ENVIRONMENTAL PRODUCT DECLARATION

In Accordance with ISO14025 and 15804:2012+A2:2019

Aluminium profiles

EPD Program:	The International EPD® System
Program operator:	EPD International AB
CPC Code:	41532 Bars, rods and profiles, of aluminium
EPD registration number:	S-P-02399
Publication date:	2021-01-08
Valid until:	2026-01-08
Geographical scope:	Global

PROGRAMME RELATED INFORMATION

Programme:	The international EPD System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com
EPD Based on Product Category Rules (PCR)	The CEN standard EN 15804 serves as the core Product Category Rules (PCR) PCR 2019:14 Construction products (EN 15804:A2); Version 1.1; 2020-09-14
PCR review was conducted by	The Technical Committee of the International EPD® System.
Independent third-party verification of the declaration and data, according to ISO 14025:2006	☐ EPD process certification ☑ EPD verification
Third party verifier:	Vladimir Koci Approved by: The International EPD® System
EPD Prepared by	ENVIROMETRICS Ltd Envirometrics.gr
Procedure for follow-up 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 from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

COMPANY INFORMATION

ETEM is one of the European leaders in aluminium extrusion, among the most promising ones in Southeastern Europe. The company was founded in 1971 and is the first integrated designer and producer of architectural systems and aluminium profiles for industrial applications in Greece.
Through continuous innovation and investments in infrastructure, cutting-edge equipment and our people, **ETEM** is an international company with worldwide exports and presence.

With over 50 years of experience and continuous presence in both the design and production of profiles for architectural systems and different industrial applications, the company is committed to serving its customers with value added products and services, thus establishing and maintaining longstanding relationships that are solely based on trust, through integrity, professionalism and reliable consistency.

ETEM holds a strong position in Southeastern Europe and tirelessly pursues opportunities for penetration and establishment in more countries and emerging markets.

From the birth of an idea, **ETEM** helps the individual, investor or developer to select the best product or solution to meet their requirements, in the most effective, supportive and cost-efficient of ways.

ETEM actively assists the architect or engineer to define the specifications of the project and can also offer technical support or training to the constructor and installer of company's complete product portfolio.

ETEM's main goal is to design and engineer products that help us improve our everyday living, whether in a residential, commercial or work environment.

The company remains loyal to its customers and keeps its promises for continuous innovation, tailor-made solutions, integrated assistance throughout a project, and strategic business thinking, ensuring the customers' commercial success.

PRODUCT DESCRIPTION

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

- Architectural elements for windows, doors, partition wall, facades and shutters
- Interior furnishing, lighting, stirs, grilles, meshes
- Cooling and heating surfaces, electronic modules and electro motor housing
- Flexible mounting systems and special machinery parts
- Floors of trucks and trailers, pneumatic equipment, railways and internal applications
- Heavy structure in wagons, frames of heavy load trucks, shipbuilding, bridges

A typical material composition along with technical specification of the product are presented below:

Raw Material	**Relative weight of components (% w/w)**	
	Aluminium profile	Thermal break Aluminium profile
Aluminium profile	100	>90
Aluminium ingot	93.00 - 99.00	
Magnesium	0.35 - 0.90	
Silicon	0.30 - 0.60	
Others	< 1	
Polyamide	-	<10

Technical Specifications		
Density (g/cm^3)	2.50 - 2.70	Standard test method based on scientific and technical sources
Melting range (oC)	585 - 650	Standard test method based on scientific and technical sources
Thermal conductivity, W/mK	200 - 220	ASTM E1225-13
Thermal expansion (10-6/K)	23.20 - 23.40	ASTM E831-14
Elastic Modules (MPa)	69000 - 70000	EN ISO 6892-1
Modules of rapture (MPa)	26000 - 26500	EN ISO 6892-1

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).

