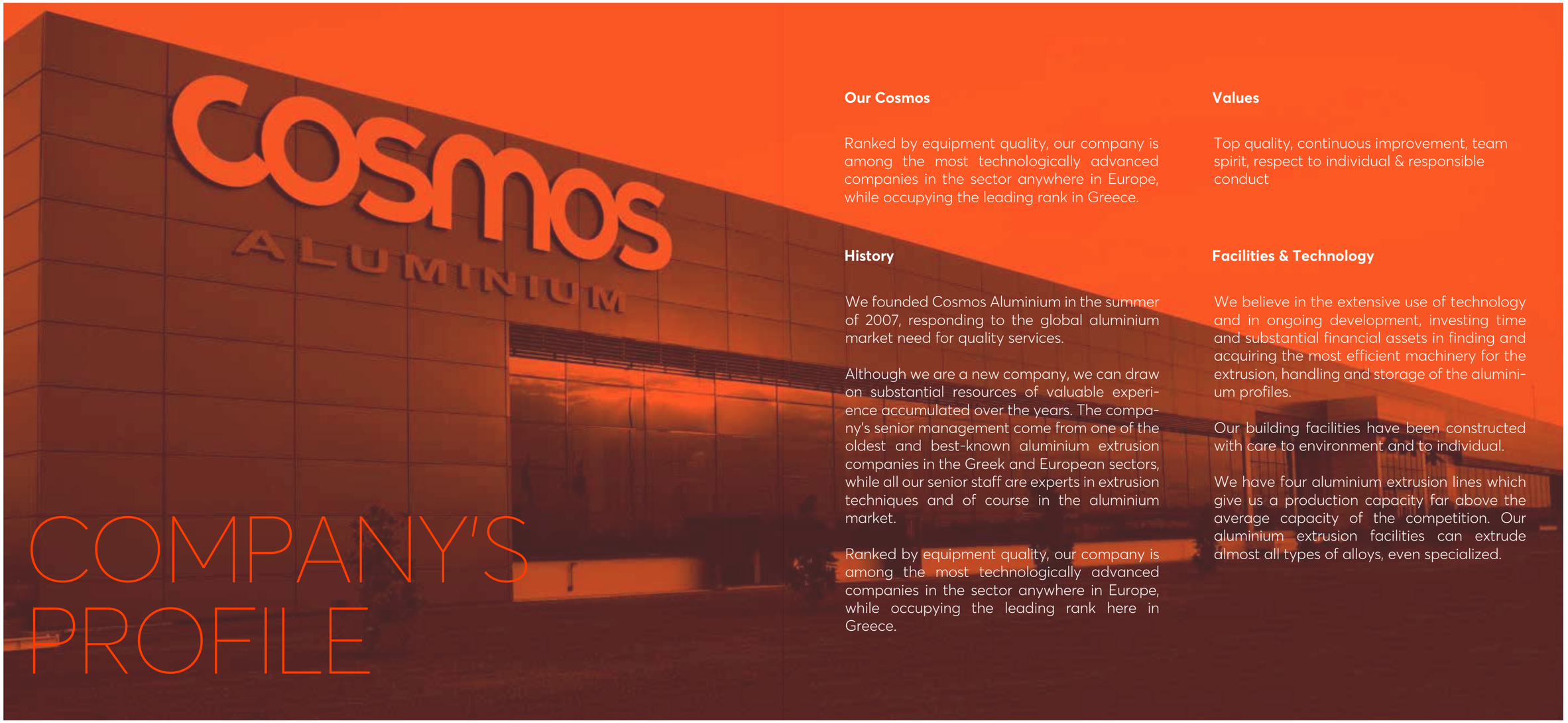
Product category rules (PCR):	CEN Standard EN 15804 serves as the Core Product Category Rules (PCR) PCR 2019:14 Construction products version 1.11 (EN 15804:A2)
LCA accountability:	SustChem Technical Consulting S.A. www.sustchem.gr
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:	EPD verification by external individual verifier
Third-party verification:	Dr-Ing. Nikolay Minkov GREENZERO AX GmbH nikolay.minkov@greenzero-ax.com
	Approved by: The International EPD System

