

Low Emissions Aluminium

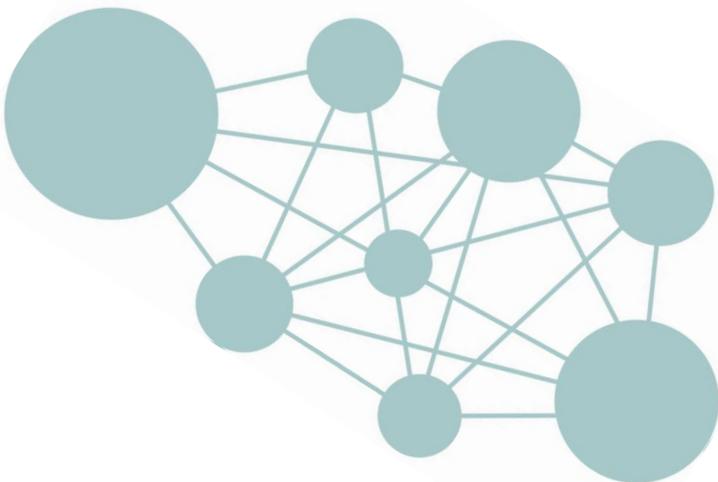
The challenges and opportunities for
advancing Australia's low carbon future





Aluminium Working Group

**Connecting the
dots in a complex
ecosystem to
help drive
change**



Materials & Embodied Carbon Leaders' Alliance (MECLA) was established in 2021 and brings together leaders across industry and government supply chains to drive the reduction of embodied carbon in the building and construction industry.

There is growing recognition of the importance of embodied carbon in buildings. Making up 11% of the world's Greenhouse Gas emissions, this contribution is only expected to increase as the global building stock doubles in size by 2050. Tackling these emissions will be difficult as the biggest contributors (concrete, steel, and aluminium) are traditionally "hard to abate" sectors.

There are many barriers to the uptake of low and zero carbon materials for building and construction. MECLA members recognise the growing demand for carbon friendly materials worldwide. Founding Partners of MECLA have been exploring how we can collaborate and address these significant barriers. Working Groups have been established to address these barriers.

Our Aluminium Working Group has focussed on understanding the technical, funding, standards and capacity challenges facing the industry in manufacturing low carbon and recycled aluminium.

The group is pursuing Australia's first low carbon and recycled aluminium commercial facade at large and small scale to send a market demand signal. The market is shifting quickly and we are hopeful and confident we can achieve this.

This document seeks to raise awareness of the issues and the opportunities for a low emissions aluminium future in Australia's development and construction industry.



**1st Bauxite
Production**



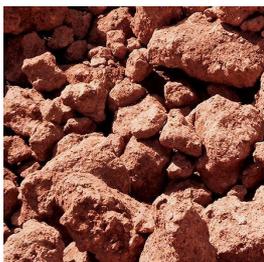
**1st Alumina
Exporter**



**2nd Alumina
Producer**

Aluminium in Australia

Australia is the world's largest bauxite producer, largest alumina exporter, and second largest alumina producer... yet Australia is the 6th largest aluminium producer.



4-5 tonnes of mined Bauxite Ore produces...



2 tonnes of refined Alumina that produces...



1 tonne of virgin aluminium from smelting.

Currently, much of the aluminium value chain in Australia is exported as bauxite or alumina only to later be re-imported as aluminium products for our buildings.

Approximately 85% of our locally produced alumina is exported, leaving only 15% smelted locally into aluminium.

Of this remaining 15% of alumina smelted at one of Australia's four aluminium smelters, more than 90% of the 1.6Mt of aluminium produced per year is exported! Interestingly, Australia imports nearly as much aluminium as it exports.¹

When considered with the fact that we currently export over 95% of our recovered scrap aluminium for recycling overseas, there are clear opportunities to be realised in the Australian aluminium value chain.