ENVIRONMENTAL PERFORMANCE RELATED INFORMATION

Declared unit	The declared unit is 1 kg of Aluminium Profile
Product group classification	UN CPC 41532 “Bars, rods and profiles, of aluminium”
Goal and Scope	This EPD evaluates the environmental impacts of the production of 1 kg of Aluminium Profile from Cradle to gate with module C1-C4 and D
System Boundary	Cradle-to-gate with module C1-C4 and D (A1-A3 + C+ D)
Cut-Off Rules	For this LCA study, 1% cut off rule applies.
Background Data	The most recent version of Ecoinvent database (V3.7) was used as a source of background data.
Data Quality	Data on raw materials, transportation, energy, waste and water is collected by ETEM S.A.
Time representiveness	All primary data used in this study is for the entire year 2019.
Geographical Scope	Worldwide
Allocations	There are no co-products in the production of Aluminium profiles manufactured by ETEM S.A.. Hence, there was no need for co-product allocation.
LCA software	openLCA v. 1.10.3

SYSTEM BOUNDARIES

Product stage			Con-struction 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-potentia
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND		MND							X	X	X	X	X

Description of the system boundary (X = Included in the study, MNA = Module Not Declared)

PRODUCT STAGE

Product stage include raw material supply, transportation and manufacturing.

A1: Raw Material Supply

Production starts with raw materials supply. This stage includes raw material extraction and processing along with processing of secondary materials. Production starts with raw materials supply. The aluminium billets for the profile production consist of 50% primary and 50% recycled aluminium.

A2: Transportation

Some of the raw materials are locally sourced while others are transported from different countries in Europe with lorry 16-32 tonnes.

A3: Manufacturing

Manufacturing processes include all the production activities within the plant with all the associated impacts. These include:

1. Extrusion
2. Cutting
3. Aging
4. Thermal breaking (in case of thermal break profiles)
5. Packaging

The emissions of the electricity used in manufacturing process and modelled as Greece electricity residual mix are 601.4 g CO2eq/kWh, according to Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA) Report for ''Residual Energy Mix 2019'' for Greece

SYSTEM BOUNDARIES

END OF LIFE STAGE

The end-of-life stages begins with the deconstruction and demolition from the installation site and then they transferred for recycling and disposal. According to the European Aluminium Association above 90% of the aluminium for building applications is being recycled, while the rest 10% are being disposed/landfilled.

C1: De-construction, demolition

Due to lack of information concerning the environmental impacts for the de-construction and/or dismantling of aluminium profiles from installation site, are assumed to be zero.

C2: Transport to waste processing

The product is assumed to be 90% recycled and 10% landfilled. Hence, a distance of 200 km by lorry 16-32 tonnes from construction/demolition sites to scrap dealers and disposal sites has been chosen as a conservative assumption.

C3: Waste processing for reuse, recovery and/or recycling

90% of the product is recycled, by remelting process, to produce secondary aluminium billets.

C4: Disposal

10% of the product will be landfilled.

BENEFITS AND LOADS BEYOND THE PRODUCT SYSTEM BOUNDARY IN INFORMATION MODULE D

Module D consists of avoided burdens related to the potential reuse and/or recycling of the product after its end-of-life stage. As it is referred above, 90% of waste aluminium is recycled while the recycled content in the raw materials feed is 50%.

ENVIRONMENTAL PERFORMANCE INDICATORS

The environmental performance indicators for 1 kg of Mill-Finished Al Profile are shown in the following tables. For stages A1-A3 the results are aggregated.

