



ENVIRONMENTAL PRODUCT DECLARATION

Aluminium Window Systems





Introduction

This environmental product declaration (EPD) is for a GEN standard window frame produced by Metal Technology Ltd in Antrim, Northern Ireland. It has been developed using a Life Cycle Analysis (LCA) study that we commissioned in 2021 and carried out in accordance with the principles of ISO 14040:2006, ISO 14044:2006 and EN 15804:2012 +A2:2019.

This EPD discloses the average impacts and resources used to supply a standard Metal Technology window frame.

Metal Technology Window Systems

The Metal Technology Thermally-Broken Commercial Windows have been designed to offer the specifier the advantages of polyamide thermal break technology in meeting and exceeding the latest thermal requirements of the current building regulations. Metal Technology's System 4-35/5-35 polyamide window suites have been developed with a diverse range of profile options. Bespoke thermal isolators and insulation combined with structural mullions, vents, and outer frames offer architects and designers the ability to achieve flexible design solutions.

As with all Metal Technology systems, the 4-35/5-35 window system is manufactured to exacting standards enabling economy to be combined with strength to give many years of aesthetic, trouble-free operation.

This study considers the System 4-35 Casement Window and System 5-35 Tilt and Turn Window ranges.

Analysis

This EPD has been created based on a life cycle assessment (LCA) conducted by 3Keel LLP, who have conducted the LCA in accordance with data provided by Metal Technology Ltd. Due care has been exercised in assessing the quality of information provided, but information provided by others has not been independently verified.



Product Profile

Thermal Break

Reduces temperature loss through the framing system

A polyamide thermal break offers enhanced thermal performance improving insulating properties of the window

Compliant with Document L

Frame

Aluminium profile providing optimal weather and thermal performance.

Can achieve a U_w -value of $0.9 \text{ W/m}^2\text{K}$

Coating

Metal Technology's high quality polyester powder paint finish provides outstanding resistance to environmental conditions thereby extending the life of the window system.

Also available in a range of anodised colours specifically for architectural glazing systems.



Product Description

The window systems assessed in this study are standard window frames exclusive of glazing and furniture. Metal Technology windows are designed with aesthetics and energy efficiency in mind, to encompass weather performance and security, as well as customer use and its production process.

Materials

Metal Technology windows use materials that maximise the opportunity for reuse and recycling at their end of life.

Frame materials are 100% recyclable and Metal Technology's extruded aluminium includes more than 75% recycled content, combining pre and post-consumer scrap.

Production Process

The window systems profiles assessed in this EPD are produced by Hydro in Birtley, England. Aluminium billets are extruded to form the profile then assembled with a thermal break. Extrusions are aged before being coated, then packaged and supplied to customers for fabrication. Windows are then delivered to construction sites for fitting and glazing installation.