- The EPD owner has the sole ownership, liability, and responsibility for the EPD
- EPDs within the same product category but from different programs may not be comparable.
- EPDs of construction products may not be comparable if they do not comply with EN 15804
- The EPD covers one aluminium extrusion product group (rod/bar, tube, profile)



COMPANY'S PROFILE

Our Cosmos

Ranked by equipment quality, our company is among the most technologically advanced companies in the sector anywhere in Europe, while occupying the leading rank in Greece.

History

We founded Cosmos Aluminium in the summer of 2007, responding to the global aluminium market need for quality services.

Although we are a new company, we can draw on substantial resources of valuable experience accumulated over the years. The company's senior management come from one of the oldest and best-known aluminium extrusion companies in the Greek and European sectors, while all our senior staff are experts in extrusion techniques and of course in the aluminium market.

Ranked by equipment quality, our company is among the most technologically advanced companies in the sector anywhere in Europe, while occupying the leading rank here in Greece.

Values

Top quality, continuous improvement, team spirit, respect to individual & responsible conduct

Facilities & Technology

We believe in the extensive use of technology and in ongoing development, investing time and substantial financial assets in finding and acquiring the most efficient machinery for the extrusion, handling and storage of the aluminium profiles.

Our building facilities have been constructed with care to environment and to individual.

We have four aluminium extrusion lines which give us a production capacity far above the average capacity of the competition. Our aluminium extrusion facilities can extrude almost all types of alloys, even specialized.

PRODUCT DESCRIPTION

This is a specific EPD that covers one aluminium extrusion product group manufactured by **Cosmos Aluminium** in the form of rod/bar, tube and profile. The two main categories are standard and drawings (custom made) profiles, both being produced according to highest quality standards.

Application

Aluminium profiles are used in a variety of building and construction applications and other sectors, such as:

- Architectural sections, windows, doors, curtain walls, lightings, railing, ladders, furniture, fences, truck flooring, heat sinks, irrigation, cooling pipes
- Electronic modules, electric motor housings, office equipment, special machine elements
- Bus and railway profile structures, structural engineering, pylons, platforms, pipeline
- Heavy duty structures in rail coaches, truck frames, ship building, mast and beams for ship-building, offshore, bridges, boiler making, scaffolding, motorboats

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations are present in the company's products, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/ wt).

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TECHNICAL SPECIFICATIONS

Cosmos Aluminium

Extruded Aluminium products consists of the following materials as defined in the table below. The contribution of each material is presented in ranges of % w/w.

Extruded Aluminium Profiles	
Component	**Composition (%)**
Aluminium profile	100.0
> Aluminium (Al)	> 98.0
> Magnesium (Mg)	0.35 – 1.2
> Silicon (Si)	0.2 – 1.3
> Others	≤ 1.0

Technical Specifications		
Density (g/ cm3)	2.7	Scientific and Technical sources
Melting range (0C)	585 – 650	Scientific and Technical sources
Thermal conductivity (W/ mk)	170 – 220	Scientific and Technical sources
Thermal expansion (10-6/ K)	21.8 – 25.6	Scientific and Technical sources
Young's Modulus (MPa)	69,500 – 70,000	Scientific and Technical sources
Shear Modulus (MPa)	26,100 – 26,400	Scientific and Technical sources
Elongation (%)	8% min	EN 755-2