ENVIRONMENTAL IMPACTS 1 KG MILL-FINISHED AL PROFILE

ENVIRONMENTAL IMPACTS	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	5.61E+00	0.00E+00	3.29E-02	3.05E-01	3.94E-03	-3.19E+00
GWP-fossil	kg CO2 eq	5.59E+00	0.00E+00	3.29E-02	3.04E-01	3.92E-03	-3.19E+00
GWP-biogenic	kg CO2 eq	1.81E-02	0.00E+00	1.11E-05	3.12E-04	1.31E-05	-8.09E-04
GWP-luluc	kg CO2 eq	2.63E-03	0.00E+00	1.12E-05	9.90E-05	3.71E-06	-6.24E-04
GWP-GHG[1]	kg CO2 eq	5.59E+00	0.00E+00	3.29E-02	3.04E-01	3.92E-03	-3.19E+00
ODP	kg CFC-11 eq	9.64E-08	0.00E+00	7.53E-09	1.74E-12	4.33E-10	-2.52E-11
AP	mol H+ eq	3.22E-02	0.00E+00	1.65E-04	7.46E-04	2.59E-05	-1.95E-02
EP-freshwater	kg $PO4^{-3}$ eq	2.08E-03	0.00E+00	6.83E-06	6.48E-07	3.65E-06	-4.64E-06
EP-freshwater[2]	kg P eq	6.77E-04	0.00E+00	2.23E-06	2.11E-07	1.19E-06	-1.51E-06
EP-marine	kg N eq	5.27E-03	0.00E+00	5.76E-05	2.33E-04	6.47E-06	-2.80E-03
EP-terrestrial	mol N eq	5.38E-02	0.00E+00	6.29E-04	2.52E-03	6.94E-05	-3.09E-02
POCP	kg NMVOC eq	1.47E-02	0.00E+00	1.79E-04	6.58E-04	2.05E-05	-8.52E-03
ADPe	kg Sb eq	6.77E-06	0.00E+00	9.16E-07	3.49E-08	3.86E-08	-7.49E-07
ADPf	MJ	1.36E+02	0.00E+00	5.03E-01	4.88E+00	6.32E-02	-4.76E+01
WDP	m^3 eq	2.96E+00	0.00E+00	2.33E-03	0.00E+00	1.83E-03	-1.18E+00

[1] This 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.

RESOURCE USE PER 1 KG MILL-FINISHED AL PROFILE

RESOURCE USE	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	5.67E+01	0.00E+00	6.76E-03	4.35E-01	3.57E-03	-1.87E+01
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	5.67E+01	0.00E+00	6.76E-03	4.35E-01	3.57E-03	-1.87E+01
PENRE	MJ	1.36E+02	0.00E+00	5.33E-01	4.88E+00	5.91E-02	-4.14E+01
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.36E+02	0.00E+00	5.33E-01	4.88E+00	5.91E-02	-4.14E+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	2.31E-01	0.00E+00	2.23E-03	0.00E+00	7.20E-04	-9.26E-02

ENVIRONMENTAL PERFORMANCE INDICATORS

OUTPUT FLOWS AND WASTE CATEGORIES PER 1 KG MILL-FINISHED AL PROFILE

OUTPUT FLOWS AND WASTE CATEGORIES	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	1.11E-05	0.00E+00	1.31E-06	1.25E-09	5.34E-08	-2.90E-08
NHWD	kg	1.38E+01	0.00E+00	2.41E-02	3.38E-01	1.05E-01	-4.65E+00
RWD	kg	7.29E-03	0.00E+00	3.44E-06	1.98E-04	2.21E-07	-2.46E-03
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 IMPACTS PER 1 KG MILL-FINISHED AL PROFILE

ADDITIONAL	Unit	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	4.18E-07	0.00E+00	2.35E-09	4.43E-09	3.69E-10	-2.72E-07
IR	kBq U235 eq	8.15E-01	0.00E+00	2.62E-03	3.15E-02	3.24E-04	-4.69E-01
EF	CTUe	6.46E-01	0.00E+00	8.81E-02	2.18E-03	3.02E-03	-7.46E-02
HT-c	CTUh	1.83E-08	0.00E+00	6.72E-10	1.49E-10	8.72E-11	-4.99E-09
HT-nc	CTUh	2.25E-07	0.00E+00	4.81E-09	2.05E-09	3.82E-10	-1.16E-07
LU	Dimensionless	2.81E+01	0.00E+00	5.05E-01	1.25E-01	1.12E-01	-1.68E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

The environmental performance indicators for 1 kg of Thermal break Mill-Finished Al Profile are shown in the following tables.