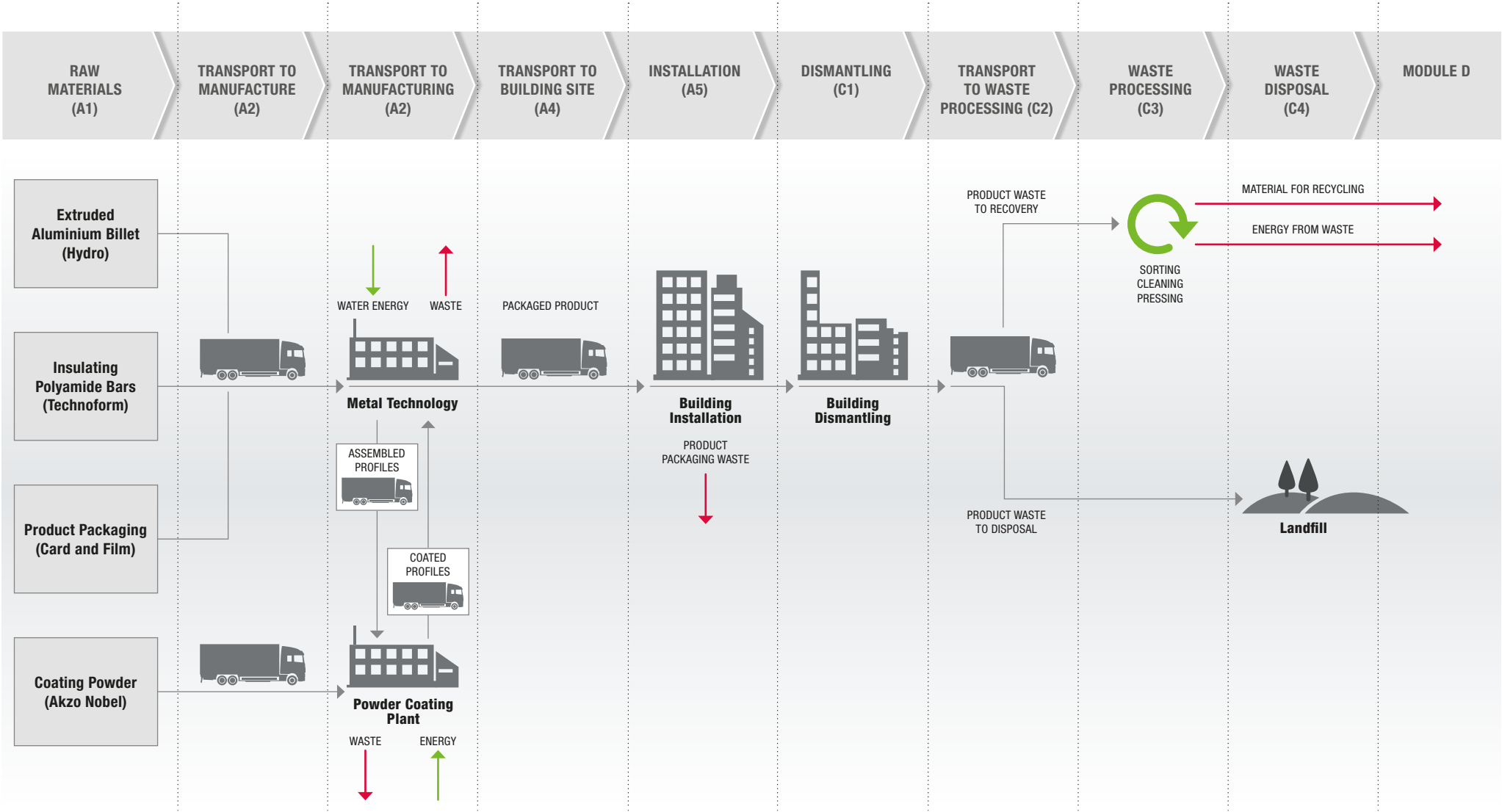
Material Declaration

	Weight (kg)	%
Frame	7.15	82.8
Polyamide	1.29	14.9
PPC	0.20	2.3
Total	8.64	100



Process Flow Diagram - Metal Technology Profiles

EPD - Aluminium Window Systems



A LCA determines the cradle-to-grave impacts of a product. At Metal Technology we take all our responsibilities very seriously. We're dedicated to creating products and systems that promote integrated, whole-building design practices. Our LCA helps us to measure and review our products to minimise the resources and impacts associated with their use from cradle-to-grave. This EPD covers 'cradle-to-gate' and end of life processes.



Declared Unit

The declared unit is 1m² of product.
This is related to a CEN standard window (1230 x 1480mm).

Key Considerations

Metal Technology production and supply chain data was used for extrusion and coating processes.

Data provided directly by Metal Technology was collated under PAS 2050 guidelines to ensure cut-off criteria and other LCA requirements were met.

All significant inputs were included covering more than 95% of inputs and neglected inputs are likely near 0%.

The analysis includes the resources and impacts associated with the production of frame components ready for fabrication by Metal Technology’s customers. It excludes final assembly, furniture, and then building installation.