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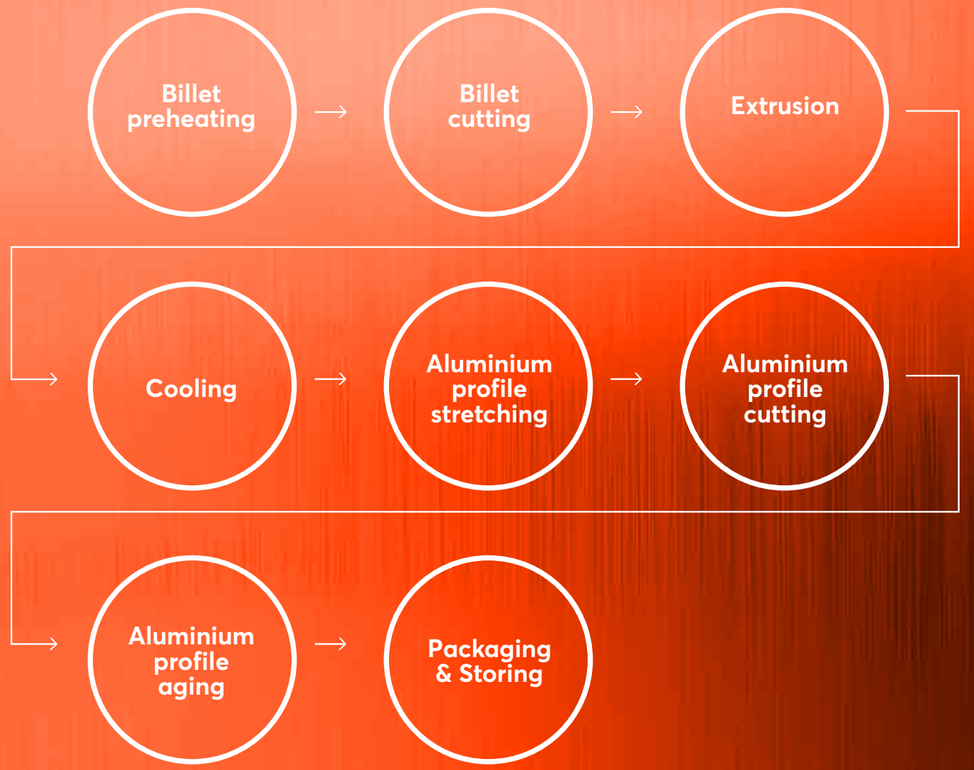
MANUFACTURING PROCESS

The raw material (aluminum billet) is introduced along its longitudinal axis into the billet furnace, where is heated to a temperature of approximately 500 °C. It is then cut into a range of lengths by the billet shear and fed into the extrusion press.
Inside the press, the appropriate die to be used has already been placed, in order for the produced profile to take the required shape, and the extrusion begins by imposing with the use of hydraulic force on the piece of aluminum (aluminum billet) to pass through the matrix, to obtain the required shape. The result of the extrusion is a piece of aluminum profile with a desired cross-section, which is then cooled, stretched and cut into desired lengths.

It should be mentioned that the manufacturing procedure of all products of the product group category examined is the same in terms of steps followed and the respective raw materials and utilities used. Hence, the potential environmental impacts computed are representative for all products of the product group category (Aluminium Extrusion products).



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DESCRIPTION OF EXAMINED MODULES

Declared Unit

The declared unit is 1 kg of Extruded Aluminium Profile. Packaging weight is taken into account but is not included in the 1 kg of the declared unit.

System boundaries

This EPD covers the cradle-to-gate with options approach. Therefore, the defined system boundaries include modules A1-A3, A4, C & D.

Reference Period Considered

January 2021 – December 2021

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource Recovery Stage
	Raw material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	EU-27	EU-27	GR	EU-27									EU-27	EU-27	EU-27	EU-27	EU-27
Specific data used	> 50%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