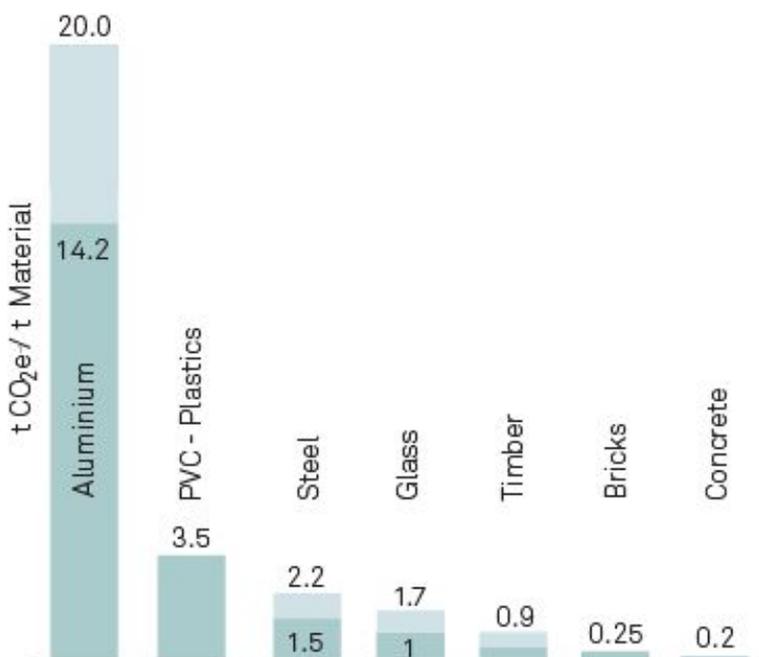
There is a tremendous opportunity to retain and grow across the aluminium value chain - making Australia a world leading in low carbon aluminium production.

1. Australia currently exports approximately 1.45Mt per annum. According to the United Nations COMTRADE database, Australia imported 1.28Mt of aluminium in 2021.

Why Aluminium?

Of the three primary materials that contribute to nearly 70% of a building's embodied carbon, aluminium is the most emissions intensive per tonne by far, contributing approximately 14.2 - 20t CO₂-e/t Aluminium.²

Compared to Australian averages of 0.2 t CO₂-e per tonne of concrete, and 2.2 t CO₂-e per tonne of steel³, it is clear why we must prioritise a low carbon future for this essential construction material.



Figures compiled from the Australian Aluminium Council Factsheets and the Clean Energy Finance Corporation's publication, *Australian buildings and infrastructure: Opportunities for cutting embodied carbon.*³

Why is aluminium so carbon intensive?

The energy required to produce aluminium is immense. Approximately 85% of the emissions associated with the production of aluminium arise from the predominantly coal-based power supply that currently operates our smelters.

In addition to the majority of indirect emissions from the electricity supply, the direct emissions from carbon anode consumption, fuel combustion, and the raw material supply represent the majority of direct process emissions.

The four Australian aluminium smelters consume nearly 10% of the national electricity grid capacity alone.⁴

Why is aluminium important for building and construction?

The majority of emissions for a building facade reside in the primary aluminium used in its extrusions, panels and shading devices. This aluminium often does not fall in the direct supply chain for contractors or developers. Layers of subcontractors and frequent international procurement create a disconnection between the raw materials and the facade modules eventually installed on our buildings. To help solve this, deeper engagement with our supply chains is needed to ultimately influence processes further upstream.

What are the challenges to an Australian low emissions aluminium?

The single biggest challenge, and simultaneous opportunity to decarbonise the Australian vertically integrated aluminium industry is through the decarbonisation of their electricity supply.

Decarbonising industries that require intense levels of industrial heat is not as straightforward as others. The high temperatures, constant heat flux, and very high capacity factors mean that traditional renewables such as wind and solar alone are currently not well suited to these applications. However, the energy landscape is evolving rapidly, and a more distributed system, with a wider variety of supplies – such as wind, solar and storage – is far more resilient to disruption and will continue to decarbonise our grid and help deliver lower emissions aluminium.