Assumptions

The deconstruction and waste management of profiles is modelled after the end-of-life pathway for metal windows and doorsets (BS EN 17213:2020).

Aluminium has a high market value and has a strong recycling rate in the UK construction industry. Recycling of aluminium has a substantially lower environmental impact than the production of virgin alloy, however this analysis only considers the environmental benefits of Metal Technology’s use of recycled aluminium in the billets used for third party supplied extrusions.

Ecoinvent 3.8 was used to assess the environmental impact of purchased materials and processes.

Environmental Metrics and Resources

This study was conducted following the principles and analytical requirements of EN 15804:2012+A2:2019 regarding the creation of EPDs for construction products. The standard requires that the lifecycle stages assessed, and disclosure of environmental criteria adhere to specific environmental, resource, waste and other flows. All Environmental impacts have been assessed using EF v3.0 EN15804.

Environmental Impact

- Global Warming (Climate Change)
 - Total
- Global Warming (Climate Change)
 - Fossil
- Global Warming (Climate Change)
 - Biogenic
- Global Warming (Climate Change)
 - Land Use
- Ozone Depletion Potential
- Acidification Potential
- Eutrophication Potential in Fresh Water
- Eutrophication Potential in Marine Water
- Eutrophication Potential in Terrestrial Environment
- Photochemical Ozone Creation Potential
- Depletion Abiotic Resources: Minerals / Metals
- Depletion Abiotic Resources: Fossil Fuels
- Water Depletion Potential
- Particulate Water
- Ionising Radiation
- Ecotoxicity, Freshwater

- Human Toxicity, Carcinogenic Effects
- Human Toxicity, Non-Carcinogenic Effects
- Land Use (SQP)

Resource Use

- Renewable Primary Energy
- Non-Renewable Primary Energy
- Renewable Secondary Fuels
- Non-Renewable Secondary Fuels
- Fresh Water