*MND: Module Not Declared

EPD TYPE

Specific

SOFTWARE

GaBi ts version 10.6.0.110

DATABASE

Ecoinvent 3.8.1 & Professional 2021

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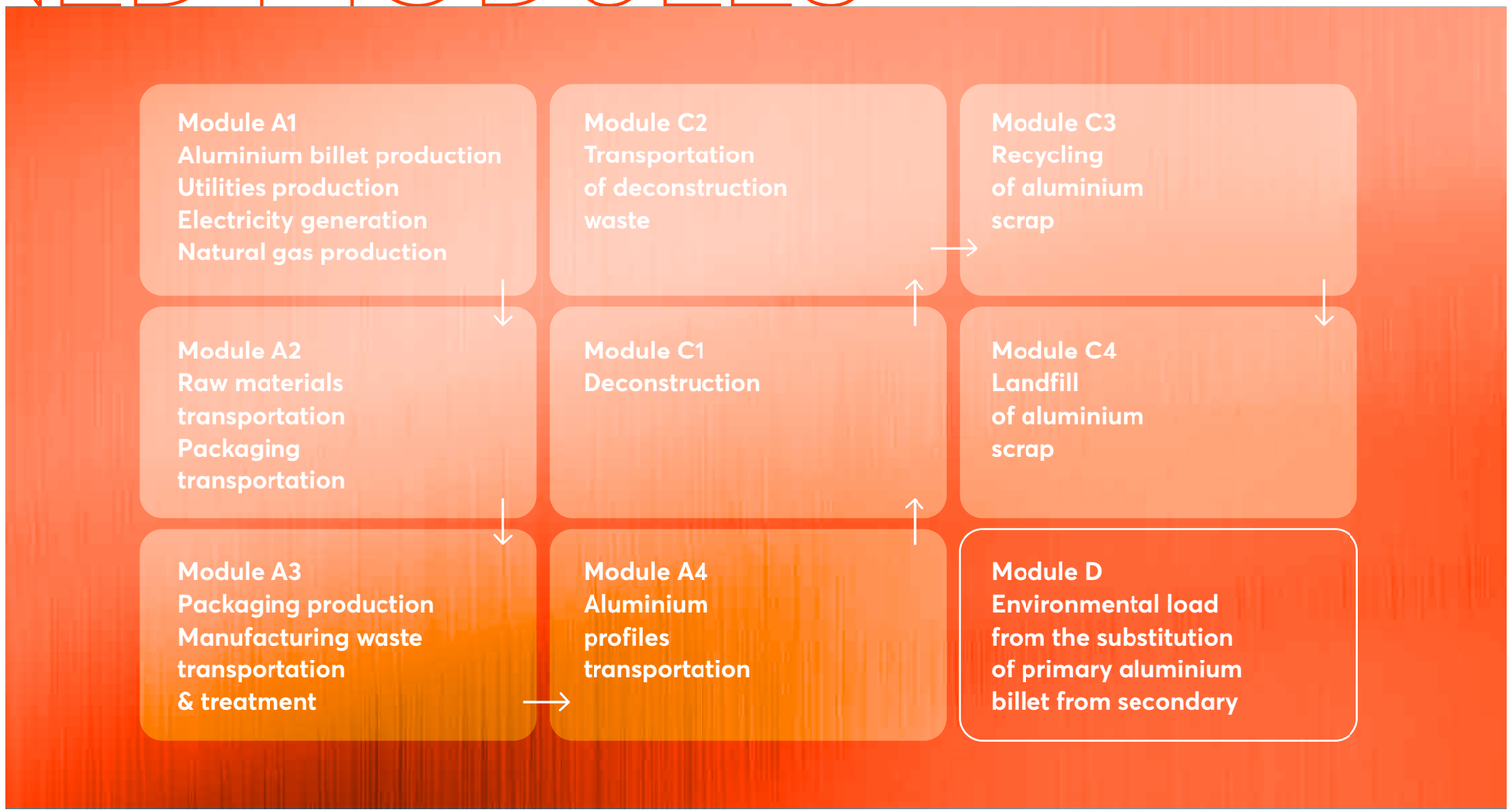
DESCRIPTION OF EXAMINED MODULES



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DESCRIPTION OF EXAMINED MODULES

A1: Raw Material Extraction and Production

Module A1 includes the production of all raw materials and utilities (i.e., electricity, natural gas, water, etc.) required in the manufacturing process.

