



Australian Aluminium Council Economic Contribution of the Australian Aluminium Industry

20 September 2024

Table of Contents

Executive Summary	1
The Industry’s Contribution to the Australian Economy.....	2
Interdependencies	3
Import Competition.....	3
Policy and Regulatory Barriers	4
Observations for Policy and Regulatory Improvements	5
1. Introduction.....	6
1.1. Background.....	7
1.2. Scope of Works - Objectives.....	7
1.3. Approach	8
1.4. Structure of the Report	8
2. The Australian Aluminium Industry.....	9
2.1. Industry Structure and Size	9
2.2. Industry Value and Challenges	11
2.3. Classification of Aluminium on the Australian Minerals Lists	11
3. Economic Contribution Analysis.....	13
3.1. Modelling Approach.....	13
3.2. Economic Contribution Results	13
4. Interdependencies.....	18
4.1. Upstream and Downstream Linkages of Aluminium Manufacturing.....	18
4.2. Analysis of an Industry Shock	18
5. International Trade Challenges	21
5.1. Exposure to Dumping, Subsidies and Import Surges	21
5.2. Import Competition Analysis.....	22
5.3. Sovereign Capability	23
6. Implications of Industry Contribution	25
6.1. Regional Contributions	25
6.2. Workforce Implications	26
6.3. Indigenous Communities.....	27
7. Policy and Regulatory Barriers	28
7.1. The Industry’s Future Potential.....	28
7.2. Policy and Regulatory Barriers Affecting the Aluminium Industry.....	30

8. Observations for Policy and Regulatory Improvements.....	33
Appendix A – Methodology to Economic Contribution Analysis	35
Appendix B – Economic Contribution by State	38
Western Australia.....	38
Queensland	39
New South Wales	40
Victoria	41
Northern Territory.....	42
Tasmania	43
South Australia	44
Cross-border flows	45
Disclaimer	46

Executive Summary

The Australian Aluminium Industry (the Industry) has been a key contributor to Australia's heavy industrial and manufacturing sector since 1955. The Industry has an ongoing commitment to understanding and leveraging the benefits of aluminium for Australia. The Industry enhances Australia's innovation capacity through the advanced commercial and industrial applications of aluminium, which are also crucial for residential uses.

Aluminium is valued for its durability, strength, thermal resistance and malleability, as well as its relatively light weight compared to other metals. Additionally, aluminium is highly recyclable and can be repurposed for new commercial and low carbon uses.

Traditionally, aluminium has been used in various sectors, including construction (for cladding and structural applications), transportation (as structural material for cars and airplanes), electrical applications (such as towers and wiring) and residential uses (for window and door framing).

Aluminium is also finding new applications that support the global shift towards a low-carbon economy, with attributes that benefit green economy products. These applications include solar panels, transmission lines, batteries, and the production of relatively light weight electric vehicles. Australia is developing the production of aluminium derivatives, including high-purity alumina (HPA) which is used in LED screens, batteries, and semiconductors.

Australia is one of the few countries globally that possesses all four key elements of the aluminium supply chain: bauxite mining, alumina refining, aluminium smelting, and aluminium extrusion. Australia is one of the world's largest bauxite producers with mining occurring in Queensland, Western Australia and the Northern Territory. The bauxite is supplied to domestic and global markets.

Domestically, bauxite is refined into alumina at specialised facilities in Western Australia and Queensland that are tailored to the grade of associated bauxite mines. Alumina is then further refined into aluminium at four smelters: Tomago (NSW), Portland (Victoria), Boyne (Queensland) and Bell Bay (Tasmania). Finally, aluminium is manufactured into industrial and commercial products at extruding sites located across most Australian states.

The Industry has become a key contributor to both global and domestic aluminium applications. It plays a pivotal role in Australia's industrial landscape, supporting various downstream industries and contributing to Australia's economic resilience. Its ability to adapt to changing market conditions and technological innovations has helped maintain its competitive edge.

Australia is a major global player in aluminium production, ranking as one of the world's largest producers of bauxite – producing over 103 million tonnes annually, or approximately a quarter of global production. It is also the world's second largest producer of alumina, exporting around 86% of its production. The Industry's total export revenue exceeds \$15 billion annually, with more than \$13 billion coming from the alumina and aluminium sectors.

