

Lower-Carbon Aluminium for Australian Manufacturers

A Cleaner, Greener, more Sustainable choice for your project

Background

To meet the 1.5°C global warming target outlined in the Paris Agreement, science tells us that global carbon emissions should reach net-zero around mid-century. Proactive governments, industries, and organisations are actively seeking pathways to reduce carbon emissions.

Aluminium is a critical enabler in a carbon-constrained future, with properties of strength, ductility and lightweight, which will support the development of innovative technologies and solutions in various industry sectors, including transport, marine, renewable energy, electrical and construction.

This white paper outlines the importance of lower-carbon aluminium for Australian manufacturers. It provides global benchmarks for traditional and lower-carbon aluminium. It highlights the business case and pathway for selecting lower-carbon aluminium today as part of a solution to protect our collective future.

Primary Aluminium Production

Primary aluminium is made from bauxite, refined to make alumina before being smelted to make aluminium.

Alumina refineries process bauxite ore to produce alumina, which is used to extract the aluminium metal.

It takes 4-6 kilograms of bauxite (depending on the grade) to make ~2 kilograms of alumina, which then makes 1 kilogram of aluminium.

Aluminium smelters use an electrolytic process to extract aluminium metal from alumina.

Key Facts

- Australia has the second largest bauxite reserves in the world and is currently the world's largest producer (101 Mt in 2021).
- Australia is the world's second-largest alumina producer (21.0 Mt in 2021).
- Australia is currently the sixth largest producer of primary aluminium (1.56 Mt in 2021).
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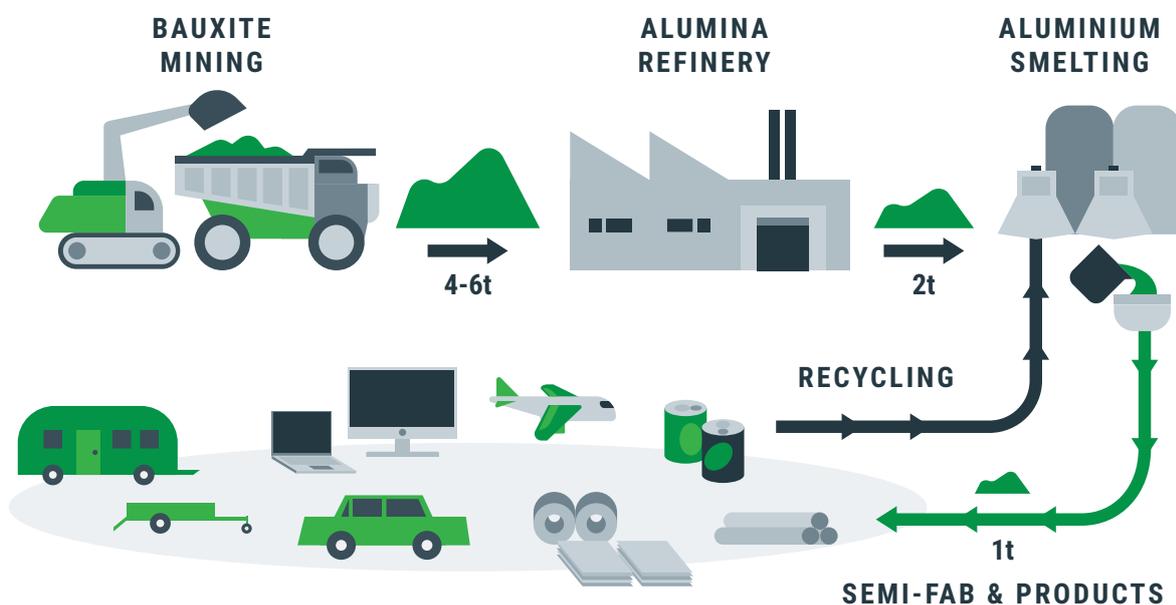


Fig 1: Illustrating the flow of material in Aluminium production and recycling, from raw material to finished goods

Aluminium can be formed into various products by extruding, rolling or casting.

Construction, transport, marine and electronics are just some ways aluminium is used. Aluminium is lightweight and strong enabling use in the aviation, aerospace, shipping and rail industries.

Aluminium is durable and can be recycled many times, making it a popular choice for the renewable energy sector.

Aluminium Recycling

Aluminium remelt is the secondary recycling of aluminium, as opposed to the primary raw extraction of aluminium from bauxite. In aluminium remelt furnaces, aluminium is remelted and recycled into new products.