A2: Transport to Cosmos Aluminium Facilities

Module A2 includes the transport of all raw materials and utilities to the company's plants.

A3: Manufacturing

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

A4: Finished Products Transport

Module A4 includes the transport of finished products (Aluminium profiles) to clients/ Building sites. Actual data of distances of sites locations have been taken into account.

C1: Deconstruction/Demoltion

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

C2: Aluminium Waste Transport

A nominal distance of 500 km is assumed for the transport of aluminium scrap to sorting/ recovery plants and disposal facilities (Truck 12-14 tons).

C3: Steel Waste Processing

Based on European Aluminium Association, 90% of the product is recycled, by remelting process, to produce secondary aluminium billets.

C4: Disposal

The remaining 10% is being disposed.

D: Reuse, Recovery, Recycling Potential

Module D covers the net benefits and load arising from the recycling of aluminium from end-of-waste state materials. As per EN 15804 + A2, the following equation is used to calculate the net benefits and loads:

$$e_D = (M_{MRout} - Y * M_{MRin})(E_{MR\,after\,EoW\,out} - E_{VMSub\,out.} * \frac{Q_{Rout}}{Q_{Sub}})$$

As already mentioned, 90% of aluminium scrap is recycled while the recycled content in the raw material feed is 15%.

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LIFE CYCLE ASSESSMENT INFORMATION

Cut-off criteria

All major raw materials, elements and all the essential energy required are included within the system boundaries. Data for elementary flows to and from the product system contributing to minimum of 99% of the declared environmental impacts are included in the study. Thus, it is assumed that the total neglected input flows are less than 1% of total energy and mass. The only flows that have been excluded from the examined system are:

- Tape, one of the packaging materials used, is omitted since the specific quantity is negligible and cannot be measured precisely.
- Certain manufacturing related packaging waste streams such as wooden, plastic and paper packaging waste since they are traced in minor quantities in comparison to the total waste produced.

Assumptions, Allocation and Limitations

- Regarding the exclusion of product life cycle stages and processes, use phase has not been accounted for. Also, construction installation (A5) phase is not included in the LCA study.
- Cosmos Aluminium production processes yield no commercial by-products in its plants. Thus, there is no need for by-product allocation in the manufacturing process..
- A default mean of road transportation "Truck Euro 6 – 9.3t payload – 12 – 14t gross weight" was assumed. Weighted average of the distance covered, and time needed were taken into account. Regarding ship transportation, "Average ship, 3,500t payload capacity" was assumed due to lack of actual data.
- Regarding Module A4, the following information is provided:

A4 Scenario Information	Unit
Fuel type and consumption of vehicle or vehicle type used for transport	Euro VI heavy-duty diesel engine truck & Ship
Distance	Weighted average distance of 1,890 km for truck and 4,124 km for ship transportation

- Deconstruction waste that was excavated in Module C1 is assumed to be sent to landfill and recycling facilities of 500 km distance far from the deconstruction site.
- Finally, as concerns Modules C3 and C4, it is concluded that the overall recycling rate of aluminium scrap is estimated to be about 90%. The remaining percentage (10%) is assumed to be disposed. A nominal distance of 500 km is assumed for the transportation (Module C2) of aluminium scrap to sorting plants/ recovery facilities and to disposal facilities.

Background data and data quality

For all processes, primary data were collected and provided by Cosmos Aluminium. Data related to material and energy flows of the defined system, were acquired from the company developing the EPD and data related to life cycle impacts resulted from calculations based on widely used and trust-worthy databases.
Primary data refer to January – December 2021 reference period.
In regard to electricity consumption in the manufacturing processes, a conjunction of the supplier's residual electricity mix, according to DAPEEP's 2021 Report on electricity mix, and the Guarantees of Origin (GOs) acquired is being used.
Regarding modules C1-C4 and D no actual data were available and hence specific scenarios were developed based on bibliography and the most common industry practices. However, these scenarios were modeled based on accurate and area representative datasets available either in Professional 2021 or Ecoinvent 3.8.1. Thus, these data are expected to be of high quality too.
The LCA software GaBi ts version 10.6.0.110 was used for inventory and impact assessment calculations based on data entry of the developed mode. A compilation of Ecoinvent v.3.8.1 and Professional 2021 databases was used.