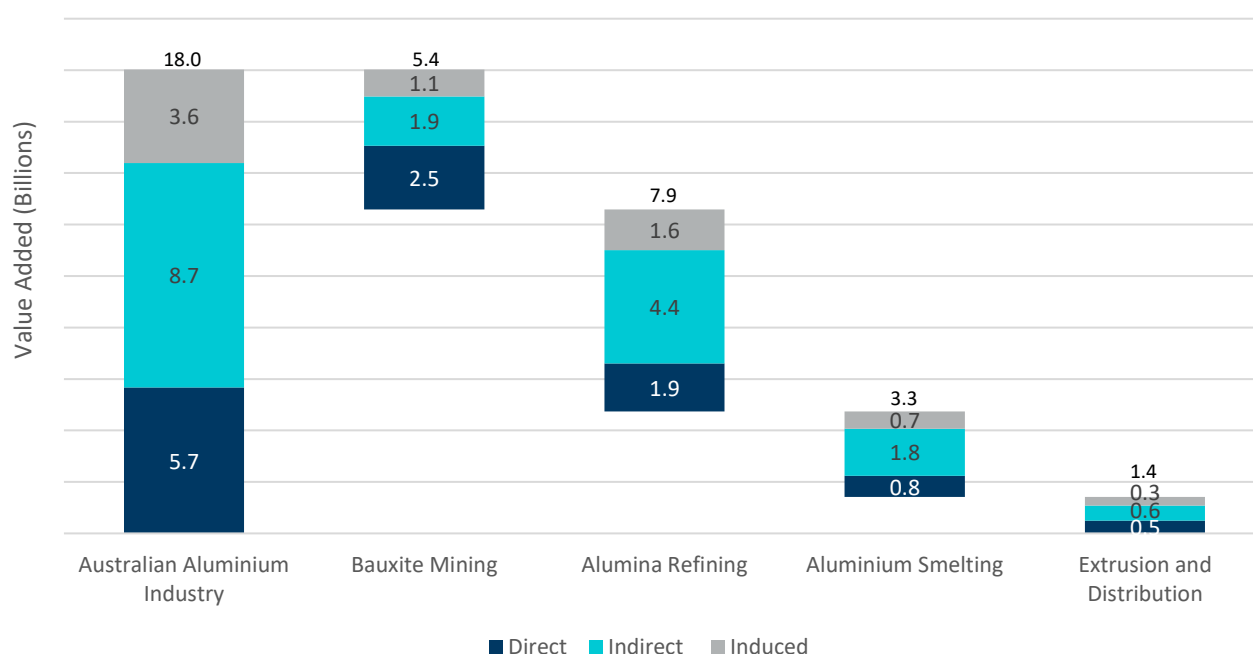
The Industry's Contribution to the Australian Economy

The analysis below estimates the economic contribution of the Industry based on its activity in the 2023 calendar year.¹ The Industry plays a significant role in the national economy through its direct, indirect and induced contributions, measured in terms of value added and employment.²

The Industry is a major employer, providing over 20,700 jobs for people directly with average earnings of \$134,000. The Industry average wage is \$50,000 or 60% higher than the national manufacturing average. In 2023, the Industry supported a total of 75,900 jobs when accounting for both supply chain and induced effects.

In 2023, the Industry is estimated to have contributed \$5.7 billion in direct value added and \$18.0 billion in total value added, which includes the indirect and induced contributions.

Figure 1: Aluminium Supply Chain Contribution – Value Added, 2023³



The bauxite sector has a comparable economic contribution to both the Australian nickel mining sector and the Australian gold mining sector. However, it is estimated that the Industry provides a significantly greater overall benefit to Australian communities due to its vertical integration with downstream processing and manufacturing sectors. The economic contribution from all sectors (bauxite mining, alumina refining, aluminium smelting, and extrusion sectors) is approximately 3.3 times greater than the contribution from bauxite extraction alone.

¹ The Kwinana alumina refinery has since entered a phased curtailment process, with alumina production ceasing in 1H 2024.

² Value added measures the level of activity (income) generated by the Industry's production factors (labour and capital). It represents the Industry's contribution to the economy and community welfare, with the total value added across all sectors equating to gross domestic product (GDP).

³ Due to rounding the sum of sector contributions may not appear equal to the total of each sector or the Industry.

A high concentration of the value added and employment generated by the Industry occurs in Queensland and Western Australia. Of the estimated \$18 billion in value added, \$4.2 billion and \$5.8 billion is generated in those states respectively. Downstream sectors of the Industry are also located in Victoria, New South Wales and Tasmania. These sectors have higher levels of employment and value added per tonne of production.

Industry expenditure can extend across state borders, creating additional economic benefits for other states. Under the modelling framework used in this analysis, these cross-border flows are not attributable to any single state. The total value of these flows were estimated at \$5.4 billion in 2023, representing additional business and household activities beyond the individual state's direct contributions.

