

Productivity Commission
Opportunities in the circular economy
<https://www.pc.gov.au/inquiries/current/circular-economy/>
1 November 2024

Dear Commissioner

Opportunities in the circular economy

The Australian Aluminium Council (the Council) represents Australia's bauxite mining, alumina refining, aluminium smelting and downstream processing industries. The aluminium industry has been operating in Australia since 1955, and over the decades has been a significant contributor to the nation's economy. Department of Industry, Science and Resources has recently forecast¹ that earnings for Australian exports of aluminium, alumina and bauxite are expected to rise from \$16 billion in 2023–24 to \$18 billion in 2025–26. More than \$14B of this comes from the alumina and aluminium industries, as value adding mineral processing sectors. The industry includes six large bauxite mines plus several smaller mines which collectively produce over 100 Mt per annum making Australia one of the world's largest producers of bauxite. Australia is the world's largest exporter of alumina with five² alumina refineries producing around 20 Mt per annum of alumina. Australia is the seventh largest producer of aluminium, with four aluminium smelters and additional downstream processing industries including more than 20 extrusion presses and producers of metal powders and aluminium coatings. Aluminium is Australia's top manufacturing export. The industry directly employs 21,000 people and also indirectly supports a further 55,000 families predominantly in regional Australia³.

The Australian Government has asked the Productivity Commission (the PC) to undertake an inquiry into Australia's opportunities in the circular economy to improve materials productivity and efficiency in ways that benefit the economy and the environment. The Council welcomes the opportunity to provide feedback to the PC on its Discussion Paper Opportunities in the circular economy [the Paper]. The Council notes that this consultation is one of many processes being undertaken in parallel by the Government looking at opportunities in the circular economy.

Aluminium Industry Context

Aluminium is one of the commodities most widely used in the global transition to a clean energy future⁴. It is also recognised for its importance to both economic development and low emissions transition. Aluminium use is highly correlated with GDP, so as countries urbanise, per capita use of aluminium increases. It is expected that by 2050, global demand for aluminium will nearly double⁵. While an increasing proportion will be met through recycled aluminium, there will still be a need for increased production of primary aluminium requiring a comparable increase in global bauxite mining and alumina refining rates (Figure 1).

¹ <https://www.industry.gov.au/publications/resources-and-energy-quarterly-june-2024>

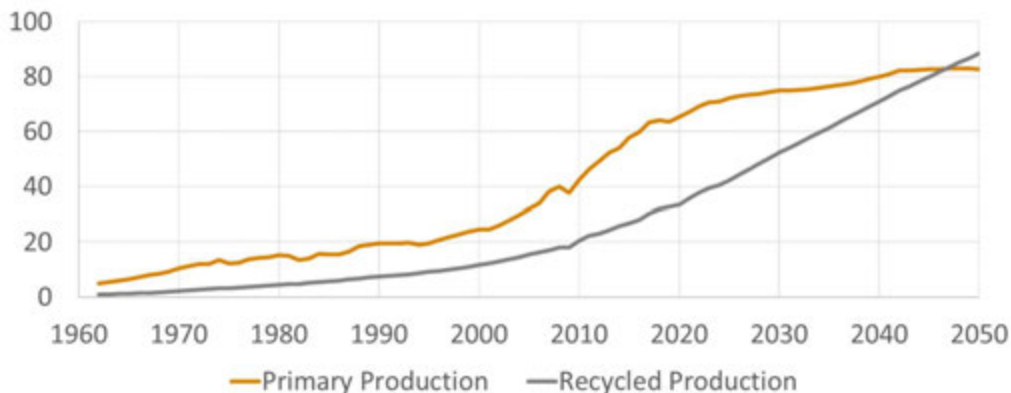
² Alcoa announced the curtailment of Kwinana in August 2024 - <https://news.alcoa.com/press-releases/press-release-details/2024/Alcoa-announces-curtailment-of-Kwinana-Alumina-Refinery-in-Western-Australia/default.aspx>

³ <https://aluminium.org.au/wp-content/uploads/2024/09/241003-AAC-Report-Economic-Contribution-of-the-Australian-Aluminium-Industry-FINAL.pdf>