Comparability

- EPDs within the same product category but from different programs may not be comparable.
- EPDs of construction products may not be comparable if they do not comply with EN 15804.
- This EPD and PCR 2019:14 "Construction products" v.1.11 are available on the website of The International EPD® System (www.environdec.com).

ENVIRONMENTAL PERFORMANCE INDICATORS

		Impact/ 1 kg of Extruded Aluminium Profile						
Core Environmental Impact Categories	**Unit**	**A1 – A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global Warming Potential -total	kg CO2 eq.	8.521	0.072	6.177E-04	0.026	0.713	4.838E-03	-5.564
Global Warming Potential – fossil	kg CO2 eq.	8.571	0.072	6.407E-04	0.026	0.694	4.883E-03	-5.547
Global Warming Potential– biogenic	kg CO2 eq.	-0.053	-9.207E-05	-2.807E-05	-3.400E-05	0.018	-5.002E-05	-0.015
Global Warming Potential– land use and land use transformation	kg CO2 eq.	3.104E-03	5.899E-04	5.055E-06	2.128E-04	8.573E-04	4.887E-06	-2.125E-03
Global Warming Potential– GHG (1)	kg CO2 eq.	8.574	0.073	6.458E-04	0.026	0.695	4.888E-03	-5.549
Ozone Depletion Potential	kg CFC-11 eq.	4.852E-14	9.204E-18	7.887E-20	3.319E-18	0.000	1.154E-17	-6.443E-15
Acidification Potential	Mole of H+ eq.	0.042	9.299E-05	3.043E-06	2.498E-05	9.395E-03	1.555E-05	-0.029
Eutrophication aquatic freshwater	kg P eq.	7.188E-06	2.139E-07	1.833E-09	7.712E-08	7.142E-04	3.717E-09	-2.231E-06
Eutrophication aquatic freshwater (2)	kg PO4-3 eq.	2.207E-05	6.566E-07	5.627E-09	2.368E-07	2.193E-03	1.141E-08	-6.850E-06
Eutrophication aquatic marine	kg N eq.	5.538E-03	2.222E-05	1.431E-06	7.913E-06	7.807E-04	3.861E-06	-3.709E-03
Eutrophication terrestrial	mol N eq.	0.060	2.632E-04	1.584E-05	9.381E-05	9.378E-03	4.236E-05	-0.040
Photochemical Ozone Formation	kg NMVOC eq.	0.017	6.264E-05	4.025E-06	2.178E-05	2.748E-03	1.217E-05	-0.011
Depletion of abiotic resources, minerals and metals (3), (4)	kg Sb eq.	1.207E-06	5.485E-09	4.700E-11	1.978E-09	2.531E-05	3.370E-10	-4.039E-07
Depletion of abiotic resources, fossils (3), (4)	MJ net calorific value	110.162	0.959	8.218E-03	0.346	8.133	0.071	-70.800
Water Use (3)	m3 world eq. deprived	1.294	6.257E-04	5.361E-06	2.256E-04	0.649	-5.788E-05	-0.854

(1) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013).

(2) Eutrophication aquatic freshwater shall be given in both kg PO4-3 eq. and kg P eq.

(3) The results of the specific environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(4) The abiotic depletion potential is calculated and declared in two different indicators:
— ADP-minerals & metals include all non-renewable, abiotic material resources
— ADP-fossil includes all fossil resources and includes uranium.