Interdependencies

The Industry in Australia is best defined as a value chain that begins with bauxite mining and continues through the refining of bauxite into alumina, aluminium, and aluminium products for both export and domestic use. There are significant levels of trade between each sector, which provides a stable source of demand to support the industry sectors. For example, alumina refineries in Australia purchase \$3.0 billion worth of bauxite, representing almost 65 percent of the bauxite produced in Australia.

Additionally, the high silica content in south-west Western Australian bauxite requires specialised equipment within Australian alumina refineries, making these facilities unique globally. Consequently, these two sectors in Western Australia are closely linked, and thus any disruption to bauxite mining or alumina refining in this region affects the other.

Analysis shows that a one-third fall in bauxite production in Western Australia would likely lead to a 15% decrease in the Industry's national value added and a 14% reduction in employment. The impact on the Industry as a whole is significantly greater than the impact on the bauxite sector alone. For example, the total reduction in industry-wide employment (direct, indirect and induced) is 17 times higher than the reduction in employment within the bauxite sector alone (direct). This highlights the high level of interdependence between the different sectors within the Industry.

Table 1: Interdependency Scenario – Industry Contribution

	Base Case	Scenario	Reduction	Reduction Bauxite	Reduction Industry-Wide
Revenue (\$ million)	21,700	18,700	16%	800	3,000
Value added (\$ million)	18,000	15,300	15%	420	2,700
Employment (FTE)	75,900	65,300	14%	620	10,600

Import Competition

The Industry operates in a highly competitive international market. While Australia is a significant player in export markets, established and emerging producers may impact domestic operations. The extrusion sector faces import competition from various countries, including China, Malaysia and Vietnam.

During our consultation sessions, Industry Members expressed significant concerns about the detrimental market effects of dumping and subsidised aluminium products entering the country. They are actively engaged in monitoring these import practices. Members emphasised the need for a strong and robust

international trade remedies system in Australia. Similar international markets, including the US, UK, Europe and Canada, use anti-dumping tariffs to ensure domestic manufacturers are not exposed to unfair international trading practices.

In recent years, the extrusion sector has successfully petitioned for trade remedies from the Australian Anti-dumping Commission for unfair international trade practices. Industry has emphasised that there remains a strong case for the continued application of trade remedies under the Customs Act 1901 to maintain a level playing field in the long-term interests of domestic consumers and producers.

Currently, Australian producers supply approximately two-thirds of the Australian market for extruded aluminium products, which come in various extruded sizes. Australian producers hold a dominant 80% market share in mid-sized (7-12 inch die cast) domestically consumed aluminium extrusion products.

If importers increase their share of the domestic aluminium extrusion and distribution market, it could lead to a decline in domestic value added and employment in the sector. For example, our analysis of a 25% increase in imports of mid-sized aluminium extrusion products suggests that, if the displaced Australian products cannot be redirected to alternative markets, the aluminium extrusion sector's domestic value added could decrease by \$349 million and result in the loss of 1,941 full time equivalent (FTE) workers.

Policy and Regulatory Barriers

As outlined above, the Industry currently provides the Australian community with significant economic contributions. Where the sector attracts investment, it has opportunities for continued and sustained growth. However, Industry Members have stated that key risks must be addressed to maintain the current level of operations and generate future growth. High interdependencies within the Industry mean that risks in one sector can ripple through the supply chain.

In consultations with Industry Members, several key themes were emphasised that represent policy and regulatory barriers. The policy and regulatory barriers were stated by Industry Members as an impediment to future investment, as the reduced certainty of project outcomes can lead to lower levels of capital investment or increased costs. Given the capital-intensive nature of production, the Industry may struggle to maintain current production levels and economic contributions without new capital investment.

A significant risk outlined by Industry Members is the current Federal and various State planning and environmental approvals processes. As governments amend and adapt their environmental approvals requirements, the Industry may face additional costs and project-specific challenges in meeting these new requirements. For example, Industry Members expressed concerns about the likely impacts of the new Federal 'nature positive' reforms. Additionally, Industry Members noted that the system – across all jurisdictions – operates in a non-transparent manner, with limited feedback and active engagement from regulators. This can contribute to the extremely long lead times and uncertain outcomes which are barriers to new major project investments.

Decarbonisation initiatives and expectations around Australia's transition to net zero by 2050 were also identified by Industry Members as a challenge to overcome. While Members support national and state decarbonisation agendas and individual net-zero targets, they indicated that uncertainty around some policy settings and technology pathways introduces significant capital, operational, and technical risks to investors. Members also highlighted the risk of losing international competitiveness due to high energy costs and capital requirements compared to foreign competitors.

There are also additional risks (discussed in the main body of this report), including the unreliable supply of some core input materials sourced from overseas.