ENVIRONMENTAL IMPACTS 1 KG THERMAL BREAK MILL-FINISHED AL PROFILE

ENVIRONMENTAL IMPACTS	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	6.71E+00	0.00E+00	3.29E-02	2.88E-01	1.25E-02	-3.20E+00
GWP-fossil	kg CO2 eq	6.68E+00	0.00E+00	3.29E-02	2.87E-01	1.25E-02	-3.20E+00
GWP-biogenic	kg CO2 eq	2.02E-02	0.00E+00	1.11E-05	2.95E-04	1.30E-05	-8.15E-04
GWP-luluc	kg CO2 eq	2.87E-03	0.00E+00	1.12E-05	9.35E-05	3.84E-06	-6.27E-04
GWP-GHG[1]	kg CO2 eq	6.68E+00	0.00E+00	3.29E-02	2.87E-01	1.25E-02	-3.20E+00
ODP	kg CFC-11 eq	1.11E-07	0.00E+00	7.53E-09	1.64E-12	5.88E-10	-2.52E-11
AP	mol H+ eq	3.75E-02	0.00E+00	1.65E-04	7.05E-04	3.52E-05	-1.96E-02
EP-freshwater	kg $PO4^{-3}$ eq	2.35E-03	0.00E+00	6.83E-06	6.12E-07	3.76E-06	-4.66E-06
EP-freshwater[2]	kg P eq	7.66E-04	0.00E+00	2.23E-06	2.00E-07	1.22E-06	-1.52E-06
EP-marine	kg N eq	6.70E-03	0.00E+00	5.76E-05	2.20E-04	1.16E-04	-2.81E-03
EP-terrestrial	mol N eq	6.36E-02	0.00E+00	6.29E-04	2.38E-03	1.13E-04	-3.10E-02
POCP	kg NMVOC eq	1.75E-02	0.00E+00	1.79E-04	6.22E-04	3.58E-05	-8.53E-03
ADPe	kg Sb eq	8.25E-06	0.00E+00	9.16E-07	3.30E-08	4.58E-08	-7.50E-07
ADPf	MJ	1.57E+02	0.00E+00	5.03E-01	4.61E+00	7.39E-02	-4.77E+01
WDP	m3 eq	3.86E+00	0.00E+00	2.33E-03	0.00E+00	2.34E-03	-1.18E+00

[1] This 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.

RESOURCE USE PER 1 KG THERMAL BREAK MILL-FINISHED AL PROFILE

RESOURCE USE	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	6.16E+01	0.00E+00	6.76E-03	4.11E-01	3.66E-03	-1.87E+01
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.16E+01	0.00E+00	6.76E-03	4.11E-01	3.66E-03	-1.87E+01
PENRE	MJ	1.57E+02	0.00E+00	5.33E-01	4.61E+00	7.06E-02	-4.15E+01
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.57E+02	0.00E+00	5.33E-01	4.61E+00	7.06E-02	-4.15E+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	9.01E-01	0.00E+00	2.23E-03	0.00E+00	8.27E-04	-9.26E-02

ENVIRONMENTAL PERFORMANCE INDICATORS

OUTPUT FLOWS AND WASTE CATEGORIES PER 1 KG THERMAL BREAK MILL-FINISHED AL PROFILE

OUTPUT FLOWS AND WASTE CATEGORIES	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	1.31E-05	0.00E+00	1.31E-06	1.18E-09	7.22E-08	-2.90E-08
NHWD	kg	1.50E+01	0.00E+00	2.41E-02	3.20E-01	1.49E-01	-4.66E+00
RWD	kg	7.91E-03	0.00E+00	3.44E-06	1.87E-04	2.91E-07	-2.46E-03
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 IMPACTS PER 1 KG THERMAL BREAK MILL-FINISHED AL PROFILE

ADDITIONAL	Unit	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	4.76E-07	0.00E+00	2.35E-09	4.19E-09	2.17E-09	-2.72E-07
IR	kBq U235 eq	8.89E-01	0.00E+00	2.62E-03	2.98E-02	3.75E-04	-4.69E-01
EF	CTUe	1.03E+00	0.00E+00	8.81E-02	2.06E-03	3.77E-02	-7.47E-02
HT-c	CTUh	2.42E-08	0.00E+00	6.72E-10	1.41E-10	2.17E-10	-4.99E-09
HT-nc	CTUh	2.50E-07	0.00E+00	4.81E-09	1.94E-09	1.22E-09	-1.16E-07
LU	Dimensionless	3.08E+01	0.00E+00	5.05E-01	1.18E-01	1.52E-01	-1.68E+00

ENVIRONMENTAL PERFORMANCE INDICATORS

As can be seen in Figures 1-2, the life cycle environmental impacts of Aluminium profiles are mainly dominated by Product Stage (A1-A3) with contribution over from 85% for all impact categories.