The Australian Renewable Energy Agency (ARENA) has a new Investment Plan that offers a vision where renewable electricity is integrated into our aluminium supply chains. Given that Australia is a major player in the aluminium supply chain, we have the potential to become a world leader in low carbon aluminium production.

A lack of industry awareness leading to a corresponding lack of demand

Compared to other carbon intensive construction materials, the opportunities for a low emissions alternative are far less understood by the development and construction industries.

As the largest contributors, concrete and steel have held the initial focus for the low embodied carbon material movement. “Green Building” rating tools include specific credits for these materials.

International industry bodies have released decarbonisation roadmaps and commitments, and there are a growing number of Environmental Product Declarations (EPD’s) giving greater transparency to those industries. Without building awareness of the issues and opportunities around aluminium, local demand for low emissions aluminium will continue to lag.

Low domestic manufacturing capability and complex international supply chains

The growth of overseas competition has led to a steadily declining domestic manufacturing base of aluminium building components and commercial facades. While small to midsize projects are still mostly procured locally, the majority of large scale, commercial building facades are imported from southeast Asia or China, largely driven by lower costs. *But what is the carbon and social cost?*

Our current procurement models must change from strategies that often only prioritise cost and delivery risk over other considerations such as embodied carbon and material provenance factors.

In Australia, there aren’t many procurement pathways currently for low embodied carbon aluminium. Understanding and evolving our overseas procurement strategies to consider carbon is incredibly complex, *but it can be done.*

Finally, investment is needed to increase our domestic capacity and capability to produce low emissions aluminium - both primary and recycled - and to grow our domestic manufacturing base of aluminium building products and facades.

Do you know where your aluminium comes from?

As a society, we often don't understand our supply chains, how things are made, where they come from or the impact they have on our environment and people.

As previously highlighted, aluminium in the built environment, particularly in Australia, often has a complex, international and disconnected supply chain making it difficult to know the full impact of our developments.

As a result of continued overseas procurement, Australia's domestic fabrication capabilities have been steadily declining in recent decades, highlighted by the closure of Australia's last rolling mill in 2014 and the fact that only one major facade fabricator operates domestically.

Digging deeper on modern slavery and material provenance

Part of this conversation is not just about the carbon emissions of the aluminium, but also about understanding the broader environmental and social impacts of the materials that form our buildings and cities.

Modern slavery due diligence is increasingly embedded in procurement and supplier agreements. Businesses and institutions will begin to lose their competitive edge if they fail to demonstrate how they have identified and mitigated modern slavery risks in their operations and supply chains.

There is a tremendous opportunity for the Australian aluminium industry to align with government-backed policies and deliver co-benefits supporting our modern manufacturing initiatives, the transition to renewables while increasing jobs potential.

Specify ASI Certified Aluminium on your next project!

The ASI (Aluminium Stewardship Initiative) works together with producers, users and stakeholders in the aluminium value chain to collaboratively foster responsible production, sourcing and stewardship of aluminium.

Australia is the largest global producer of bauxite and the second largest exporter of alumina. Australian bauxite mining is regarded as having some of the highest sustainability standards in the world, particularly for rehabilitation and for explicitly prohibiting modern slavery.

ASI has developed an independent third-party certification program to ensure sustainability and human rights principles are increasingly embedded in aluminium production, use and recycling. ASI's Performance Standard and Chain of Custody Standard are designed to link responsible production with responsible sourcing, and thus support increased emphasis on sustainability in procurement practices.



Infinitely recyclable...the perfect material for the circular economy.

Capral Aluminium and Tomago Aluminium have recently agreed for Capral to supply nearly 550 tonnes of production scrap annually to Tomago for remelting. This agreement is the first of its kind in Australia, and will open access to locally produced, low carbon aluminium for Australian manufacturers.⁵

This announcement is greatly welcomed given that Australia currently exports approximately 95% of its aluminium scrap. The agreement should also help pave the way for others to see the value of processing our scrap metal resource onshore for distribution to local fabricators.

When considered in the context of our rapidly decarbonising national energy grids, Australia has the potential to become a leader in low carbon recycled aluminium. Creating greater demand for recycled aluminium products in our built environment will help accelerate this change.