Whilst scrap aluminium has long been collected for recycling within Australia until recently, Australian aluminium smelters have had limited capacity for safe and successful remelting. More than 95% of Australia's scrap aluminium is exported for recycling. The primary buyers are in South Korea and Indonesia. Other leading markets include European countries and India. In 2020 Australian exporters reported 119,075 tonnes of aluminium were sent overseas, an increase of 25.13% from the previous year.¹

Aluminium can be recycled again and again, almost infinitely, making it an excellent material choice for use in a circular economy.

Recycling aluminium requires up to 95% less energy than production from ore, avoiding emissions including greenhouse gases.²

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Carbon emissions of Primary Aluminium

There are large variations in the carbon emissions generated by smelters during the production of primary aluminium. Primary aluminium can range from under 4kg CO₂e/kg Al to over 20kg CO₂e/kg Al largely dependent upon the energy sources used³, these figures are based on Scope 1 and Scope 2 emission ex smelter.

Bauxite mining represents a small portion of the carbon footprint, but alumina refining can have a footprint between 0.4-0.6 kg CO₂e/kg alumina. The global average is 1.2 kg CO₂e/kg alumina.

For consistency, the Aluminium Stewardship Initiative recommends approximately 2.6kg CO₂e/kg Al should be added to all smelters for a full mine to metal number (inclusive of scope 3 emissions).

Capral Aluminium, Australia's largest extruder of aluminium products estimates the carbon emissions associated with the aluminium extrusion process to be approximately 0.47kg CO₂e/1kg Al extruded.

The main contribution to the carbon emissions of aluminium comes from the electrolysis process used in aluminium smelting. Around 60% of the aluminium sector's GHG emissions are from the production of electricity consumed during the aluminium smelting process.

Within Australia, the four Australian Aluminium Smelters consume approximately 10% of the national energy grid. In simple terms, because the strength of the chemical bond between aluminium and oxygen is extreme, significant energy is required to split that bond and form the metal.

The major sources of non-electricity-related emissions in the aluminium sector are fuel combustion in alumina refineries and smelter anode consumption.⁴

It is estimated that the current global average carbon emission for primary aluminium is approximately 16.8 kg CO₂e/kg Al.⁵

The Aluminium Stewardship Initiative states that "Total aluminium sector GHG emissions are currently 1.1 billion tonnes of carbon dioxide equivalent (Gt CO₂e). This is 2% of all human-made emissions."

By 2050, the aluminium sector must drop its GHG emissions from over a billion tonnes of CO₂e to around 50 million tonnes under a 1.5-degree scenario. This is less than one-twentieth of current emissions.⁶

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- It is estimated that current global average carbon emissions for primary aluminium is approximately 16.8 kg CO₂e/kg Al.⁷

Lower Carbon Aluminium

Lower-carbon aluminium has become a recognised term within the aluminium industry. It is used to describe primary aluminium with carbon emissions of 8kg CO₂e/kg Al or lower (ex smelter scope 1 and 2) and secondary aluminium produced with large amounts of end-of-life scrap.

Aluminium is increasingly available with carbon emissions significantly lower than the global average (16.8kg CO₂e/kg Al).

Lower-carbon aluminium has the same technical properties as primary aluminium produced using traditional energy sources; it simply has lower embodied emissions.

Lower-carbon aluminium is already accessible to Australian manufacturers. In 2022, 22% of the primary aluminium billet Australia's largest Aluminium extruder Capral Aluminium procures for use in its eight local extrusion presses has carbon emissions of less than 8kg CO₂e/1kgAl with approximately 300t having a certified carbon content of less than 4kg CO₂e/1kg Al (Based on scope 1 and scope 2 emissions ex smelter).



Fig 2: Lower-carbon Aluminium options available on the Australian Market v Global averages

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- Lower-carbon aluminium is already accessible to Australian manufacturers.
- In 2022, 22% of the primary aluminium billet Capral Aluminium procures will have carbon emissions of less than 8kg CO₂e/1kgAl with approximately 300t having a certified carbon content of less than 4kg CO₂e/1kg Al.

The Aluminium Stewardship Initiative

The Aluminium Stewardship Initiative (ASI) is a global non-profit organisation that brings together producers, users and stakeholders in the aluminium value chain. ASI members are committed to the sustainable production and use of aluminium within society.

ASI and its members strive to foster responsible production, sourcing and stewardship of aluminium collaboratively.