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		Impact/ 1 kg of Extruded Aluminium Profile						
Use of Resources	**Unit**	**A1 – A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ. net calorific value	54.955	0.054	4.586E-04	0.019	1.207	5.136E-03	-33.774
Use of renewable primary energy resources used as raw materials	MJ. net calorific value	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	54.955	0.054	4.586E-04	0.019	1.207	5.136E-03	-33.774
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ. net calorific value	110.373	0.960	8.228E-03	0.346	8.153	0.071	-70.908
Use of non-renewable primary energy resources used as raw materials	MJ. net calorific value	8.000E-06	0.000	0.000	0.000	2.000E-03	0.000	-0.000
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	110.373	0.960	8.228E-03	0.346	8.155	0.071	-70.908
Use of secondary material	kg	0.176	0.000	0.000	0.000	0.000	0.000	-0.000
Use of renewable secondary fuels	MJ. net calorific value	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Use of non-renewable secondary fuels	MJ. net calorific value	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Use of net fresh water	m3	0.124	6.126E-05	5.249E-07	2.209E-05	0.015	7.349E-07	-0.084

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Impact/ 1 kg of Extruded Aluminium Profile								
Waste Categories	**Unit**	**A1 – A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	1 1.072E-08	4.838E-11	4.146E-13	1.745E-11	0.000	1.260E-11	-1.211E-09
Non-hazardous waste disposed	kg	2.497	1.426E-04	1.222E-06	5.144E-05	0.000	0.100	-1.722
Radioactive waste disposed	kg	6.282E-03	1.162E-06	9.953E-09	4.189E-07	0.000	8.106E-07	-4.672E-03

Impact/ 1 kg of Extruded Aluminium Profile								
Output Flows	**Unit**	**A1 – A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Material for recycling	kg	0.000	0.000	0.000	0.000	0.900	0.000	-0.000
Materials for energy recovery	kg	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Exported energy, electricity	MJ	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
Exported energy, thermal	MJ	0.000	0.000	0.000	0.000	0.000	0.000	-0.000

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ENVIRONMENTAL PERFORMANCE INDICATORS

Additional Impact Categories	Unit	Impact/ 1 kg of Extruded Aluminium Profile						
		A1 – A3	A4	C1	C2	C3	C4	D
Particulate matter emissions (PM)	Disease incidence	4.428E-07	5.089E-10	3.445E-11	1.258E-10	3.923E-08	1.687E-10	-2.805E-07
Ionizing radiation, human health (IRP) (5)	kBq U235 eq.	1.309	1.662E-04	1.425E-06	5.997E-05	0.065	1.162E-04	-0.990
Ecotoxicity, freshwater (ETP-fw)	CTU_e	38.730	0.693	5.940E-03	0.250	71.200	0.021	-25.627
Human toxicity, cancer effects (HTP-c)	CTU_h	4.966E-09	1.398E-11	1.198E-13	5.044E-12	3.790E-10	2.428E-12	-3.406E-09
Human toxicity, non-cancer effects (HTP-nc)	CTU_h	1.036E-07	7.235E-10	7.207E-12	2.609E-10	3.878E-08	2.441E-10	-6.464E-08
Land use related impacts/ soil quality (SQP)	Dimensionless	8.703	0.329	2.822E-03	0.119	7.111	5.236E-03	-2.405