Recycled aluminium requires only 5% of the energy needed to make virgin aluminium.

It is estimated that 75% of all aluminium ever produced is still in use...waiting for recovery, recycling and reuse in the circular economy model.

Globally, aluminium enjoys a high collection rate of around 85% from buildings at end of life. As an industry, we need to advocate and lead for a future where all aluminium used in our buildings is collected for recycling at the end of its use.

Today around 13 million tonnes of aluminium a year are used in construction, while it is estimated that globally some 220 million tonnes of aluminium are currently in use in buildings.⁶

Certified recycled aluminium alloys offer the same quality and technical performance characteristics as their virgin counterparts.

There are a number of misconceptions in the market today around the quality and suitability of recycled aluminium. However a recycled aluminium with a specific alloy composition is as good as the same primary aluminium alloy for anodizing and other surface finishes.⁷

A particular challenge facing post-consumer scrap is understanding the other metals that are often alloyed with the aluminium - which requires alloys to be sorted and processed prior to remelt. There is potential for improved chain of custody processes that will facilitate the recycling of alloyed aluminium.

Low carbon aluminium already exists! ...and is coming to Australia.

Through the use of renewable energy sources like hydro power, aluminium's footprint can be reduced on average to approximately 6-4.0 kg CO₂e per kg aluminum - a fourth of the global average. Globally, there are many producers supplying low carbon aluminium from hydroelectricity. This can be pushed even lower using recycled post consumer scrap content. Products with 75% post consumer recycled scrap can have emissions of 2.3 kg CO₂e per kg aluminum...or lower.

One of the world's largest aluminium producers, Hydro Norsk, have acquired the facade manufacturer Wicona as a subsidiary company, to create a clear and simple supply chain for projects looking to provide a low carbon solution for their facades. Over 100 projects worldwide have used Wicona facades with Hydro's leading recycled aluminium product, CIRCAL. There are many other suppliers of low carbon aluminium around the world including Rio Tinto, Alcoa, Emax, EGA and Alvanco to name a few.

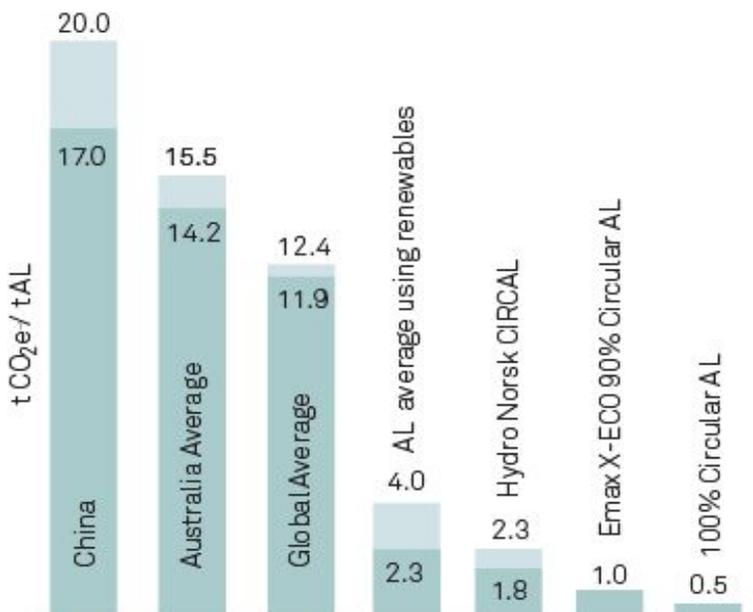


Table of Aluminium Carbon Intensities compiled from multiple sources.⁸

The announcement that Australia's largest smelter at Tomago will aim to operate fully on renewables by 2029 is greatly welcomed and signals a shift in our rapidly evolving pathway to decarbonisation.