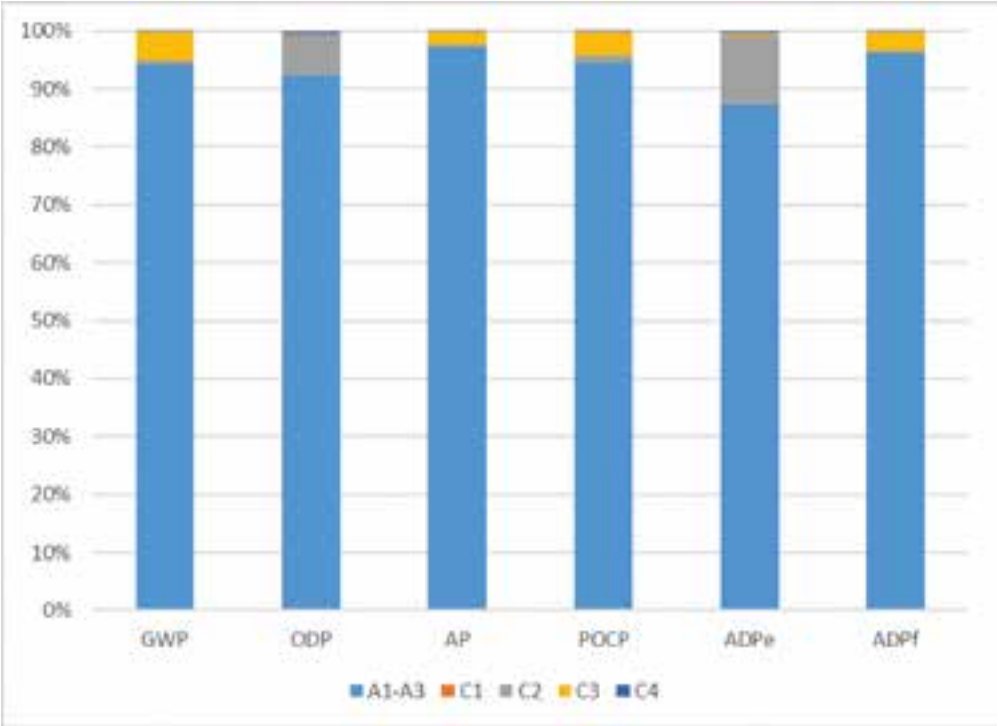

Figure 1. Contribution of each stage of Life cycle of Mill-finished Aluminium Profiles in environmental impacts