⁴ <https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action>

⁵ International Aluminium Institute High Substitution Scenario

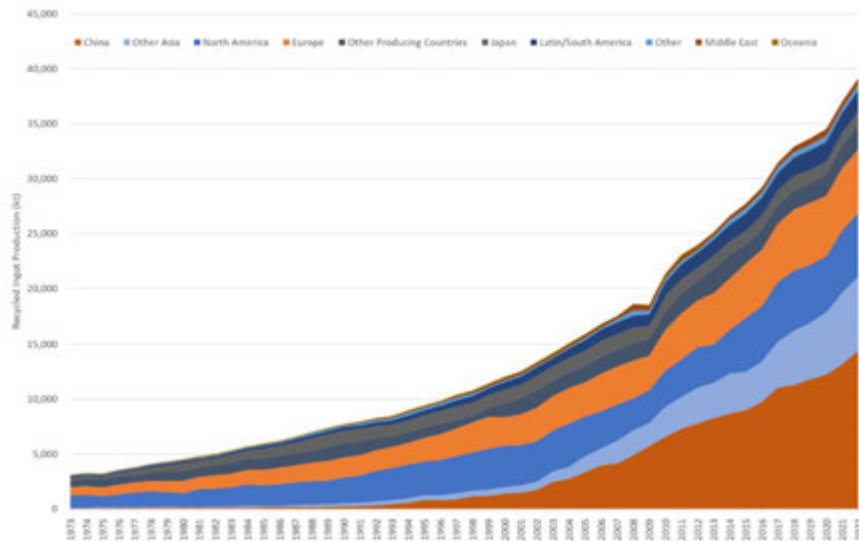
Figure 1. Aluminium Production Scenarios (Mt)⁶



Australia is the world’s second largest bauxite producer, producing around 100 Mt per annum or almost 25% of global production in 2023⁷. Of this, around 40 Mt is exported, with more than 98% going to China. The balance is refined to produce 21 Mt per annum of alumina (aluminium oxide) in Australia. Of this more than 85% is exported to a range of countries, with Australia being the world’s largest exporter. Australia produces around 1.5 Mt of aluminium per annum, of which more than 90% is exported. There is some downstream manufacturing of aluminium in extrusion presses (around 150 kt capacity), metal powders (~10kt) and aluminium coatings (~10kt).

Increasingly, in the future, recycled aluminium will also be a key international measure of production and China already produces almost 40% of global recycled ingots (Figure 2). Oceania, which includes Australia and New Zealand, produces <0.1%.

Figure 2. Global Recycled Ingot Production 1973-2022⁸



Aluminium Recyclability

Aluminium is infinitely recyclable making it an incredibly sustainable material. Around 75% of the almost 1.5 billion tonnes of aluminium ever produced is still in productive use today as it can be recycled endlessly. Aluminium’s life cycle provides significant benefits through recycling, saving 95% of the energy it would take to

⁶ International Aluminium Institute 2024 Production Scenario based on 2024 Aluclye Reference Scenario and Last historical year 2023, Primary Production - aluminium tapped from electrolytic cells, Recycled Production – Production from scrap ex alloying elements

⁷ <https://aluminium.org.au/wp-content/uploads/2024/04/2023-Trade-Competitiveness-Factsheet-.pdf>

⁸ Data supplied by International Aluminium Institute

make primary aluminium metal. Every year, more than 30 million tonnes of aluminium scrap is recycled globally, ensuring its status as one of the most recycled materials on the planet⁹. The global Recycling Efficiency Rate (RER) of aluminium is currently 76%¹⁰. The RER defines how efficiently aluminium is recycled throughout the value chain. It is an indicator used to estimate the amount of recycled aluminium produced annually from scrap, as a percentage of the total amount of available scrap sources. This rate includes collection, processing and melting losses, but internal scrap is not included. Today more than 70% of the material used in aluminium cans is recycled into new products – almost double that of glass (34%) and plastic (40%)¹¹, which makes the aluminium can the most recycled drinks container on the planet.

Recycled aluminium is part of the global decarbonisation pathway for the sector, but it cannot fully meet aluminium demand today nor in 2050. Aluminium applications can have long use lives in sectors such as transport and infrastructure and that metal is not available for recycling in the short term. For example, cars can have lifetimes of over 20 years, and buildings over 50 years.

There are also a range of global references such as the Global Recycling Standard (GRS), ISO and International Aluminium Institute which aim to ensure the tracking and verifying the content of recycled materials in products and that claims about recycled content are accurate and verified.

While recycled aluminium offers a lower emission pathway, as recycling aluminium uses only 5% of the energy, this does not recognise the potential limitations in this technology application in Australia due to the limited downstream manufacturing market. In many cases, recycled aluminium is provided directly to manufacturers such as the car industry, rolling mills etc. In the absence of these manufacturing industries, more work is required to quantify the true opportunity for Australia. Additionally, there is limited data available on the composition of the aluminium scrap which is exported as to its source, composition and location. Increased collection of this data at Australia's border would provide further insights in the scale of any potential opportunity for domestic recycling, aligned with Australia's manufacturing capabilities.