Waste Flows

- Hazardous Waste
- Non-Hazardous Waste
- Radioactive Waste

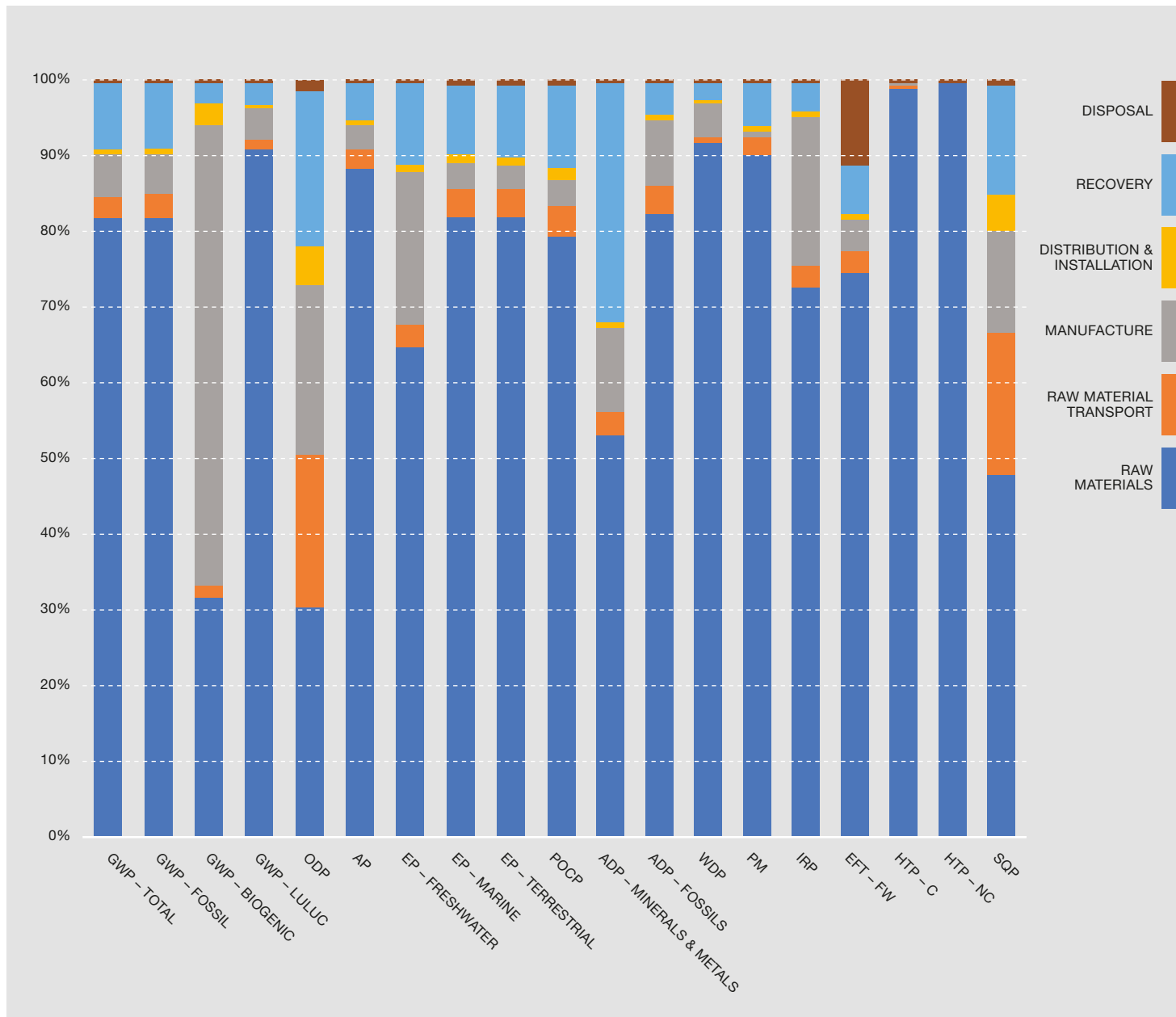
Other Flows

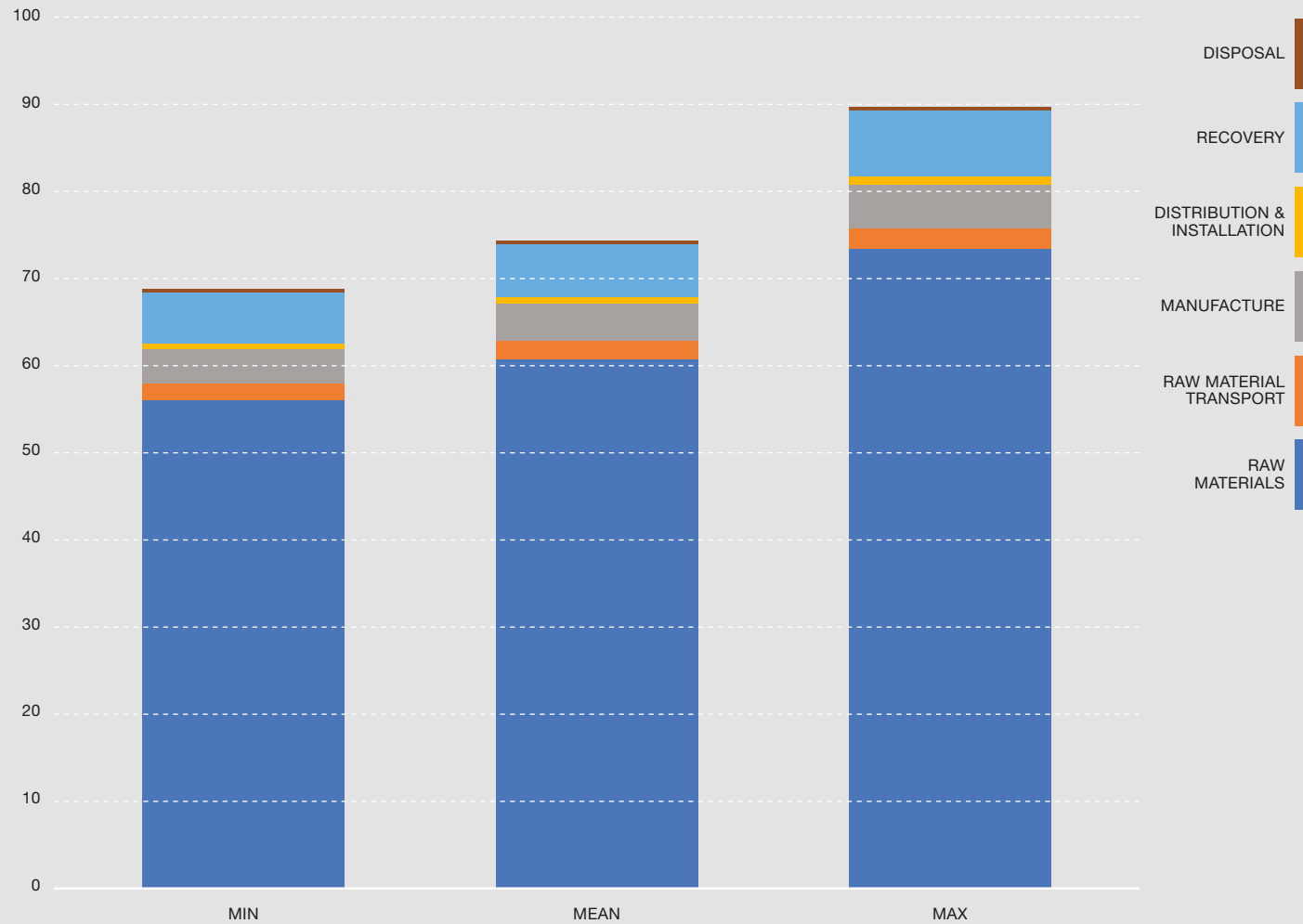
- Components for Reuse
- Materials for Recycling
- Materials for Energy Recovery
- Export Recovery