ASI Certified aluminium is metal that has been produced and sourced – from its mined or recycled source and through each step in the value chain – following ASI's Standards. The aluminium value chain includes upstream production, such as aluminium smelting, through downstream use sectors such as construction, transport, marine and engineering.

Each of the companies in the value chain for ASI Aluminium have been independently certified against both the ASI Performance Standard and the ASI Chain of Custody Standard.

This provides Australian manufacturers and consumers with complete transparency regarding the source of their primary aluminium enabling informed decisions about aluminium procurement at each stage in the buying process.

By using ASI certified aluminium, manufacturers and end users can demonstrate their commitment to a sustainable supply chain and be assured of the responsible production, sourcing and stewardship of aluminium.



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The Business Case for Lower-Carbon Aluminium

As awareness of climate change and the necessity of climate action grows amongst our population, decarbonisation and sustainability can bring forward-thinking businesses unique opportunities.

Making an active choice to procure lower-carbon aluminium for your projects is not just an ethically sound decision but one which can positively impact business success and financial performance.

An abundance of research and literature demonstrates that this trend is now well established and will impact all businesses over the long term, delivering opportunities for businesses to grow further and enhance existing revenue lines with proven sustainability credentials.

Today's talent market is more competitive than ever, and climate change and sustainability have become key decision factors for graduates and experienced hires. If businesses are to be successful in the future, attracting, motivating and retaining top talent is critical. Incorporating sustainability practices into the business strategy will help in this regard.

Making a responsible choice to procure lower-carbon aluminium for your project is a great story to share with the market.

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Sourcing Lower-Carbon Aluminium

Using responsibly sourced lower-carbon aluminium for your next project is the right choice for the environment and will boost your sustainability credentials. Here are some simple steps you can take to ensure the responsible procurement of lower-carbon aluminium for your next project.

- Educate yourself and your customers about the lower-carbon aluminium options available for your products.
- Ask your supply chain questions to demonstrate their commitment to sourcing lower-carbon aluminium products.
- Partner with suppliers committed to providing you with responsibly sourced, lower-carbon aluminium.
- Consider the climate change commitments of your aluminium supplier, and ask to see targets and decarbonisation pathways.
- Specify Aluminium from manufacturers who are certified to a credible stewardship scheme e.g. Aluminium Stewardship Initiative.
- Support manufacturers who are participating in emissions reduction and research and development activities.

Capral is committed to supplying low carbon aluminium

Capral Aluminium is Australia's largest extruder and distributor of Aluminium products. In early 2022 Capral set several ambitious sustainability targets, including a commitment to achieve net zero emissions by 2022. One significant change the business has made during 2022 is to actively procure primary aluminium billet for extrusion with lower carbon emissions.

The global average carbon emission for a Kilogram of aluminium is 16.8kg CO₂e/kgAl. Given our reliance on coal-fired power generation in Australia, locally produced aluminium would typically boast emissions intensity in this range.

Yet, aluminium with a lower carbon footprint is increasingly available, and Capral has committed to being ready to meet local market demands for lower-carbon aluminium in Australia.

In 2022, 22% of the primary aluminium billet Capral procures for use in its eight local extrusion presses has carbon emissions of less than 8kg CO₂e/1kg Al with approximately 300t having a certified carbon content of less than 4kg CO₂e/1kg Al.

Industry sectors like construction, renewable energy, transport and marine are looking for lower carbon options for their products to meet customer expectations. Capral is ready to support these sectors with access to aluminium, almost 75% lower in emissions intensity than they can currently source locally.

All of this is excellent news for Australian businesses using extruded aluminium in their products, who can now consciously choose to use lower carbon aluminium, literally cutting the carbon footprint of the aluminium in their products in half. A cleaner, greener choice all around.

1 Australian Aluminium Council - Australian Recycling Market 2021

2 International Aluminium Institute Recycling-Factsheet

3 CO₂e emissions stated are ex smelter based on Scope1 and Scope 2 emissions

4 Australian Aluminium Council: Factsheet #1 Australia's Role in a Global Aluminium Decarbonisation Pathway

5 Addressing the problem of Greenwashing in the Aluminium Industry, Light Metal Age, August 2022

6 Aluminium Stewardship Initiative: Issue Brief Low Carbon Aluminium [<https://aluminium-stewardship.org/>]

7 Addressing the problem of Greenwashing in the Aluminium Industry, Light Metal Age, August 2022