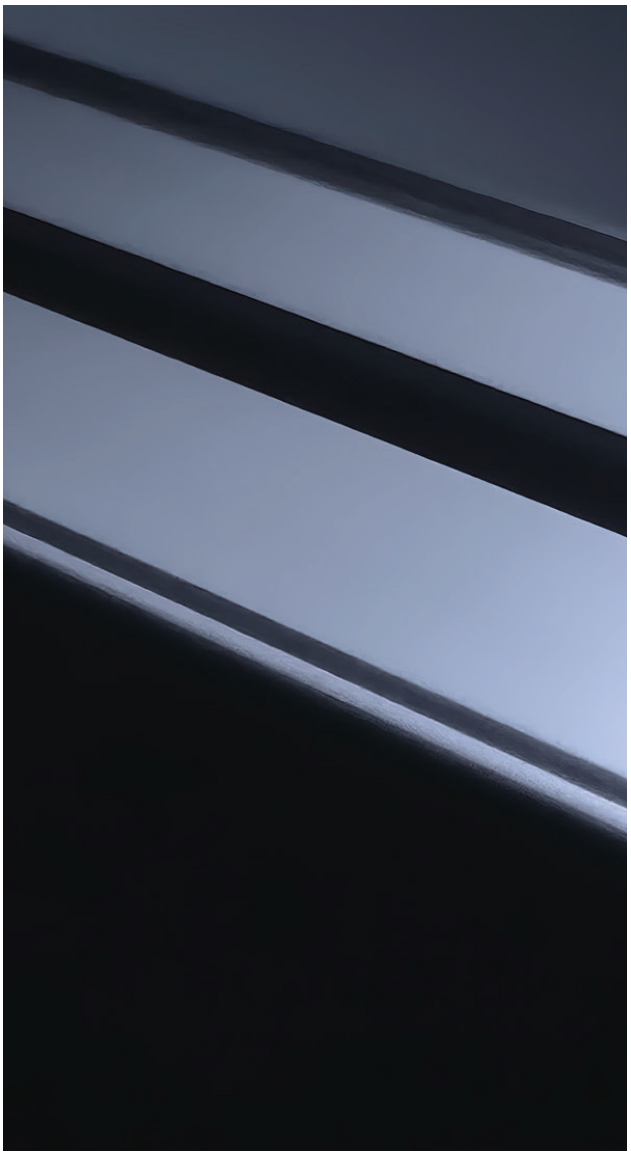
ENVIRONMENTAL PRODUCT DECLARATION OF ALUMINIUM PROFILES BY ELVIAL S.A.

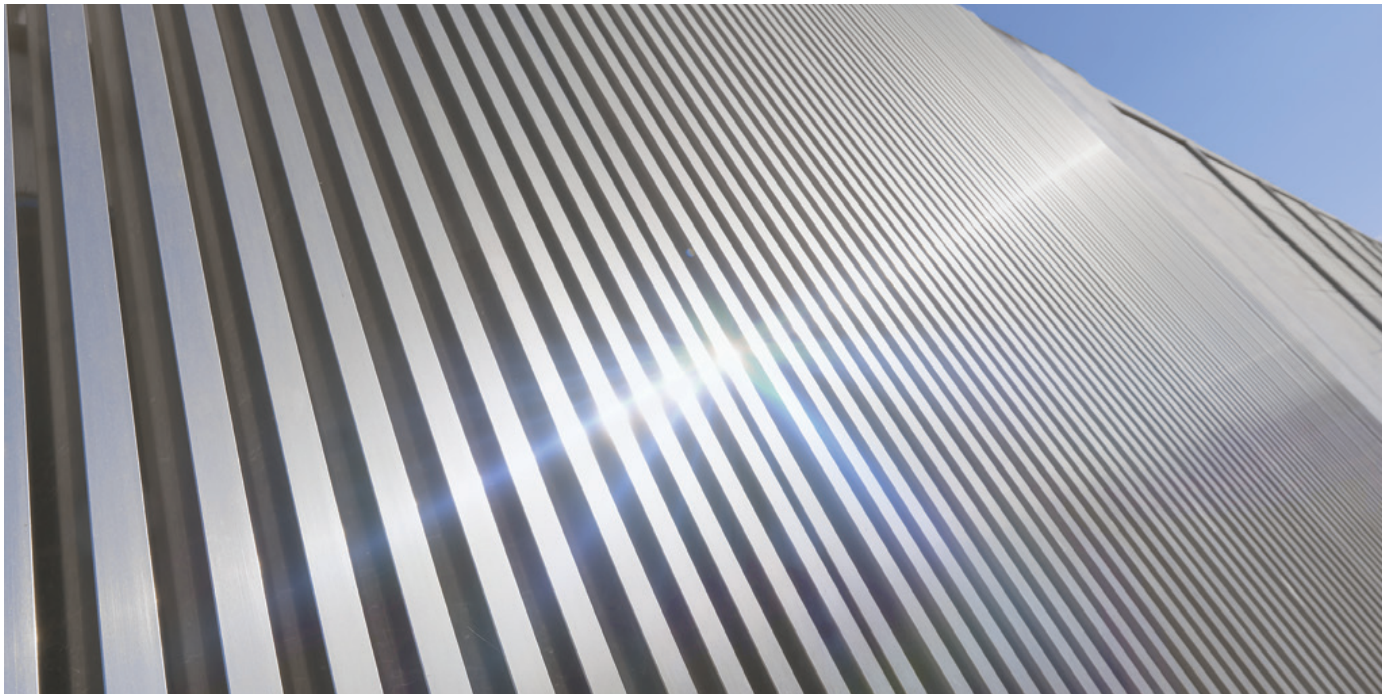
In accordance with ISO 14025:2006 & EN 15804:2012+A2:2019



PROGRAMME	The International EPD® System
PROGRAMME OPERATOR	EPD International AB
EPD REGISTRATION NUMBER	S-P-06907
PUBLICATION DATE	2022-09-23
VALID UNTIL	2027-09-22

PROGRAMME	The International EPD System
ADDRESS	Box 210 60 SE-100 31 Stockholm, Sweden
WEBSITE	www.environdec.com
EMAIL	info@environdec.com
EPD BASED ON PRODUCT CATEGORY RULES (PCR)	The CEN standard EN 15804:2012+A2:2019 serves as the core Product Category Rules PCR 2019:14, version v.1.11 'Construction products'
PCR REVIEW WAS CONDUCTED BY	The Technical Committee of the International EPD System
INDEPENDENT THIRD-PARTY VERIFICATION OF THE DECLARATION AND DATA IN ACCORDANCE WITH ISO 14025:2006	○ EPD process certification ● EPD verification
PROCEDURE FOR FOLLOW-UP DURING EPD VALIDITY INVOLVES THIRD PARTY VERIFIER	● Yes ○ No
THIRD PARTY VERIFIER	Business Quality Verification P.C 144 Septemvriou 3rd Str. Athens, Greece www.bqv.gr info@bqv.gr Accredited by Hellenic Accreditation System E.SY.D., Accreditation No. 1218
EPD OWNER	ELVIAL S.A Industrial Park of Agios Panteleimonas, 611 00 Kilkis, Greece www.elvial.gr
EPD PREPARED BY	ENVIROMETRICS S.A. 3 Kodrou Str. Chalandri, Athens Greece www.envirometrics.gr
CPC CODE	41532, bars, rods, and profiles of aluminium

The EPD owner has the sole ownership, liability, and responsibility for the EPD.
EPDs within the same product category but from different programmes may not be comparable.
EPDs of construction products may not be comparable if they do not comply with EN 15804:2012+A2:2019. For further information about comparability, see EN 15804:A2+A2:2019 and ISO 14025:2006.