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

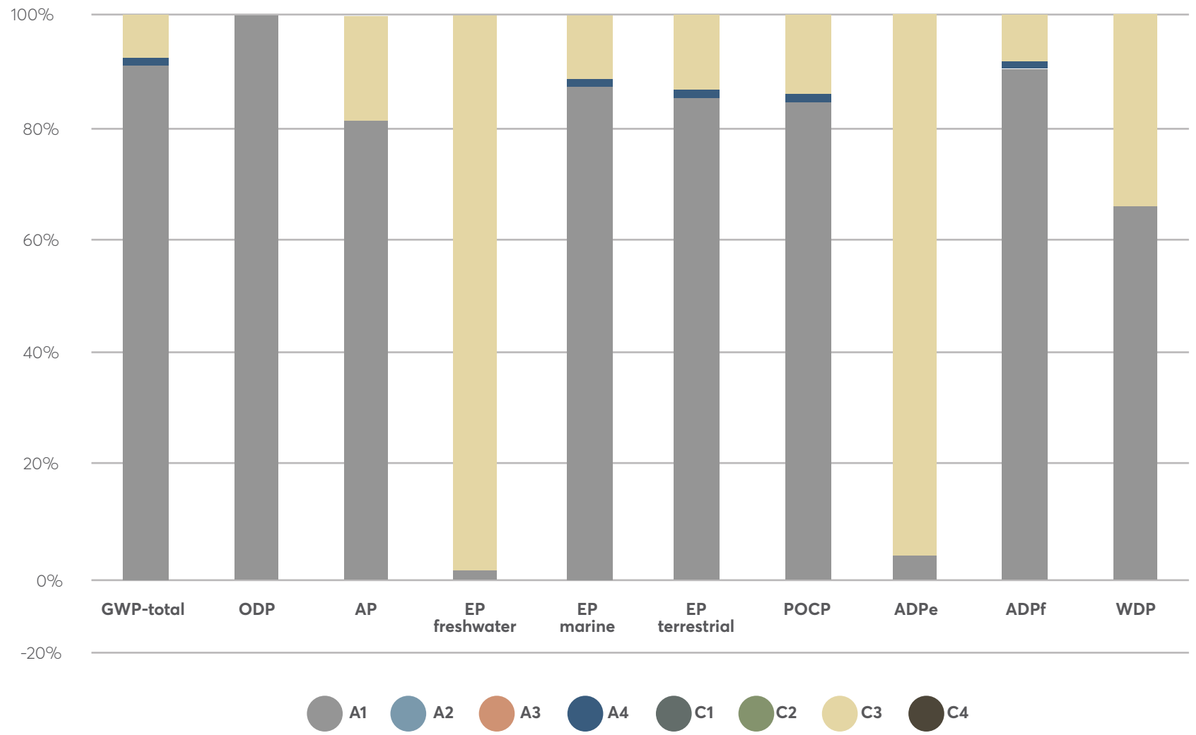
INTERPRETATION

The following figure represents the contribution of each examined modules (A1-A4 & C1-C4) on the core environmental impact indicators formation. Interpretation of the results was carried out in the form of a dominance analysis on the core environmental impacts. It can be clearly depicted that the majority of the analyzed impact categories are mainly influenced by modules A1-A3 and C3.

Regarding Global Warming Potential – total, Module A1-A3 is the dominant phase of the life cycle (91.25%) followed by Module C3. The greatest proportion of the GWP – total is attributed to the extraction and production of raw materials, and specially to the production of primary aluminium billet which accounts for almost 88% of the total emissions. In contrast, electricity consumption holds a negligible proportion (<1%) of the Global Warming Potential – total indicator due to the almost exclusive use of renewable electricity through the acquired Guarantees of Origin (GOs). A proportion of 1% applies for natural gas production and consumption.

Also, Modules A1 – A3 impacts are accounted for at least 70% for most of the core environmental impact indicators. The only environmental impact indicators that are not dominantly affected by Modules A1 – A3 are Eutrophication, freshwater and Depletion of abiotic resources, minerals and metals, which are dominated by Module C3.

Characterized Results of Extruded Aluminium Profiles



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REFERENCES

- International EPD® System, General Program Instructions for the International EPD System, version 3.01
- International EPD® System, PCR 2019:14 Construction products (EN 15804:A2) v. 1.11
- International Organization for Standardization (ISO), Environmental labels and declarations – Type III environmental declarations – Principles and procedures. ISO 14025:2006
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Requirements and guidelines. ISO 14044:2006
- The International EPD® System – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. www.environdec.com
- EN ISO 14001 – Environmental Management Systems – Requirements
- ISO 14020 – Environmental Labels and Declarations – General Principles
- Sphera – GaBi Product Sustainability software – www.sphera.com
- European Aluminium Association – Aluminium Recycling in LCA

cosmos
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