LCA Results

The majority of impacts associated with the production and supply of windows occur before they reach Metal Technology as part of the raw material supply that goes into the extrusion process. This is expected and consistent with other analyses assessing the impacts of extruded aluminium products.

Manufacturing impacts are the second biggest contributor across almost all impact and resource categories, except for waste.



WINDOW FRAME VARIATIONS (kgCO₂e/m²)

Product Range Variability

A median product profile was used to calculate the average impact of Metal Technology window frames.

The specific window profile and format supplied by Metal Technology may be different depending on:

Specific product type

Window dimensions

Profile

Bead type

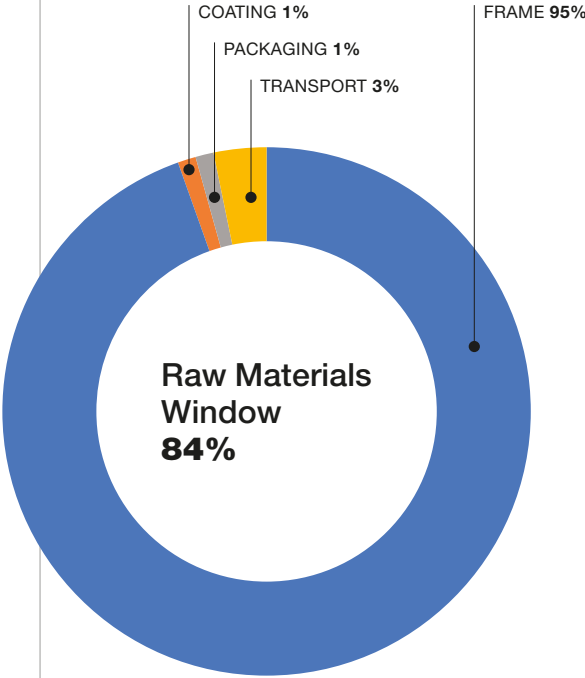
Although the specific impact may vary, the relative contribution to each life cycle stage does not change as the materials used are adjusted in similar proportions.