ELVIAL S.A. is one of the most powerful Greek aluminium extrusion companies and has managed to establish itself in the Greek and European aluminium market with impressive growth rates. ELVIAL develops, produces and supplies to selected frame manufacturing companies, advanced aluminum systems for simple and complex architectural applications, from doors and windows to shading and lighting and from automotive to medical purposes.
ELVIAL plant is placed in Agios Panteleimon, Kilkis Industrial Park. The exact geographical coordinate of the plant is 40.816665oN 22.989436oE.
Our team of engineers and services-oriented personnel is committed to safeguarding quality for our common projects and delivering the best. Our fully automated production unit, our capabilities and pledge to responsible business and environmental practices render us a technology partner of preference.

That's how we create sophisticated aluminium products that rank top in class and quality. With a world-class extrusion plant where high-end robotic technology is applied, ELVIAL provides premium product quality combined with excellent customer care.
Our know - how, operations and service are organized to make sure the output is top performing and the aluminium product will precisely fulfill your technical requirements.
A quality product though is only part of the experience we create for our customers. It starts with well trained personnel and clear processes that guarantee that only faultless components are sent to the next processing step throughout the ELVIAL organization. The product is thus fully traceable, its production is closely followed and measured, all data are stored and of course it is all documented in our CRM system.

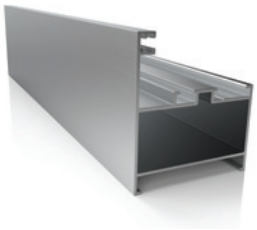
Our company and products are certified with the following standards:

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018
- QUALICOAT SEASIDE CLASS
- QM QUALIMARINE
- EN ISO 15088 (CE marking)
- ALU +C-

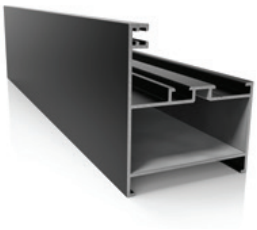
ELVIAL's main activities are:

- Pproduction of aluminium profiles & thermal insulated profiles
- Extrusion
- Die design and die manufacturing
- CNC processing
- Powder coating
- Pre-anodizing 2in1
- Polyamide insertion& perforation
- Innovative insulation I² technology

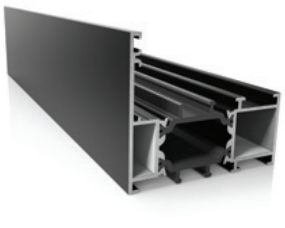
This is a specific EPD and covers three types of aluminium profiles manufactured by ELVIAL S.A. Aluminium profiles are used in office buildings (for windows and frames production) and public works.



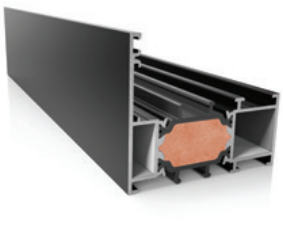
Extruded profile



Extruded coated profile



Thermal break coated profile



Thermal break
coated + polyurethane foam profile

Technical specifications are listed below. Technical data are representative for aluminium alloy EN AW-6060.

Technical Specific ations	Value	Source
Density (g/cm^3)	2,70	Scientific and Technical Sources
Melting Range (^{0}C)	585 - 650	Scientific and Technical Sources
Thermal conductivity (W/mK)	200 - 220	Scientific and Technical Sources
Thermal expansion (10^(-6)/K) (20-100 ^{0}C)	23,4	Scientific and Technical Sources
Tensile strength, wall thickness <5 mm (MPa)	215	EN 755-2:2016
Tensile strength, 5<wall thickness≤25 mm (MPa)	195	EN 755-2:2016
Elongation A50 mm (% min)	6	EN 755-2:2016

Composition ranges of aluminium profiles (in w/w%) manufactured by ELVIAL are presented below.
Recycled aluminium content in the feed is approximately 20%.

Material	Extruded profile	Extruded coated profile	Thermal break coated profile	Thermal break coated+polyurethane foam profile
Aluminium	100%	>95%	>85%	>80%
Polyamide/Polythermide	-	-	<10%	<10%
Powder	-	<5%	<5%	<5%
Polyurethane	-	-	-	<5%

Chemical composition (in w/w%) of aluminium alloys used in extrusion line is presented below.

Chemical composition	Al	Si	Fe	Cu	Mg	Mn	Cr	Ti	Zn
Min (%)	98,10	0,30	0,10	0,00	0,35	0,00	0,00	0,00	0,00
Max (%)	99,25	0,60	0,30	0,10	0,60	0,10	0,05	0,00	0,15

Declared unit
1 kg of extruded aluminium profile

Goal and Scope
This EPD assesses the environmental impacts of the production of 1 kg of extruded aluminium profile from Cradle-to-gate with modules C and D.

System Boundary
The type of EPD is caradle to gate (modules A1-A3) with modules C1-C4 and module D. No parts of the plant were excluded from the study.

Geographical scope
Worldwide

Allocations
Allocation rules have been performed in accordance with the requirements of ISO 14044:2006. Mass allocation is applied in the following streams.

- Water used in extrusion, thermal break and coating stage based on the mass of each of four profiles.
- Electricity used in packaging line and other general purposes based on the mass of each of four profiles.
- Natural gas used in aging furnaces based on the mass of each of four profiles.
- Polyamide and polythermide used in thermal break stage based on the mass of the two products manufactured in this stage (Thermal break and thermal break coated aluminium profile).
- Powder and chemicals used in coating stage based on the mass of the two products manufactured in this stage. (Coated and thermal break coated aluminium profile).
- Wastes generated from the manufacturing process based on the mass of each four profiles (except from aluminium scrap and powder).

Cut-off
The cut-off criteria adopted is as stated in “EN15804:2012+A2:2019”. cut-off rules were applied for some iron containing wastes and some packaging materials such as foam foil and metal strips the total amount was very low.

Assumptions
Module A2: a EURO5 lorry 16-32 metric ton was utilized for road transportation, a bulk carrier for dry goods for sea transportation and freight train, diesel for railway transportation.
Module C1: the specific diesel consumption for a building demolition is considered as 0,239 MJ/kg product of material according to JRC TECHNICAL REPORT ‘’Model for Life Cycle Assessment (LCA) of buildings’’.
Module C2: a conservative assumption of 100 km by lorry 16-32 metric ton was used.
Module C3 and C4: The scenarios included are currently in use and are representative for one of the most probable alternatives. According to the European Aluminium Association 90% of the aluminium for building applications is being recycled and transformed to secondary aluminium billets while the rest 10% is disposed/landfilled.