Additionally, the government's focus on the development of Renewable Hydrogen Industrial Hubs in industrial precincts around Australia will stimulate existing industrial capabilities and workforces in relevant regions including local manufacturing jobs associated with low-carbon products such as aluminium. Australia's hubs program will build our potential to supply domestic users and international trading partners with low-cost clean energy, and will help to capitalise on global interest in investing in Australian hydrogen opportunities. The NSW Hunter Region and the Tomago Aluminium Smelter are well placed to drive supply of low emissions aluminium.

Ask you contractors and suppliers if they supply any of their products using low carbon aluminium. If not, can they?

CO₂ emissions intensity of aluminium sourced from China is estimated at greater than 17t CO₂-e / t Al compared to less than 4t CO₂-e / t Al for low emissions alternatives.⁸

Sending a clear and strong demand signal

The power of demonstration projects

In a risk averse industry, it's always challenging to be one of the first movers. However demonstration projects are needed to demonstrate to the industry that it is possible to procure low embodied carbon aluminium in the Australian market. These exercises provide huge lessons learnt for designers, developers, and our local and international supply chains.

They also highlight the opportunity to the market that this is a conversation that is only going to grow, and that there is opportunity for those who are able to provide the solutions that are needed. Demonstration projects will not only promote awareness, but drive momentum in the market and encourage others to take this journey.

If you are interested in having your company be a part of a demonstration project please contact MECLA at info@mecla.org.au.

What can we do?

Particularly in the case of aluminium, as an industry we need to be talking much more about the issues and the opportunities. On your next project:

- Start by educating yourself and your clients about the options available and the tradeoffs to achieve certain goals and outcomes.
- Ask questions of your supply chain to demonstrate that there is interest in sourcing low carbon aluminium products.
- Partner up with others who are also interested.
- Consider climate change commitments of the aluminium provider and ask to see targets and decarbonisation pathways.
- Support manufacturers who are transparent e.g. have a product-specific Environmental Product Declaration (EPD)
- 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
- Consider product offsetting as part of a broader program of decarbonisation e.g. products with Climate Active certification.

Citations

1. Australia Imports of Aluminium - 2022 Data 2023 Forecast; <https://tradingeconomics.com/australia/imports/aluminum>
2. Figures for t CO₂-e/t Aluminium were compiled from the following sources:
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14.2 t CO₂-e / t Al - Australian Aluminium Council, [Factsheet #3 Australia Will Help Develop Low Carbon Alumina Refining Technologies For The World](#), and Australian Aluminium Council, [Factsheet #4 Australian Aluminium Smelting Provides Baseload Stability in a Decarbonising Grid](#)
3. Clean Energy Finance Corporation, [Australian buildings and infrastructure: Opportunities for cutting embodied carbon](#)
4. Australian Aluminium Council, [Factsheet #4 Australian Aluminium Smelting Provides Baseload Stability in a Decarbonising Grid](#);
5. Capral Aluminium; [Press Release](#)
6. The International Aluminium Institute; [Aluminium Recycling – Quality & Value](#)
7. Anodizing World; [The Good and the Bad About Recycled Aluminium](#)
8. The table of Aluminium carbon intensity ranges was compiled from multiple sources;
China Average: [As aluminium surges in China, so do carbon emissions](#), and [China's Aluminum Output Hit a Record High in 2020](#)
Australia Average - Australian Aluminium Council, [Factsheet #3 Australia Will Help Develop Low Carbon Alumina Refining Technologies For The World](#), Australian Aluminium Council, [Factsheet #4 Australian Aluminium Smelting Provides Baseload Stability in a Decarbonising Grid](#); and [Carbon Trust - International Carbon Flows](#)
Global Average - [Rio Tinto Climate Change Report 2020](#); [Carbon Trust - International Carbon Flows](#)
Global average using hydroelectricity - [Hydro Reduxa 4.0](#), [Rio Tinto RenewAL](#), [Rio Tinto Atlantic Hydro CIRCAL \(75% recycled content\)](#) - [Hydro Circal 755 - EPD Norge](#)
E-Max Eco Billet (90% recycled content) - [E-MAX sustainable aluminium](#)
Circular Aluminium using renewables (100% recycled content) - [E-MAX sustainable aluminium](#)

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