Global Collaboration

The Council, as part of the International Aluminium Institute (IAI), contributes to the global effort to increase aluminium recycling rates and improve sustainability as well as enhancing transparency for products using aluminium scrap. For more information visit the International Aluminium Institute¹². The Council, together with the IAI, is currently working on a range of aluminium recycling related projects including the public review of a Reference Document on Carbon Footprint Calculations of Aluminium Scrap,¹³ and in 2023 completed¹⁴ a study looking at aluminium can recycling across Australia, Asia and the Middle East which complements work undertaken in Brazil, China, Europe, Japan and the US in 2022¹⁵.

Australia's Remelting Capability

Despite having an integrated primary aluminium sector, the closure of Australia's car industry a decade ago was accompanied by a closure in the two aluminium rolling mills¹⁶ which also provided aluminium remelt capabilities, so Australia has lost this manufacturing capability. Recycling (melting) of aluminium scrap requires expertise in scrap handling, sorting and melting. Scrap types where there is a risk of moisture entrapment require particular safety barriers to be in place. Generally speaking, pre-consumer scrap can more easily be utilized in existing smelters. Currently, specialist metal recyclers currently collect and export both pre- and post-consumer scrap for recycling. However, within the existing industry, pre-consumer scrap may offer an efficient

⁹ https://international-aluminium.org/work_areas/recycling/

¹⁰ <https://international-aluminium.org/resource/aluminium-recycling-fact-sheet/>

¹¹ <https://international-aluminium.org/resource/aluminium-beverage-can-study/>

¹² <https://www.international-aluminium.org/>

¹³ <https://international-aluminium.org/resource/public-review-guidelines-on-transparency-aluminium-scrap/>

¹⁴ <https://aluminium.org.au/news/aluminium-cans-market-assessment-australia/>

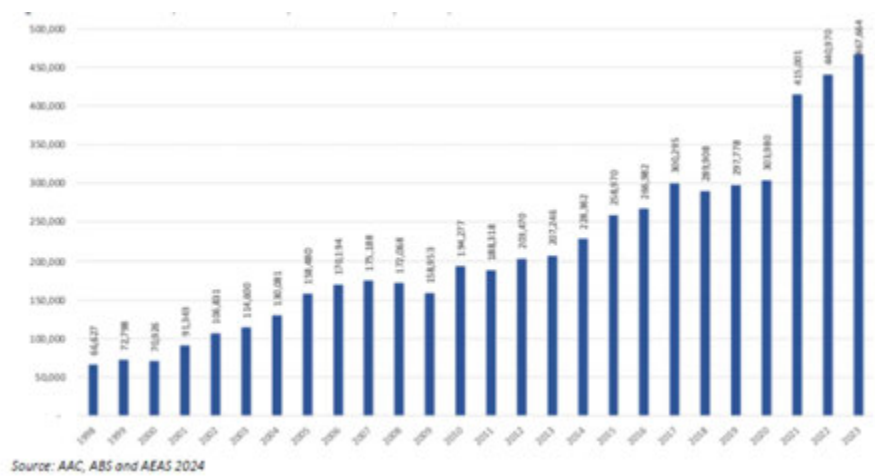
¹⁵ <https://international-aluminium.org/resource/aluminium-beverage-can-study/>

¹⁶ <https://news.alcoa.com/press-releases/press-release-details/2014/Alcoa-to-Close-Point-Henry-Aluminum-Smelter-and-Rolling-Mills-in-Australia/default.aspx>

feedstock for recycled billet product and an initial entry point into increased recycled content for Australian supply chains. The industry is exploring this further in 2024.

Australia imports almost 400kt aluminium product - including of 214 kt of sheet and plate, 89kt of aluminium extrusions, 70kt of alloyed primary aluminium and 25kt of foil. And Australia currently exports around 470kt of scrap aluminium a year¹⁷ which is increasing (Figure 3). It is believed that this includes around ~40-45kt of pre consumer extrusion scrap. This scrap is predominantly exported to India, China and other south east Asian destinations.

Figure 3. Annual Scrap Aluminium Export Volumes (tonnes)¹⁸



But much of the scrap being exported may also include the end of life of products imported into Australia (i.e. not manufactured domestically). There is currently limited visibility of this scrap (i.e. sources and alloys) and where its generated (i.e. states and regions), and forecast growth increases as products come out to the end of life to help give insights into the challenges which would be faced by Australia in developing domestic remelt capacity.