Data quality
ISO 14044:2006 was applied in terms of data collection and quality requirements. The impact of the production of raw materials recovered from Ecoinvent database v.3.8. The data concerning the modules A2 (Transportation) and A3 (Product manufacturing) were provided by ELVIAL and concerns the full year 2021. These data were the quantities of all input and output materials extracted from the company’s ERP system, the consumed utilities (energy, water) the quantities of wastes extracted from the electronic waste register and the distances and means of transport for each input stream. Regarding electricity mix, the latest (2020) national residual electricity mix as published in DAPEEP SA was utilized. The emission factor for natural gas is provided from National Inventory Report of 2021 for Greece. The end-of-life are based on the most representative scenarios for this product. Background data for this stage are retrieved from Ecoinvent v.3.8.

Time representativeness
Data for year 2021 were used

Software used
OpenLCA v.10.3 was used.

	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 DEMOLIT	TRANSPORT	WASTE PROCESSING FOR REUSE, RECOVERY AND/OR RECYCLING	DISPOSAL	REUSE-RECOVERY-RECYCLING-POTENTIAL
MODULES	**A1**	**A2**	**A3**	A4	A5	B1	B2	B3	B4	B5	B6	B7	**C1**	**C2**	**C3**	**C4**	**D**
MODULES DECLARED	**X**	**X**	**X**	MND	MND	MND	MND	MND	MND	MND	MND	MND	**X**	**X**	**X**	**X**	**X**
GEOGRAPHY	**GLO**	**GLO**	**GR**										**EU**	**EU**	**EU**	**EU**	**EU**
SPECIFIC DATA USED		**>90%**											-	-	-	-	-
VARIATION-PRODUCTS		**Not relevant**											-	-	-	-	-
VARIATION-SITES		**Not relevant**											-	-	-	-	-

Modules of LCA analysis: X = module declared, MND = Module Not Declared

A1: RAW MATERIAL SUPPLY
The production starts with the material supply. This stage includes the mining and processing of raw materials, the generation of fuels required for the manufacturing and the recycling process of secondary materials. Aluminium ingot, primary and secondary, is the raw material charged in the extrusion line. During the thermal breaking stage, the main raw materials used are polyamide and polythermide (type of PVC), which reinforces the insulation characteristics of aluminium profiles. Furthermore, for the coating of profiles, the usage of powder and other chemicals for the wastewater treatment of this stage is required. Polyurethane foam is used in some of thermal break coated profiles.

A2: TRANSPORTATION OF RAW MATERIALS TO MANUFACTURER
Transportation is relevant to the delivery of raw materials from the supplier to the gate of manufacturing plant. Raw materials are transported with trucks, ships and trains from all over the world.

A3: MANUFACTURING
The manufacturing process starts with the extrusion, in which primary and secondary aluminum ingots are driven through extrusion line in order to be moulded into aluminum profiles. Then, some of the profiles become thermally broken, with the addition of polyamide and polythermide. A thermal break profile appears a low thermal conductivity with the purpose of reducing the flow of thermal energy. Extruded and thermal break aluminium profiles undergo a coating process using powder. Finally, some of thermal break coated aluminium profiles undergo a polyurethane coating stage.

C1: DE-CONSTRUCTION AND DEMOLITION
The deconstruction and demolition of the product takes place with the demolition of the building or other construction.

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 transportation to waste processing sites is assumed.

C3: WASTE PROCESSING FOR REUSE, RECOVERY AND/OR RECYCLING
Aluminium waste collected from the deconstruction site are separated from the other waste in order to be recycled and used in a new product system. According to the European Aluminium Association 90% of the aluminium for building applications is being recycled and transformed to secondary aluminium billets while the rest 10% is disposed/landfilled.

C4: DISPOSAL
Usually, a small amount of the waste is remaining either in the deconstruction site or in the separation. This small portion will be landfilled. As it is said above, 10% of the aluminium integrated in the final product is disposed. Powder, polyamide and polyurethane integrated in extruded coated and thermal break coated aluminium profiles re also disposed/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.

A1
Raw materials production

A2
Raw materials transportation

A3
Manufacturing

C3
Recycling

C2
Transportation for waste processing

C1
Deconstruction/Demolition

C4
Disposal

D
Avoided burdens

EXTRUDED ALUMINIUM PROFILE

ENVIRONMENTAL IMPACTS	UNIT	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	7,23E+00	2,20E-02	1,66E-02	1,54E-02	3,92E-03	-4,98E+00
GWP-fossil	kg CO2 eq	6,90E+00	2,20E-02	1,66E-02	1,54E-02	3,90E-03	-4,84E+00
GWP-biogenic	kg CO2 eq	5,21E-02	3,56E-06	5,86E-06	2,49E-05	1,30E-05	-2,68E-02
GWP-luluc	kg CO2 eq	1,56E-01	2,19E-06	6,53E-06	1,13E-05	4,36E-06	-1,16E-01
GWP-GHG[1]	kg CO2 eq	6,98E+00	2,17E-02	1,65E-02	1,51E-02	3,79E-03	-4,80E+00
ODP	kg CFC-11 eq	7,84E-07	4,70E-09	3,85E-09	3,55E-09	4,26E-10	-5,11E-07
AP	mol H+ eq	4,54E-02	2,28E-04	6,75E-05	9,62E-05	2,59E-05	-3,18E-02
EP-freshwater	kg PO4-3 eq	1,26E-02	2,09E-06	3,28E-06	6,67E-06	3,53E-06	-8,64E-03
EP-freshwater[2]	kg P eq	4,10E-03	6,81E-07	1,07E-06	2,18E-06	1,15E-06	-2,82E-03
EP-marine	kg N eq	6,35E-03	1,01E-04	2,03E-05	3,22E-05	6,41E-06	-4,28E-03
EP-terrestrial	mol N eq	5,84E-02	1,11E-03	2,22E-04	3,50E-04	6,90E-05	-3,92E-02
POCP	kg NMVOC eq	2,14E-02	3,05E-04	6,80E-05	1,08E-04	2,05E-05	-1,46E-02
ADPe	kg Sb eq	1,60E-05	1,13E-08	5,78E-08	5,45E-08	8,64E-09	-1,11E-05
ADPf	MJ	1,09E+02	3,01E-01	2,51E-01	2,78E-01	5,55E-02	-7,49E+01
WDP[3]	m3 eq	1,24E+01	7,39E-04	1,20E-03	-7,55E-03	1,83E-03	-9,14E+00