Raw Material Impacts

Aluminium material for the frame is the single biggest raw material impact.

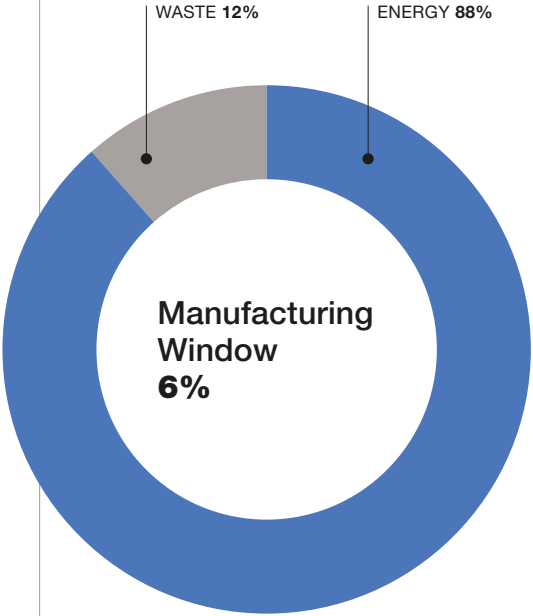
Using recycled, rather than primary (virgin), aluminium can reduce the impact of its use by over 85%.



Manufacturing Impacts

The energy used in the extrusion process – particularly electricity – is the primary contributor to Metal Technology’s manufacturing impact.

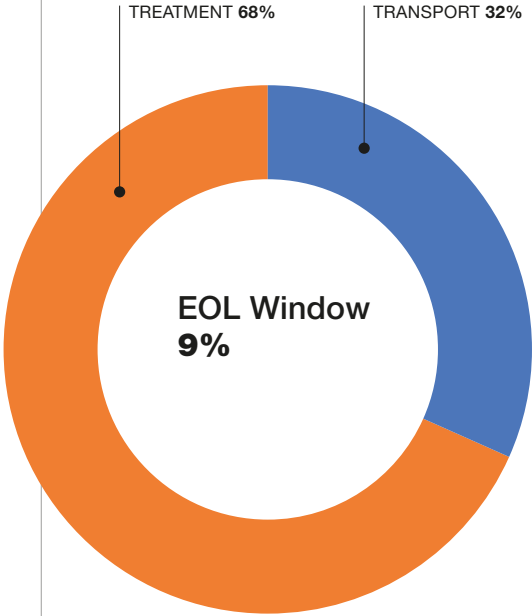
Improving production efficiency and using renewable energy within the production process can significantly reduce these impacts.



End of Life Impacts

Recycling aluminium when a window frame is removed from a building will substantially reduce its disposal impacts.

Approximately 87% of all construction waste is recovered in the UK and aluminium frames are considered to have a 95% recovery rate.



LCA Results Data Table (per m²)