It should be noted that the nature and scope of this engagement meant that FTI Consulting has not consulted outside of the Industry Members and, thus, some of the Member observations may be contestable by other stakeholders. However, the policy and regulatory barriers expressed above are clearly important to the ongoing functioning of the Industry and require further consideration.

Observations for Policy and Regulatory Improvements

The extensive consultations with Industry Members outlined potential policy and regulatory improvements that may address the policy and regulatory barriers. Industry Members stated that the policy and regulatory improvements are important for establishing a more stable policy environment that can generate future investment. FTI Consulting recognises that the Industry's observations hold merit, and further in-depth analysis is required on the Industry's observed policy issues to make informed policy decisions. The Industry Members have stressed that:

Environmental Regulation

1. More timely, clear and consistent environmental regulatory processes are required across all jurisdictions in Australia to support new capital investment. This will ensure that Australia's bauxite resources continue to be economically accessible.

Critical Minerals List

2. The Australian Government should consider the inclusion of bauxite, alumina and aluminium on the Australian Critical Minerals List. This inclusion would streamline the regulatory process and facilitate funding for decarbonisation and innovation efforts. Additionally, recognition on the list would help the Industry attract international investment.

Decarbonisation and Energy Transition

3. Industry Members have committed to decarbonisation and are working with the Safeguard Mechanism, thus governments need to better support the Industry to meet the capital cost burden. Firstly, the government should provide additional policy and financial support for the Industry that targets specific decarbonisation and energy transition projects. Secondly, a more coordinated approach to mining and energy planning is required both within and between jurisdictions. This should explore opportunities to better support the development of green metals.

International Trade Remedies

4. The Australian Government should maintain a strong and robust international trade remedies system to ensure Australian producers and manufacturers are not exposed to the detrimental effects of dumping and subsidisation. This system should also actively consider anti-circumvention investigations to address trade policy practices of competitor countries.

1. Introduction

The Australian Aluminium Council (the AAC) is the national industry body representing all aspects of value creation within the Industry. The AAC represents Australia's bauxite mining, alumina refining, aluminium smelting and downstream processing sectors including aluminium extruders and distributors.

The membership group are a diverse set of mining, mineral processing and downstream manufacturers, that include large major international mining groups and smaller start-ups.

■ Bauxite:

- ABx Group – development of two bauxite mines in Northern Tasmania and Binjour (QLD).
- Alcoa – two bauxite mines in Huntly and Willowdale (WA) with downstream alumina processing in Pinjarra and Wagerup.
- Aurukun Bauxite – development of a bauxite mine in Cape York (QLD).
- Metro Mining – a bauxite mine in Weipa (QLD) that exports production.
- Rio Tinto – bauxite operations in Gove (NT) and Weipa (QLD) with downstream alumina processing in Gladstone and some export of production.
- South32 – a bauxite mine in Boddington (WA) with downstream alumina processing in Worsley (WA).
- VBX Limited – development of a bauxite mine near Kalamaru (WA).

■ Alumina:

- Alcoa – two alumina refineries in Pinjarra and Wagerup (WA) with downstream aluminium smelter processing in Portland (VIC) and alumina export.⁴
- Queensland Alumina Limited – an alumina refinery in Gladstone with downstream aluminium smelting in Boyne (QLD) and alumina export.
- Rio Tinto – an alumina refinery in Yarwun with downstream aluminium smelting in Tomago (NSW) and Bell Bay (TAS) and alumina export.
- South32 – an alumina refinery in Worsley (WA) that exports alumina.

■ Aluminium:

- Portland Aluminium – an aluminium smelter in Portland (VIC) that exports production.
- Tomago Aluminium – an aluminium smelter in Tomago (NSW) that supplies domestic extrusion presses and exports production.
- Rio Tinto – two aluminium smelters in Bell Bay (TAS) and Boyne (QLD) that supplies domestic extrusion presses and exports production.

■ Aluminium Processing and Distribution:

- Alspec – extruder and distributor of aluminium products across Australia.
- Capral – extruder and distributor of aluminium products across Australia.
- G. James – extruder and distributor of aluminium products across Australia.
- BlueScope Distribution – distributor of aluminium products across Australia.
- Vulcan Ullrich Aluminium – extruder and distributor of aluminium products across Australia.

■ Other Industry Manufacturers:

- ABx Group – the development of aluminium fluoride production.
- Alpha HPA – the production of HPA in Gladstone (QLD).

⁴ The Kwinana alumina refinery is included in the economic contribution data, which is based on the 2023 calendar year. The refinery cased alumina production in 1H 2024 as part of a phased curtailment.

Over the period of this engagement, FTI Consulting consulted with all (except Vulcan) Industry Members to validate our contribution analysis, discuss Industry risks, and understand areas for potential policy and regulatory improvements.