RESOURCE USE	UNIT	A1-A3	C1	C2	C3	C4	D
PERE	MJ	4,19E+01	1,69E-03	3,54E-03	5,43E-03	3,59E-03	-3,04E+01
PERM	MJ	1,10E+02	0,00E+00	1,00E-01	1,80E+00	3,00E-01	1,40E+00
PERT	MJ	1,52E+02	1,69E-03	1,04E-01	1,81E+00	3,04E-01	-2,90E+01
PENRE	MJ	1,09E+02	3,01E-01	2,51E-01	2,78E-01	5,55E-02	-7,49E+01
PENRM	MJ	1,10E+02	0,00E+00	1,00E-01	1,80E+00	3,00E-01	1,40E+00
PENRT	MJ	2,19E+02	3,01E-01	3,51E-01	2,08E+00	3,56E-01	-7,36E+01
SM	kg	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	2,89E-01	1,72E-05	2,80E-05	-1,76E-04	4,25E-05	-2,13E-01

OUTPUT FLOWS AND WASTE CATEGORIES	UNIT	A1-A3	C1	C2	C3	C4	D
HWD	kg	7,54E-05	8,26E-07	6,56E-07	6,05E-07	5,53E-08	-4,69E-05
NHWD	kg	2,26E+00	4,10E-04	1,29E-02	7,63E-01	1,05E-01	-9,09E-01
RWD	kg	6,74E-04	2,08E-06	1,70E-06	1,61E-06	2,20E-07	-4,77E-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

[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 characterization factors (CFs) based on IPCC (2013).
[2] Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq.
[3] The results of this environmental impact indicators of ADPf, ADPe and WDP shall be used with care as the uncertainties of these results are high or as there is limited experienced with the indicator.

EXTRUDED ALUMINIUM PROFILE

ADDITIONAL ENVIRONMENTAL INDICATORS ADDITIONAL IMPACTS	UNIT	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	5,23E-07	6,06E-09	1,16E-09	2,92E-09	3,70E-10	-3,28E-07
IRP[4]	kBq U235 eq	1,95E+00	1,36E-03	1,29E-03	1,31E-03	3,24E-04	-1,39E+00
ETP-FW	CTUe	1,65E+02	1,71E-01	1,89E-01	4,68E+00	6,20E+01	-8,31E+01
HTP-c	CTUh	2,13E-08	6,81E-12	6,33E-12	2,38E-11	3,62E-12	-1,56E-08
HTP-nc	CTUh	3,06E-07	1,28E-10	2,06E-10	5,20E-10	1,11E-10	-2,12E-07
SQP	dimensionless	1,11E+01	3,64E-02	1,69E-01	1,55E-01	3,44E-02	-4,35E+00

EXTRUDED COATED ALUMINIUM PROFILE

ENVIRONMENTAL IMPACTS	UNIT	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	8,06E+00	2,20E-02	1,66E-02	1,46E-02	4,30E-02	-4,63E+00
GWP-fossil	kg CO2 eq	7,56E+00	2,20E-02	1,66E-02	1,45E-02	4,29E-02	-4,50E+00
GWP-biogenic	kg CO2 eq	8,24E-02	3,56E-06	5,86E-06	2,36E-05	1,58E-05	-2,49E-02
GWP-luluc	kg CO2 eq	1,58E-01	2,19E-06	6,53E-06	1,06E-05	7,14E-06	-1,08E-01
GWP-GHG[1]	kg CO2 eq	7,78E+00	2,17E-02	1,65E-02	1,42E-02	4,22E-02	-4,46E+00
ODP	kg CFC-11 eq	9,01E-07	4,70E-09	3,85E-09	3,36E-09	1,60E-09	-4,75E-07
AP	mol H+ eq	5,08E-02	2,28E-04	6,75E-05	9,09E-05	4,44E-05	-2,96E-02
EP-freshwater	kg PO4-3 eq	1,38E-02	2,09E-06	3,28E-06	6,30E-06	4,11E-06	-8,03E-03
EP-freshwater[2]	kg P eq	4,50E-03	6,81E-07	1,07E-06	2,06E-06	1,34E-06	-2,62E-03
EP-marine	kg N eq	7,05E-03	1,01E-04	2,03E-05	3,04E-05	1,06E-05	-3,98E-03
EP-terrestrial	mol N eq	6,45E-02	1,11E-03	2,22E-04	3,31E-04	1,15E-04	-3,64E-02
POCP	kg NMVOC eq	2,36E-02	3,05E-04	6,80E-05	1,02E-04	3,47E-05	-1,36E-02
ADPe	kg Sb eq	2,12E-05	1,13E-08	5,78E-08	5,15E-08	1,86E-08	-1,03E-05
ADPf	MJ	1,22E+02	3,01E-01	2,51E-01	2,63E-01	1,30E-01	-6,97E+01
WDP[3]	m3 eq	1,30E+01	7,39E-04	1,20E-03	-7,14E-03	2,43E-03	-8,50E+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 characterization factors (CFs) based on IPCC (2013).
[2] Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq.
[3] The results of this environmental impact indicators of ADPf, ADPe and WDP shall be used with care as the uncertainties of these results are high or as there is limited experienced with the indicator.
[4] Ionizing radiation potential (IRP) 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.

EXTRUDED COATED ALUMINIUM PROFILE

RESOURCE USE	UNIT	A1-A3	C1	C2	C3	C4	D
PERE	MJ	4,44E+01	1,69E-03	3,54E-03	5,13E-03	4,08E-03	-2,82E+01
PERM	MJ	1,35E+02	0,00E+00	1,00E-01	1,70E+00	5,02E-01	1,30E+00
PERT	MJ	1,80E+02	1,69E-03	1,04E-01	1,71E+00	5,07E-01	-2,69E+01
PENRE	MJ	1,22E+02	3,01E-01	2,51E-01	2,63E-01	1,30E-01	-6,97E+01
PENRM	MJ	1,35E+02	0,00E+00	1,00E-01	1,70E+00	5,02E-01	1,30E+00
PENRT	MJ	2,58E+02	3,01E-01	3,51E-01	1,96E+00	6,33E-01	-6,84E+01
SM	kg	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	3,02E-01	1,72E-05	2,80E-05	-1,66E-04	5,66E-05	-1,98E-01

OUTPUT FLOWS AND WASTE CATEGORIES	UNIT	A1-A3	C1	C2	C3	C4	D
HWD	kg	9,12E-05	8,26E-07	6,56E-07	5,72E-07	6,57E-07	-4,36E-05
NHWD	kg	2,46E+00	4,10E-04	1,29E-02	7,21E-01	1,32E-01	-8,45E-01
RWD	kg	7,12E-04	2,08E-06	1,70E-06	1,53E-06	7,31E-07	-4,44E-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 ENVIRONMENTAL INDICATORS	UNIT	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	6,23E-07	6,06E-09	1,16E-09	2,76E-09	5,61E-10	-3,05E-07
IRP[4]	kBq U235 eq	2,07E+00	1,36E-03	1,29E-03	1,24E-03	6,61E-04	-1,29E+00
ETP-FW	CTUe	2,27E+02	1,71E-01	1,89E-01	4,43E+00	5,87E+01	-7,72E+01
HTP-c	CTUh	2,20E-08	6,81E-12	6,33E-12	2,25E-11	5,97E-11	-1,45E-08
HTP-nc	CTUh	3,37E-07	1,28E-10	2,06E-10	4,92E-10	2,48E-10	-1,97E-07
SQP	dimensionless	2,06E+01	3,64E-02	1,69E-01	1,47E-01	5,31E-02	-4,04E+00

[4] Ionizing radiation potential (IRP) 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.