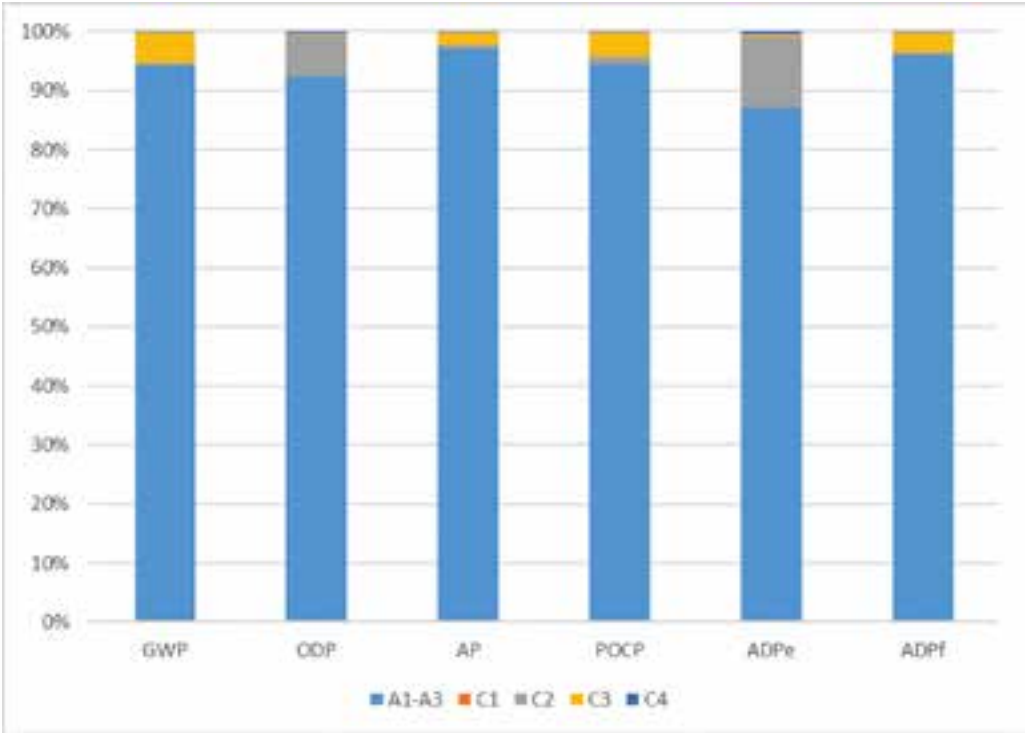

Figure 2. Contribution of each stage of Life cycle of Thermal Break Mill-finished Aluminium Profiles in environmental impacts

ENVIRONMENTAL PERFORMANCE INDICATORS

In Figures 3-4, the contribution of different stages of production phase (A1-A3) of Mill-finished & Thermal Break Mill-finished aluminium profile to the Global warming Potential is presented. For both types, the aluminium ingot production is the dominant stage with contribution more than 75% in the total emissions.

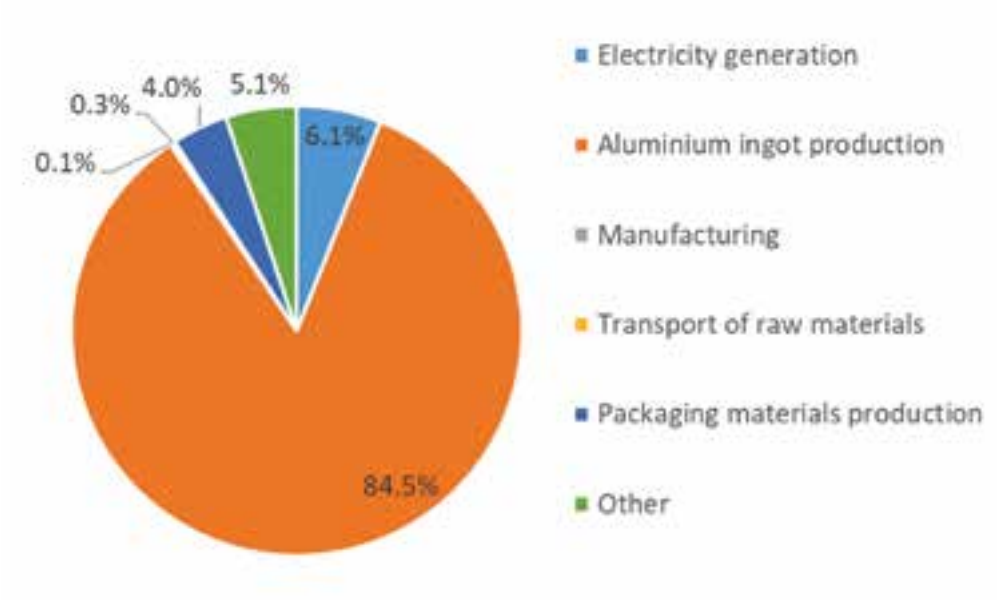

Figure 3. Contribution of each stage of A1-A3 of Mill-finished Aluminium profile in Global Warming Potential