1.1. Background

The Australian Aluminium Industry (the Industry) is unique compared to other Australian sectors and international aluminium industries. This uniqueness stems from the fact that the Industry's production spans the entire value chain, from bauxite mining and alumina refining through to aluminium smelting and extrusion.

The Industry produces critical inputs for various sectors, including manufacturing and construction, as well as for the Australian energy, transport, defence and household sectors. Australian aluminium production has been critical for other Australian industries during disruptions to international supply chains, such as COVID-19.

As Australia continues to transition to a low-carbon future, it is expected that the Industry's outputs will be utilised further in the green economy and that overall aluminium demand will increase. For example, aluminium is utilised in solar panel framing, energy storage systems, transmissions lines and is an increasingly popular choice for reducing the weight of electric vehicles.

The advanced manufacturing capabilities within the Industry are being expanded by Industry Members, through high value production that generates products such as High Purity Alumina (HPA). This places Australia at the frontier of advanced manufacturing and expands the level of value added in Australia.

However, there are potential risks to future Industry growth. These include increasingly high costs associated with the decarbonisation of energy sources and the increasing uncertainty from Australia's planning and environmental approvals system.

This report aims to serve as a comprehensive high level resource for the Industry, by providing a deeper understanding of the economic and social contributions of the Industry to Australia. Additionally, the report provides a number of observations for possible policy improvements that may serve as a basis for future engagement with policy advisers and governments.

1.2. Scope of Works - Objectives

The key objectives of this project are:

- **Economic contribution:** Demonstrate the national and regional economic contribution of the Industry. Including estimating the direct, indirect and induced value added and employment of the Industry.
- **Sectoral interdependencies:** Outline the Industry's cross sector benefits and reliance. Including an indication of how the potential loss of activity in one sector can affect the other sectors in the aluminium supply chain.
- **Competition from imports:** Outline the nature and scope of imports in the market. Including the current market share of imported (particularly extruded) products in the Australian market, and an indication of the impacts expanded import market share has on the Australian economy.
- **Sector risks:** Outline the various risks that could impede growth within the Industry. These may include risks that are experienced across the Industry value chain or those that are experienced by certain sectors.

- **Policy Observations:** To mitigate against the sector risks, outline a set of potential policy and regulatory improvements for the support of current operations and prospects of future investment in capacity or new products. These improvements or observations are directly provided by Industry Members, collected through a set of industry consultations and have not been subject to consultation with policy advisers and governments.

1.3. Approach

Our research and analysis was conducted using information in the public domain, industry consultation and an in-house model to measure the economic contribution of the Industry.

We conducted an environmental scan of information on the Industry in Australia. This included incorporating information provided by the AAC (including trade and production data) and gathering insights from the *Resources and Energy Quarterly* by the Department of Industry, Science and Resources.

Following the construction of an economic profile of the sector, we engaged with AAC Industry Members to validate the data and seek information on any data gaps. These consultations also provided information from the Industry highlighting potential key risks to Industry and observations for government policy.

We have applied our in-house input-output (I-O) model to estimate the direct, indirect and induced economic contribution of the Industry to Australia for the calendar year 2023.

The discussion on policy barriers and improvements was synthesised by FTI Consulting from the insights of Industry Members observed during consultation sessions. The nature and scope of this engagement meant that FTI Consulting did not consult outside of the Industry Members. Thus, the observed policy barriers and improvements present the Members views, which may be contestable by other stakeholders, but are clearly important considerations for future private investment in the Industry.

1.4. Structure of the Report

The structure of this report is outlined below:

- **Section 2** – Industry and the dependencies between each of the four sectors.
- **Section 3** – Contributions of the Industry to quantify the key components and value-added to the Australian economy.
- **Section 4** – Interdependencies across the Industry's various sectors, and analyses of economic contribution scenarios illustrating both upstream and downstream disruptions to the Industry.
- **Section 5** – International trade challenges, impacts and consequences.
- **Section 6** – Additional benefits to regional and indigenous communities.
- **Section 7** – Key risks and challenges faced by the Industry to achieve its future growth potential.
- **Section 8** – Observations to the Industry and policymakers for policy and regulatory improvements.

2. The Australian Aluminium Industry

The Industry consists of four sectors that provide significant value to the Australian economy and regions: bauxite mining, alumina refining, aluminium smelting, and aluminium extrusion. The Industry sectors are vertically integrated to form a value chain that is unique globally. Linkages between the sectors are critical for maintaining production and the Industry value add proposition.

Industry activity and operations across Australia are fundamental to economic activity in many Australian regional cities and in several remote townships and communities. Industry activities in regional and remote Australia are crucial to the economic and social prosperity of these communities.