THERMAL BREAK COATED ALUMINIUM PROFILE

ENVIRONMENTAL IMPACTS	UNIT	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	8,80E+00	2,20E-02	1,66E-02	1,41E-02	2,99E-02	-4,46E+00
GWP-fossil	kg CO2 eq	8,28E+00	2,20E-02	1,66E-02	1,41E-02	2,99E-02	-4,33E+00
GWP-biogenic	kg CO2 eq	8,83E-02	3,56E-06	5,86E-06	2,29E-05	1,41E-05	-2,40E-02
GWP-luluc	kg CO2 eq	1,59E-01	2,19E-06	6,53E-06	1,03E-05	5,97E-06	-1,04E-01
GWP-GHG	kg CO2 eq	8,47E+00	2,17E-02	1,65E-02	1,38E-02	2,82E-02	-4,30E+00
ODP	kg CFC-11 eq	9,52E-07	4,70E-09	3,85E-09	3,27E-09	1,09E-09	-4,57E-07
AP	mol H+ eq	5,39E-02	2,28E-04	6,75E-05	8,83E-05	4,43E-05	-2,85E-02
EP-freshwater	kg PO4-3 eq	1,41E-02	2,09E-06	3,28E-06	6,13E-06	3,89E-06	-7,73E-03
EP-freshwater	kg P eq	4,58E-03	6,81E-07	1,07E-06	2,00E-06	1,27E-06	-2,52E-03
EP-marine	kg N eq	8,10E-03	1,01E-04	2,03E-05	2,96E-05	1,34E-04	-3,83E-03
EP-terrestrial	mol N eq	7,03E-02	1,11E-03	2,22E-04	3,22E-04	1,38E-04	-3,50E-02
POCP	kg NMVOC eq	2,54E-02	3,05E-04	6,80E-05	9,93E-05	4,40E-05	-1,31E-02
ADPe	kg Sb eq	2,28E-05	1,13E-08	5,78E-08	5,01E-08	1,47E-08	-9,90E-06
ADPf	MJ	1,34E+02	3,01E-01	2,51E-01	2,55E-01	9,89E-02	-6,71E+01
WDP	m3 eq	1,38E+01	7,39E-04	1,20E-03	-6,94E-03	2,67E-03	-8,18E+00

RESOURCE USE	UNIT	A1-A3	C1	C2	C3	C4	D
PERE	MJ	4,47E+01	1,69E-03	3,54E-03	4,99E-03	3,90E-03	-2,72E+01
PERM	MJ	1,42E+02	0,00E+00	1,00E-01	1,65E+00	6,60E-01	1,25E+00
PERT	MJ	1,86E+02	1,69E-03	1,04E-01	1,66E+00	6,64E-01	-2,59E+01
PENRE	MJ	1,34E+02	3,01E-01	2,51E-01	2,55E-01	9,89E-02	-6,71E+01
PENRM	MJ	1,42E+02	0,00E+00	1,00E-01	1,65E+00	6,60E-01	1,25E+00
PENRT	MJ	2,75E+02	3,01E-01	3,51E-01	1,91E+00	7,59E-01	-6,58E+01
SM	kg	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	3,20E-01	1,72E-05	2,80E-05	-1,62E-04	6,21E-05	-1,90E-01

OUTPUT FLOWS AND WASTE CATEGORIES	UNIT	A1-A3	C1	C2	C3	C4	D
HWD	kg	9,35E-05	8,26E-07	6,56E-07	5,56E-07	3,27E-07	-4,20E-05
NHWD	kg	2,50E+00	4,10E-04	1,29E-02	7,01E-01	1,66E-01	-8,14E-01
RWD	kg	7,20E-04	2,08E-06	1,70E-06	1,48E-06	5,12E-07	-4,27E-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

[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 characterization factors (CFs) based on IPCC (2013).
[2] Eutrophication aquatic freshwater shall be given in both kg PO4 eq and kg P eq.
[3] The results of this environmental impact indicators of ADPf, ADPe and WDP shall be used with care as the uncertainties of these results are high or as there is limited experienced with the indicator.

THERMAL BREAK COATED ALUMINIUM PROFILE

ADDITIONAL ENVIRONMENTAL INDICATORS	UNIT	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	6,55E-07	6,06E-09	1,16E-09	2,69E-09	2,53E-09	-2,94E-07
IRP[4]	kBq U235 eq	2,09E+00	1,36E-03	1,29E-03	1,20E-03	5,21E-04	-1,25E+00
ETP-FW	CTUe	2,33E+02	1,71E-01	1,89E-01	4,30E+00	5,71E+01	-7,44E+01
HTP-c	CTUh	2,22E-08	6,81E-12	6,33E-12	2,18E-11	6,09E-11	-1,39E-08
HTP-nc	CTUh	3,42E-07	1,28E-10	2,06E-10	4,78E-10	3,30E-10	-1,89E-07
SQP	dimensionless	2,04E+01	3,64E-02	1,69E-01	1,42E-01	5,59E-02	-3,89E+00

THERMAL BREAK COATED+POLYURETHANE FOAM ALUMINIUM PROFILE

ENVIRONMENTAL IMPACTS	UNIT	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	9,31E+00	2,20E-02	1,66E-02	1,51E-02	3,44E-02	-4,46E+00
GWP-fossil	kg CO2 eq	8,71E+00	2,20E-02	1,66E-02	1,50E-02	3,44E-02	-4,33E+00
GWP-biogenic	kg CO2 eq	1,04E-01	3,56E-06	5,86E-06	2,44E-05	1,51E-05	-2,40E-02
GWP-luluc	kg CO2 eq	1,60E-01	2,19E-06	6,53E-06	1,10E-05	6,52E-06	-1,04E-01
GWP-GHG	kg CO2 eq	8,96E+00	2,17E-02	1,65E-02	1,47E-02	3,21E-02	-4,30E+00
ODP	kg CFC-11 eq	1,01E-06	4,70E-09	3,85E-09	3,47E-09	1,20E-09	-4,57E-07
AP	mol H+ eq	5,62E-02	2,28E-04	6,75E-05	9,40E-05	5,10E-05	-2,85E-02
EP-freshwater	kg PO4-3 eq	1,48E-02	2,09E-06	3,28E-06	6,52E-06	4,23E-06	-7,73E-03
EP-freshwater	kg P eq	4,83E-03	6,81E-07	1,07E-06	2,13E-06	1,38E-06	-2,52E-03
EP-marine	kg N eq	8,67E-03	1,01E-04	2,03E-05	3,15E-05	1,87E-04	-3,83E-03
EP-terrestrial	mol N eq	7,46E-02	1,11E-03	2,22E-04	3,42E-04	1,64E-04	-3,50E-02
POCP	kg NMVOC eq	2,69E-02	3,05E-04	6,80E-05	1,06E-04	5,31E-05	-1,31E-02
ADPe	kg Sb eq	2,51E-05	1,13E-08	5,78E-08	5,33E-08	1,62E-08	-9,90E-06
ADPf	MJ	1,43E+02	3,01E-01	2,51E-01	2,72E-01	1,09E-01	-6,71E+01
WDP	m3 eq	1,42E+01	7,39E-04	1,20E-03	-7,38E-03	3,07E-03	-8,18E+00

[4] Ionizing radiation potential (IRP) 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.