EPD - Aluminium Window Systems

	INDICATOR	UNIT	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Environmental Impact per Unit	Global warming potential (GWP100): Total	kg CO2-Eq	6.05E+01	2.10E+00	4.20E+00	6.68E+01	5.08E-01	6.95E-02	MND	0.00E+00	2.12E+00	4.57E+00	2.23E-02	-4.05E+01
	Global warming potential (GWP100): Fossil	kg CO2-Eq	6.04E+01	2.09E+00	4.00E+00	6.65E+01	5.06E-01	6.02E-02	MND	0.00E+00	2.12E+00	4.56E+00	2.19E-02	-3.94E+01
	Global warming potential (GWP100): Biogenic	kg CO2-Eq	1.06E-01	5.31E-03	2.03E-01	3.14E-01	1.25E-03	9.31E-03	MND	0.00E+00	1.88E-03	7.45E-03	4.16E-04	-1.69E-01
	Global warming potential (GWP100): LULUC	kg CO2-Eq	6.57E-02	8.83E-04	2.87E-03	6.94E-02	2.14E-04	2.04E-05	MND	0.00E+00	2.33E-04	2.12E-03	1.68E-05	-9.29E-01
	Ozone depletion potential (ODP)	kg CFC-11.	7.46E-07	4.79E-07	5.49E-07	1.77E-06	1.16E-07	9.10E-09	MND	0.00E+00	4.59E-07	1.13E-07	1.77E-09	-4.16E-06
	Accumulated exceedance (ae)	mol H+-Eq	3.39E-01	1.08E-02	1.04E-02	3.61E-01	2.78E-03	2.98E-04	MND	0.00E+00	1.34E-02	7.69E-03	1.01E-04	-2.58E-01
	Fraction of nutrients reaching freshwater end compartment (P)	kg PO4-Eq	9.22E-04	4.33E-05	2.86E-04	1.25E-03	1.03E-05	1.79E-06	MND	0.00E+00	1.24E-05	1.46E-04	1.41E-06	-7.44E-03
	Fraction of nutrients reaching marine end compartment (N)	kg N-Eq	5.43E-02	2.45E-03	2.27E-03	5.90E-02	6.33E-04	1.19E-04	MND	0.00E+00	5.38E-03	1.62E-03	1.61E-04	-3.53E-02
	Accumulated exceedance (AE)	mol N-Eq	5.78E-01	2.69E-02	2.28E-02	6.28E-01	6.97E-03	1.18E-03	MND	0.00E+00	5.90E-02	1.68E-02	2.76E-04	-3.23E-01
	Tropospheric ozone concentration increase	kg NMVOC-	1.59E-01	8.47E-03	7.10E-03	1.75E-01	2.16E-03	4.04E-04	MND	0.00E+00	2.08E-02	4.65E-03	8.33E-05	-1.20E-01
	Abiotic depletion potential (ADP): elements (ultimate reserves)	kg Sb-Eq	1.19E-04	7.21E-06	2.45E-05	1.51E-04	1.73E-06	2.44E-07	MND	0.00E+00	1.86E-06	6.91E-05	3.62E-08	-1.02E-04
	Abiotic depletion potential (ADP): fossil fuels	MJ, net c.	7.35E+02	3.07E+01	7.74E+01	8.44E+02	7.43E+00	6.89E-01	MND	0.00E+00	2.83E+01	1.28E+01	2.18E-01	-6.18E+02
	User deprivation potential (deprivation-weighted water consumption)	m3 world .	1.48E+01	1.40E-01	7.43E-01	1.57E+01	3.34E-02	6.18E-03	MND	0.00E+00	5.00E-02	3.52E-01	2.73E-03	-7.77E+01
	Impact on human health	Disease i.	5.98E-06	1.60E-07	5.55E-08	6.20E-06	3.86E-08	6.25E-09	MND	0.00E+00	2.99E-07	1.13E-07	1.54E-09	-2.99E-06
	Human exposure efficiency relative to u235	kBq U235-	4.47E+00	1.61E-01	1.22E+00	5.86E+00	3.86E-02	3.94E-03	MND	0.00E+00	1.29E-01	1.19E-01	1.27E-03	-1.15E+01
	Comparative toxic unit for ecosystems (CTUe)	CTUe	6.93E+02	2.52E+01	3.92E+01	7.57E+02	6.08E+00	7.68E-01	MND	0.00E+00	1.63E+01	4.45E+01	2.28E+02	-7.29E+02
	Comparative toxic unit for human (CTUh)	CTUh	9.30E-07	8.28E-10	4.46E-09	9.35E-07	2.01E-10	4.33E-11	MND	0.00E+00	2.89E-10	1.36E-09	1.39E-11	-1.26E-07
	Comparative toxic unit for human (CTUh)	CTUh	5.28E-05	2.42E-08	3.13E-08	5.29E-05	5.82E-09	5.79E-10	MND	0.00E+00	1.10E-08	5.56E-08	3.71E-10	-1.73E-06
	Soil quality index	dimension.	5.21E+01	2.07E+01	1.42E+01	8.69E+01	4.96E+00	2.78E-01	MND	0.00E+00	5.04E+00	1.17E+01	2.99E-01	-9.56E+01