2.1. Industry Structure and Size

Figure 2 illustrates the Industry linkages within and across state borders. Domestic linkages support the production of different resource grades. For example, alumina refineries in south-west Western Australia are specialised to process the local bauxite resource that contains high silica content and cannot be processed elsewhere. The Queensland bauxite mines and alumina refineries have similar interdependencies.

Figure 2: Australian Aluminium Industry Locations



Domestic linkages also assist the Industry to reduce commercial and supply chain risks. For example, aluminium smelting in Tasmania and New South Wales utilises Queensland alumina production to minimise supply chain risks and lower transportation costs. Similarly, the Victorian aluminium smelter relies on alumina from Western Australia.

Table 2 demonstrates the volume of production by each sector allocated to the supply of domestic or international markets. Aluminium Industry production that is supplied to domestically is essential for a reliable source of revenue for the Industry, whilst also minimising the contractual and logistical risk for

downstream operations. Exported production generates revenue for the Australian economy and totalled \$15.2 billion in 2023.

Table 2: Supply by Industry Sector (kilo-tonnes, 2023)

	Bauxite Mining	Alumina Refining	Primary Aluminium	Extruded Aluminium
Domestic	66,300	2,600	100	130
Export	37,500	16,200	1,500	10
Total	103,800	18,800	1,600	140

Bauxite Mining

Bauxite mines undergo resource and environmental surveys before receiving government approval to begin operations and extract bauxite. After mining, extensive work is undertaken to ensure sites are rehabilitated. Currently, bauxite operations are located within Western Australia, Queensland and the Northern Territory. A further four bauxite mines are awaiting government approval across Queensland, Western Australia and Tasmania.

Australia competes as one of the largest producers of bauxite globally. In 2023, six Australian bauxite mines produced over 103 million tonnes, representing approximately a quarter of global production and \$1.6 billion in export revenue. Approximately two-thirds of bauxite production was utilised for Australian alumina refining.

Alumina Refining

In the alumina refining process, bauxite undergoes fine grinding in mills and chemical reactions to recover the alumina. Each alumina refinery is designed to process a specific grade of bauxite. Due to the high silica content in south-west Western Australian bauxite, the adjacent refineries contain specialist equipment and are unique globally.

Australia is the second largest producer of alumina globally, with five refineries located in Western Australia and Queensland that produced over 18 million tonnes of alumina from Australian bauxite in 2023. The majority of Australian alumina is exported overseas and generated approximately \$8.3 billion of revenue in 2023. Around 2.6 million tonnes was retained in Australia for the production of primary aluminium.

Aluminium Smelting

Primary aluminium production is an electrolytic process that converts alumina into a molten aluminium. The molten aluminium is then casted into aluminium ingots, slabs, billets and T-bars. There are four aluminium smelting operations in Australia, located in Queensland, New South Wales, Victoria and Tasmania. These operations produced 1.6 million tonnes of primary aluminium in 2023. The majority of primary aluminium is exported overseas, with these exports generating \$5.1 billion in revenue in 2023. Approximately 100 thousand tonnes was retained in Australia to meet demand from domestic extrusion plants.

Aluminium Extrusion

Aluminium is extruded, rolled or casted by heating primary aluminium into specified temperatures and pressing the primary aluminium into pre-defined shapes. Extruded aluminium is also referred to as prefabricated aluminium.

The extrusion and distribution sector is located across Australia and produced 140 thousand tonnes of extruded aluminium for the Australian market in 2023. The extruded aluminium was sold to aluminium

fabricators that manufacture a range of goods for other Australian industries, including construction, defence, and energy.

2.2. Industry Value and Challenges

The Industry delivers significant value to the Australian economy with contributions to activity, employment, and communities. Chapter 3 quantifies the Industry's value added as direct (Industry activity), indirect (supply chain activity), and induced (household expenditure) contributions. Value added represents the economic activity from all entities, and effectively reflects the Industry's contribution to both the economy and community welfare (through the support of higher incomes that can drive higher living standards).

Additionally, the Industry provides substantial value in other areas such as workforce upskilling and support for regional and Indigenous communities. These qualitative contributions are discussed in Chapter 6.

To maintain a significant contribution to the Australian economy, Industry Members have outlined various risks and challenges that must be overcome. At a high level, Industry Members have stated that these key challenges include:

- Securing environmental approvals.
- Maintaining competitiveness, with considerations for international markets and decarbonisation objectives.
- Access to supply of input materials for downstream sectors.

The key challenges identified by Industry Members are outlined in more detail within Chapter 7.