THERMAL BREAK COATED+POLYURETHANE FOAM ALUMINIUM PROFILE

RESOURCE USE	UNIT	A1-A3	C1	C2	C3	C4	D
PERE	MJ	4,70E+01	1,69E-03	3,54E-03	5,31E-03	4,24E-03	-2,72E+01
PERM	MJ	1,55E+02	0,00E+00	1,00E-01	1,76E+00	8,01E-01	1,25E+00
PERT	MJ	2,02E+02	1,69E-03	1,04E-01	1,76E+00	8,05E-01	-2,59E+01
PENRE	MJ	1,43E+02	3,01E-01	2,51E-01	2,72E-01	1,09E-01	-6,71E+01
PENRM	MJ	1,55E+02	0,00E+00	1,00E-01	1,76E+00	8,01E-01	1,25E+00
PENRT	MJ	2,98E+02	3,01E-01	3,51E-01	2,03E+00	9,10E-01	-6,58E+01
SM	kg	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
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	3,30E-01	1,72E-05	2,80E-05	-1,72E-04	7,14E-05	-1,90E-01

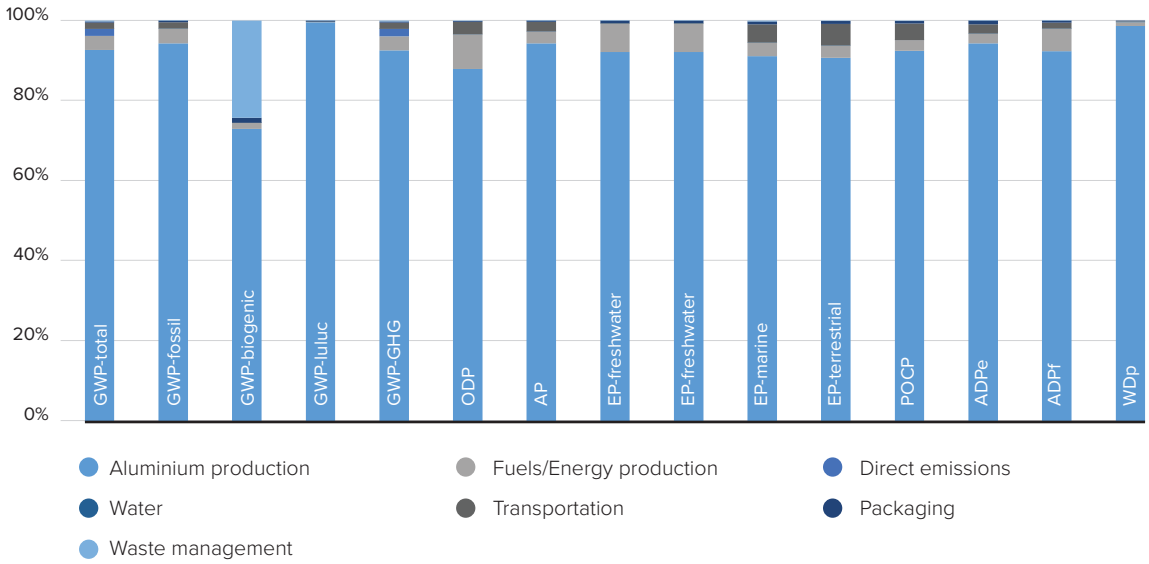
OUTPUT FLOWS AND WASTE CATEGORIES	UNIT	A1-A3	C1	C2	C3	C4	D
HWD	kg	1,03E-04	8,26E-07	6,56E-07	5,91E-07	3,41E-07	-4,20E-05
NHWD	kg	2,57E+00	4,10E-04	1,29E-02	7,46E-01	1,96E-01	-8,14E-01
RWD	kg	7,38E-04	2,08E-06	1,70E-06	1,58E-06	5,63E-07	-4,27E-04
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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 ENVIRONMENTAL INDICATORS	UNIT	A1-A3	C1	C2	C3	C4	D
PM	Diseaseincidence	7,06E-07	6,06E-09	1,16E-09	2,86E-09	3,43E-09	-2,94E-07
IRP[4]	kBq U235 eq	2,15E+00	1,36E-03	1,29E-03	1,28E-03	5,72E-04	-1,25E+00
ETP-FW	CTUe	2,70E+02	1,71E-01	1,89E-01	4,58E+00	6,07E+01	-7,44E+01
HTP-c	CTUh	2,43E-08	6,81E-12	6,33E-12	2,32E-11	7,55E-11	-1,39E-08
HTP-nc	CTUh	3,73E-07	1,28E-10	2,06E-10	5,09E-10	4,07E-10	-1,89E-07
SQP	dimensionless	3,06E+01	3,64E-02	1,69E-01	1,52E-01	6,46E-02	-3,89E+00

[4] Ionizing radiation potential (IRP) 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.

EXTRUDED ALUMINIUM PROFILES

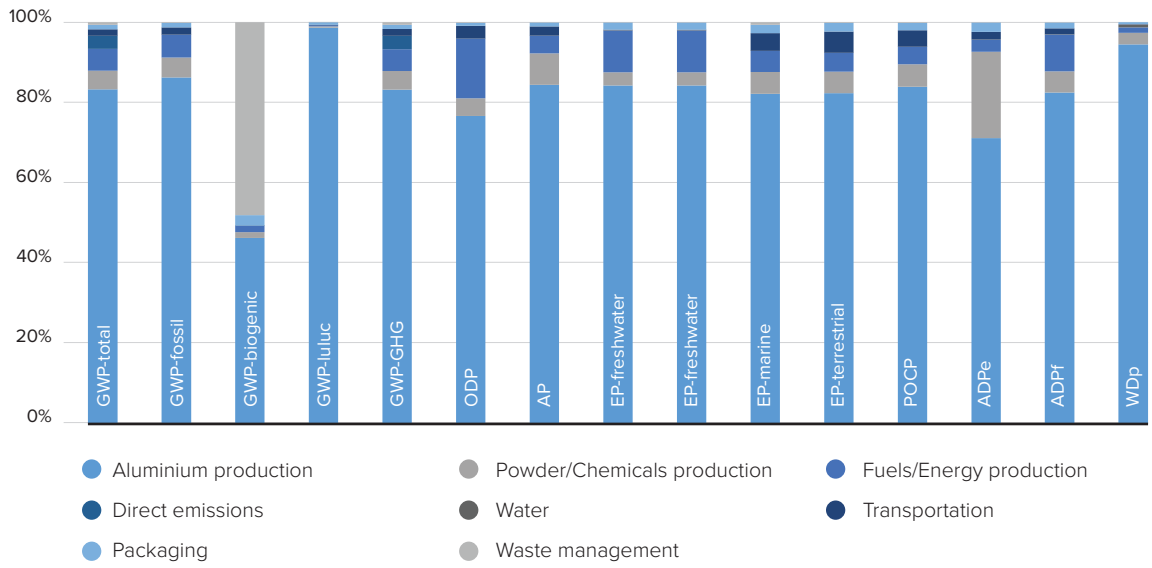
CONTRIBUTION IN CORE ENVIRONMENTAL INDICATORS