Opportunities for Australia

Work¹⁹ undertaken by the Council in 2022, in conjunction with Deloitte and Coreo, found that significant opportunities in manufacturing and recycling can be unlocked by cross-value chain coordination, including with Government and its agencies. There are clear opportunities for value-added manufacturing enabled by the existing integrated aluminium industry. This includes an opportunity for Australia to redevelop its recycling capability as part of an integrated circular industry policy²⁰. This new manufacturing capability would fit with Australia’s need to transition some regional economies, providing the potential for a new manufacturing base not linked to the location of a mineral deposit. This would cut across multiple commodities as well as a circular industry approach to the development of Australia’s emerging clean energy industries, where these could be established with circularity in their design. The work identified three flagship projects which the Council believes would present a different approach to industry policy, two of which are relevant to Australia’s future capability in a circular economy.

1. Increase recycling capacity - Global demand for recycled aluminium is growing rapidly, driven by emerging minimum content requirements from governments and corporate demand for low carbon products. A circular industry policy could lower cost and risk for domestic pre- and post-consumer scrap reprocessing.
2. A closed-loop mine-to-panel solar value chain - Aluminium is the second largest input by weight, and domestic extruders already have the capability to produce frame and rail for the sector. Solar panels, and other new renewable manufacturing should be designed with recyclability in their design.

¹⁷ <https://aluminium.org.au/australian-industry/australian-trade-statistics/> derived from ABS data.

¹⁸ AEAS Report for Australian Aluminium Council 2024

¹⁹ <https://aluminium.org.au/news/aac-deloitte-and-coreo-cast-anew-project/>

²⁰ https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Wastereduction

For example, in the context of the energy sector, aluminium accounts for more than 88% of the metal in a solar panel. The aluminium frame and rail are examples of extrusions which can be made using existing manufacturing capability in Australia. For every GW of solar PV, 5.5 kt of aluminium extrusion is needed for frames and for every GW of rooftop solar, an additional 13 kt of aluminium extrusion is needed for rails and mountings. Aluminium frame and rail can be reused or recycled if circularity is considered in design. Installed solar in Australia will need more than 1.5 M tonnes of aluminium extrusion by 2050, creating a substantial increase in demand for both aluminium and extrusions. But today more than 70% all semi-finished aluminium used in Australia is imported and <3% of Australian extrusion capacity is supplied as solar rail and none as solar frame. Leveraging opportunities for Australian aluminium to be used in the development of a solar PV industry could see Australian bauxite become Australian made solar panels, which could be designed for end-of-life circularity. In addition, the upstream aluminium industry has a growing demand for renewables, which could further catalyse demand for solar PV manufacturing.

Australia's transition towards a more a circular economy needs to be done in a way which is both commercially and environmentally sustainable, while creating jobs and opportunities. Within the existing industry, pre consumer scrap may offer an-efficient feedstock for recycled billet product (~40kt) may offer an initial entry point into increased recycled content for Australian supply chains. The industry is exploring this further in 2024.

Barriers to Circular Economy in Australia

Smelters indicated that due to their existing technology and process they are severely restricted in remelting recycled scrap. Further barriers to domestic recycling include:

- There is a geographical limit to the viability of scrap collection;
- Australia coastal bulk shipping costs and vessel availability are prohibitive;
- An increase in the percentage of floc (waste contamination) content of items to be shredded;
- Cost of removing and disposing of contamination;
- Lack of downstream manufacturing in Australia to use recycled content; and
- Price increases from government fees and regulation (most of which is made up of landfill levies) and the inability of local processors to recover these costs in the 'sell price'.

Conclusion

While aluminium is infinitely recyclable, there is currently very limited domestic capability to undertake this recycling as there are no dedicated aluminium remelt facilities producing recycled aluminium. Additionally, many aluminium consumer goods used in Australia are currently imported as Australia does not have a substantial downstream manufacturing capability. This makes closed loop recycling, where the alloying properties are maintained, more challenging. For example, there is not a rolling mill or foil mill which can use recycled content domestically.

Aluminium can be recycled again and again making it an incredibly sustainable material. While there are opportunities for Australia to potentially redevelop its recycling capability as part of an integrated circular industry policy, this must be done in a manner which is both commercially and environmentally sustainable. Supportive Government policy has a role to play in developing Australia's circular economy but this needs to be carefully staged to ensure there are no unintended consequences. The Council is happy to provide further information on any of the issues raised in this submission.

Kind regards,

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Australian Aluminium Council