2.3. Classification of Aluminium on the Australian Minerals Lists

The Australian government maintains two lists of minerals or products deemed important for its economy and sovereign capability. These lists aim to foster a supportive policy environment for the respective industries, helping Australia achieve its production potential.

The **Critical Minerals List** addresses minerals with vulnerable supply chains, aiming to enhance sovereign capability and maximise value for Australian communities.⁵ The Australian government defines resources on the critical minerals list as:

- Essential to our modern technologies, economies and national security.
- Resources where Australia has geological potential.
- In demand from our strategic international partners.
- Vulnerable to supply chain disruption.⁶

The Critical Minerals List programs are overseen by the Critical Minerals Office in the Department of Industry, Science and Resources. The Critical Minerals Strategy for 2023-2030 outlines the government's vision to grow Australia's critical minerals industry.⁷ Currently, the benefits of the Critical Minerals List include:

- Developing policy and regulatory settings to enable investment and downstream opportunities.
- Improving access to regulatory approvals and funding.

⁵ Department of Industry, Science and Resources, *Critical Minerals Strategy 2023-2030*, 2023.

⁶ Department of Industry, Science and Resources, [Australia's Critical Minerals List and Strategic Materials List](#), accessed 16 July 2024.

⁷ Department of Industry, Science and Resources, *Critical Minerals Strategy 2023-2030*, 2023.

- Promoting investment in diverse and secure global supply chains.
- Supporting research and development.⁸

The **Strategic Materials List** includes resources that are important for Australia’s economic potential, though these materials have less vulnerable supply chains compared to those on the Critical Minerals List.⁹ The Australian government supports the extraction and processing of these materials while monitoring market developments to ensure that the industries do not become vulnerable.

The inclusion of resources on both the Critical Minerals List and Strategic Materials List is overseen by the Minister for Resources. These lists are reviewed every three years and can be updated in response to “global strategic, technological, economic and policy changes”.¹⁰ Currently, the Critical Minerals List features 31 minerals, including HPA and fluorine. The Strategic Materials List contains five minerals, including aluminium.

Internationally, aluminium is listed on the Critical Minerals Lists of the United States, Canada, and South Korea, reflecting supply chain vulnerability and limited global supply chain diversity. Additionally, bauxite is included on the European Union's Critical Raw Materials List.

Industry Members have proposed the inclusion of bauxite, alumina, and aluminium production on the Critical Minerals List as outlined in Chapter 8.

⁸ Department of Industry, Science and Resources, [Critical Minerals Office](#), viewed July 2024.

⁹ Ibid.

¹⁰ Ibid.

3. Economic Contribution Analysis

This chapter examines the contributions of the Industry to quantify the value added and employment to the Australian economy.

Value added is the contribution of the Industry to national and state gross domestic product. It is a measure the level of activity (income) across the economy generated by the Industry's factors of production (labour and capital). The value added measure represents the Industry's contribution to the economy activity. In addition, the Industry contribution to employment and higher incomes can lead to higher living standards.

3.1. Modelling Approach

The analysis in this report has been conducted utilising the *FTI Consulting Regional Input-Output Framework (FRIO)*. Economic contribution studies and the FRIO estimate the impact of an industry on the wider economy at a static point in time. The economic contribution is divided into:

- **Direct contribution:** This refers to the benefits derived from Industry operations, based on the value added through the sales of production from individual projects. It is estimated using economic metrics such as wages, taxes on production, and gross operating income (EBITDA). For the Australian Aluminium Industry, data was sourced from the AAC, Industry participants, and government sources.
- **Indirect contribution:** This represents the economic benefits resulting from Industry expenditure, specifically payments to other businesses for the supply of goods and services. These purchases stimulate additional commercial activity in other sectors. The indirect contribution is estimated using the latest Australian Bureau of Statistics (ABS) national I-O tables. The FRIO framework also provides a regional disaggregation (including Australian states and sub-state regions) of both indirect and direct contributions.
- **Induced contribution:** This measures the economic impact of Industry activities on the household sector, focusing on expenditure that reaches household consumption and subsequently stimulates business activity. It is calculated using similar methods as those for indirect contribution.

The FIRO framework provides estimates of the direct, indirect and induced contribution of the Australian Aluminium Industry. This represents the volume of turnover, value added, and the employment contribution by region, state and the national economy. The FIRO outputs include the level of intra-sector-trade between each of the sectors within the Australian Aluminium Industry. Expenditures from intra-sector trade are excluded from total intermediate costs to prevent double counting.

More information on the approach and methodology to estimating the economic contributions is provided in Appendix 1.