Resource Use per Unit	Renewable energy resources, energy	MJ-Eq	1.03E+02	3.27E-01	4.37E+00	1.07E+02	7.74E-02	1.24E-02	MND	0.00E+00	7.95E-02	7.93E-01	8.98E-03	-2.41E+02
	Renewable energy resources, materials	MJ-Eq	1.28E+00	1.10E-01	2.46E+00	3.85E+00	2.62E-02	5.32E-03	MND	0.00E+00	3.28E-02	5.99E-01	4.54E-03	-1.12E+01
	Renewable energy resources	MJ-Eq	1.04E+02	4.37E-01	6.83E+00	1.11E+02	1.04E-01	1.77E-02	MND	0.00E+00	1.12E-01	1.39E+00	1.35E-02	-2.53E+02
	Renewable energy resources, energy	MJ-Eq	7.22E+02	3.32E+01	8.35E+01	8.38E+02	8.04E+00	7.44E-01	MND	0.00E+00	3.06E+01	1.38E+01	2.34E-01	-6.55E+02
	Renewable energy resources, materials	MJ-Eq	2.06E+01	1.37E-03	1.00E-03	2.06E+01	3.32E-04	2.95E-05	MND	0.00E+00	4.09E-04	9.41E-03	2.57E-05	-1.84E-02
	Renewable energy resources	MJ-Eq	7.42E+02	3.32E+01	8.35E+01	8.59E+02	8.04E+00	7.44E-01	MND	0.00E+00	3.06E+01	1.38E+01	2.34E-01	-6.55E+02
	Use of secondary materials	kg	5.98E+00	0.00E+00	0.00E+00	5.98E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Use of renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Use of non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Water	m3	1.21E+00	5.58E-03	3.26E-02	1.25E+00	1.34E-03	1.35E-04	MND	0.00E+00	2.75E-03	1.02E-02	1.83E-04	-4.23E-01
Waste to Disposal	Hazardous waste	kg waste	2.11E-03	7.81E-05	8.08E-04	2.99E-03	1.88E-05	1.76E-06	MND	0.00E+00	7.77E-05	3.69E-02	2.28E-07	-3.86E-04
	Bulk waste	kg waste	1.31E+01	1.53E+00	3.38E-01	1.50E+01	3.67E-01	1.76E-02	MND	0.00E+00	1.46E-01	5.17E-01	4.38E-01	-1.20E+01
	Radioactive waste	kg waste	2.15E-02	2.12E-04	3.69E-04	2.21E-02	5.13E-05	4.29E-06	MND	0.00E+00	2.04E-04	5.92E-05	9.05E-07	-3.92E-03
	Components of reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Materials for recycling	kg	4.46E-01	0.00E+00	0.00E+00	4.46E-01	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.63E+00
	Materials for energy recovery	kg	1.16E-02	0.00E+00	0.00E+00	1.16E-02	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Exported energy	MJ, NCV	8.72E-02	0.00E+00	0.00E+00	8.72E-02	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



Metal Technology Ltd is one of the UK and Ireland's leading architectural aluminium systems companies. Specialising in the innovative design and distribution of purpose designed fenestration systems, Metal Technology offers fabricators, developers and architects glazing solutions for modern window, door and curtain walling construction.

Since its inception in 1985, Metal Technology is now one of the UK and Ireland's leading designers and suppliers of bespoke architectural aluminium window, door and curtain wall systems. Annual installations now exceed £100 million and the company operates daily dispatches to the UK and Ireland from its three acre manufacturing and distribution headquarters.

The company has ISO 9001 quality management, ISO 14001 environmental management, and ISO 45001 occupational health and safety management certification. Metal Technology is an approved CWCT training centre, and is accredited with BES 6001 certification for responsible sourcing.

The company's success has been built upon a core focus and investment in support, product development and reducing our environmental impact.

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