As it is presented above, aluminium ingot production contributes about 90% of total GWP indicator for the extrusion of aluminium. Fuels and electricity production and transmission does not contribute at a high level, accounting for 3,54%, while even less is the contribution of direct emissions from manufacturing stage and transportation of raw materials with 1,74% and 1,54%. Packaging and waste treatment contributions in GWP-total do not surpass 0,5% each. In the other core environmental indicators, contribution of aluminium production varies between 87% (in ODP indicator) and 98% (in WDP indicator) except form GWP-biogenic, where aluminium production accord to 73%. Fuels and energy production varies between 0,2% (in GWP-luluc indicator) and 8,58% (in ODP indicator). Transportation of raw materials has a minor contribution, with the most significant impact to be 5,40% in terrestrial eutrophication indicator. Waste management has a very low impact (under 1%), apart from GWP-biogenic indicator where it accounts for 24%.

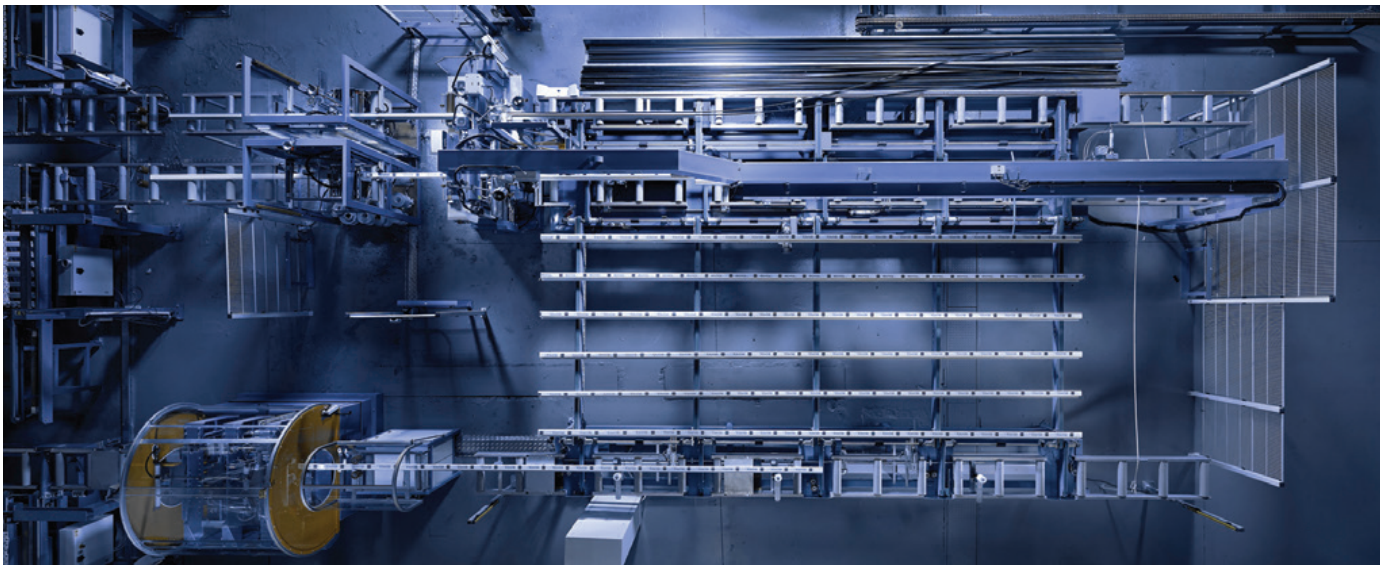
EXTRUDED COATED ALUMINIUM PROFILES

CONTRIBUTION IN CORE ENVIRONMENTAL INDICATORS

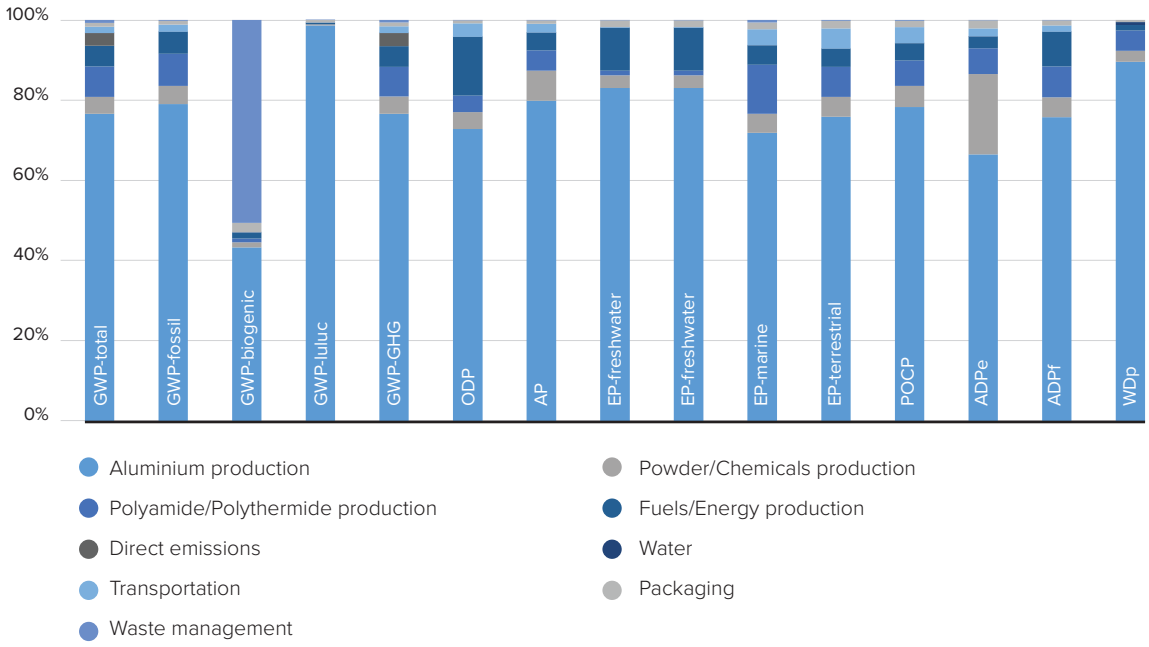


As it is presented above, aluminium ingot production contributes about 83% of total GWP indicator for the production of extruded coated aluminium profiles. Powder and chemicals production used in coating stage accord 4,66% to GWP indicator. Fuels and electricity production and transmission does not contribute at a high level, accounting for 5,47%, while even less is the contribution of direct emissions from manufacturing stage and transportation of raw materials with 3,26% and 1,60%. Packaging and waste treatment contributions in GWP do not surpass 1,5% each. In the other core environmental indicators, contribution of aluminium production varies between 71,15% (in ADPe indicator) and 98% (in GWP-luluc indicator) except form GWP-biogenic, where aluminium production accords to 46%. Fuels and energy production varies between 0,32% (in GWP-luluc indicator) and 10,46% (in freshwater eutrophication indicator). Maximum contribution of powder and chemicals production appear in ADPe and AP indicators, with 21,45% and 7,80%, while transportation of raw materials has a minor contribution, with the most significant impact to be 5,26% in terrestrial eutrophication indicator. Waste management has a very low impact (under 1%), apart from GWP-biogenic indicator where it accounts for 48%.

THERMAL BREAK COATED ALUMINIUM PROFILES



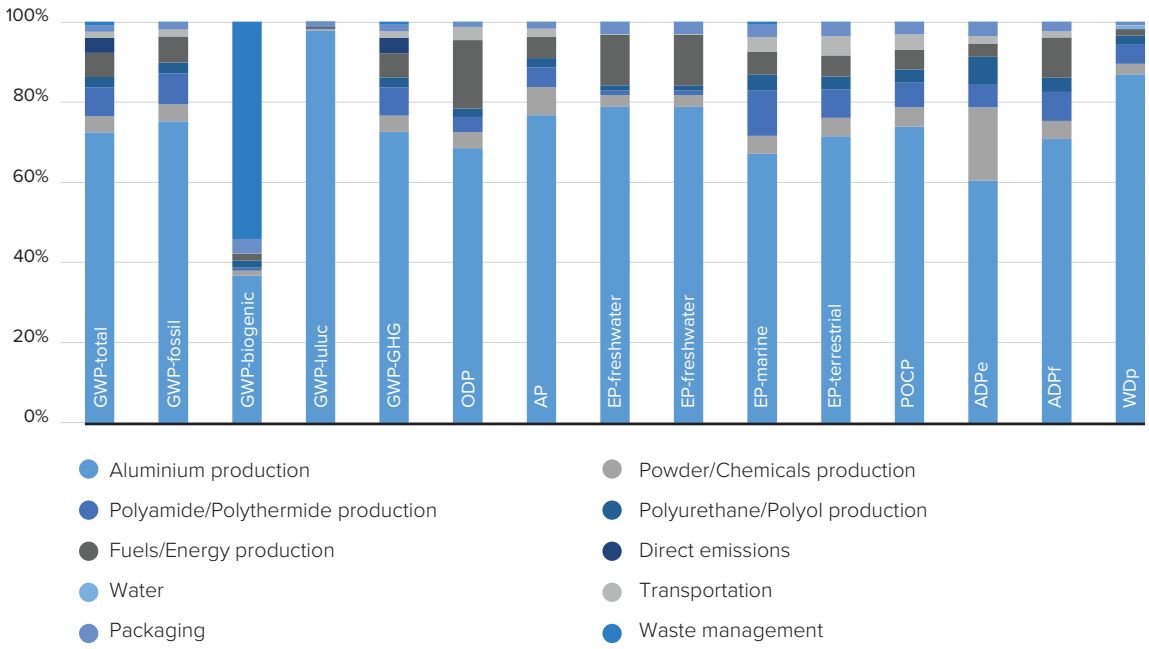
CONTRIBUTION IN CORE ENVIRONMENTAL INDICATORS



As it is presented above, aluminium ingot production contributes about 76% of total GWP indicator for the production of thermal break coated aluminium profiles. Powder/chemicals production used in coating stage and polyamide/PVC used in thermal break stage accord 4,28% and 7,50% to GWP indicator respectively. Fuels and electricity production and transmission does not contribute at a high level, accounting for 5,20%, while even less is the contribution of direct emissions from manufacturing stage and transportation of raw materials with 3,10% and 1,65%. Packaging and waste treatment contributions