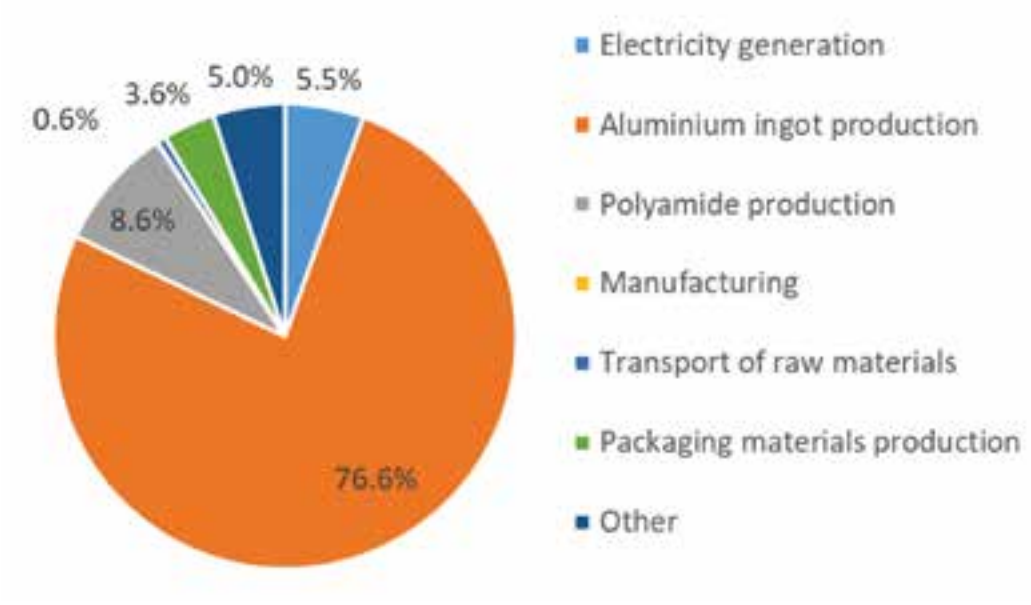

Figure 4.v Contribution of each stage of A1-A3 of Thermal Break Mill-finished Aluminium profile in Global Warming Potential

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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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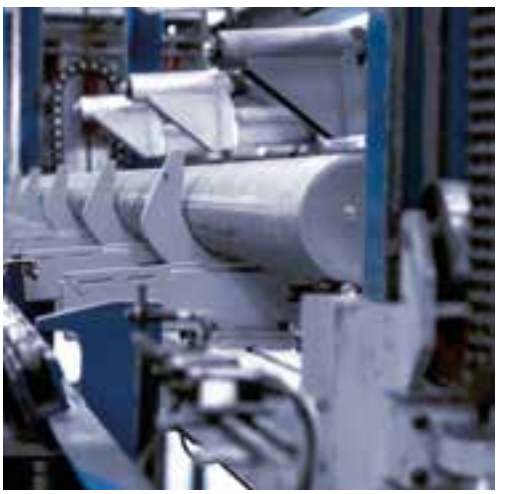
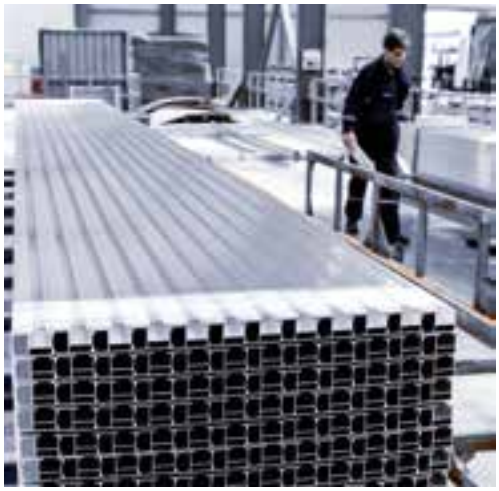
Aluminium Recycling in LCA – European Aluminium Association

ENVIRONMENTALPROFILE REPORT-Life-Cycle inventory data for aluminium production and transformation processes in Europe, European Aluminium Association, February 2018



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



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