in GWP do not cumulatively surpass 3%. In the other core environmental indicators, contribution of aluminium production varies between 66% (in ADPe indicator) and 98% (in GWP-luluc indicator) except form GWP-biogenic, where aluminium production accord to 43,37%. Fuels and energy production varies between 0,33% (in GWP-luluc indicator) and 14,64% (in ODP indicator), while polyamide/PVC production has the most significant contribution in marine eutrophication indicator with 12,17%. Maximum contribution of powder and chemicals production appear in ADPe and AP indicators, with 20,21% and 7,37%, while transportation of raw materials has a minor contribution, with the most significant impact to be 5,07% in terrestrial eutrophication indicator. Waste management has a very low impact (under 1%), apart from GWP-biogenic indicator where it accounts for 50%.

THERMAL BREAK COATED+POLYURETHANE FOAM ALUMINIUM PROFILES

CONTRIBUTION IN CORE ENVIRONMENTAL INDICATORS



As it is presented above, aluminium ingot production contributes about 72% of total GWP indicator for the production of thermal break coated aluminium profiles. Powder/chemicals production used in coating stage and polyamide/PVC used in thermal break stage accord 4,05% and 7,10% to GWP indicator respectively. Fuels and electricity production and transmission does not contribute at a high level, accounting for 6,11%, while even less is the contribution of direct emissions from manufacturing stage and transportation of raw materials with 3,62% and 1,60%. Polyurethane and polyol production contributes 2,61%. Packaging and waste treatment contributions in GWP do not cumulatively surpass 3%. In the other core environmental indicators, contribution of aluminium production varies between 60% (in ADPe indicator) and 97% (in GWP-luluc indicator) except form GWP-biogenic, where aluminium production accord to 37%. Fuels and energy production varies between 0,41% (in GWP-luluc indicator) and 17% (in ODP indicator), while polyamide/PVC production has the most significant contribution in marine eutrophication indicator with 11,36%. Maximum contribution of powder and chemicals production appear in ADPe and AP indicators, with 18,19% and 7,24%, while transportation of raw materials has a minor contribution, with the most significant impact to be 4,85% in terrestrial eutrophication indicator. Waste management has a very low impact (under 1%), apart from GWP-biogenic indicator where it accounts for 54%.

Additional Information

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

List of abbreviations

LCA	Life Cycle assessment
EPD	Environmental Product Declaration
PCR	Product category rules
GLO	Global
RER	Europe
RoW	Rest of the world
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

References

- **General Programme Instructions** of the International EPD® System. Version 3.01, 2019-09-18
- **PCR 2019:14 v.1.11** Construction products. EPD System.
- **EN 15804:2012+A2:2019**, 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
- **Ecoinvent / Ecoinvent Centre**, www.Eco-invent.org
- **Residual Energy Mix 2020** from Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA)
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