3.2. Economic Contribution Results

Value Added

The Industry plays a significant role in the national economy, contributing an estimated \$18 billion in value added for the 2023 calendar year. Overall, the Industry is estimated to have supported 0.7% of the national economy in 2023.

The direct value added from the Industry's operators was \$5.7 billion. This represents an uplift in value of Australian materials, starting from mined resources and manufactured into goods utilised across various other sectors. Within the direct value added, the Industry contributed over \$470 million in royalty payments to Australian governments and the community. By state, the Industry directly contributed \$146 million in

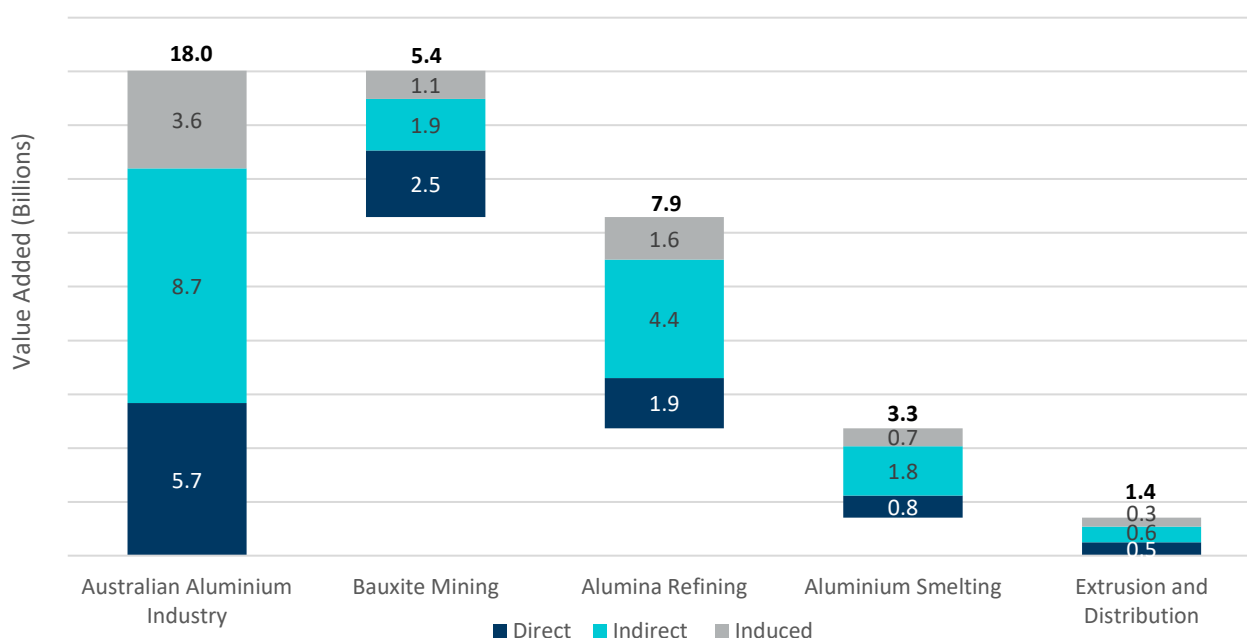
royalty payments to Queensland, \$286 million to Western Australia, and \$40 million to the Northern Territory.

Additionally, it is estimated that the Industry generated \$8.7 billion in indirect value and \$3.6 billion in induced value. The indirect and induced value is generated from a total operating expenditure of \$19.4 billion on domestic goods and services for production. The expenditure on domestic supplies fosters a wide range of business activities, creating additional value and jobs. The Industry's expenditure is predominantly allocated to six Australian and New Zealand Standard Industrial Classification (ANZSIC) industries:

- Mining
- Manufacturing
- Electricity, gas, water and waste services utilities
- Financial and insurance services
- Rental and real estate services
- Professional, scientific and technical service

The Industry acts as a customer for operators within these sectors. The Industry provides a stream of revenue to these sectors that can help these sectors continue to operate.

Figure 3: Economic Contribution – Value Added (\$ billion)¹¹



The bauxite mining sector's economic contribution, alone, is similar to the contribution of other key Australian mining industries such as the nickel and gold mining sectors. The nickel mining sector's economic contribution in Australia was estimated at \$1.8 billion (direct) in 2024 using I-O modelling.¹² The gold mining sector in Australia was estimated to support \$6.8 billion (direct and indirect) in 2020.¹³ However, the vertical integration of downstream sectors means the Industry as a whole generates a significantly greater level of economic contribution. Specifically, the economic contribution generated by the whole integrated Industry (bauxite extraction, alumina refining, aluminium smelting, and extrusion sectors) combined is estimated at approximately 3.3 times more than the contribution made by bauxite extraction activities alone.

¹¹ Due to rounding the sum of sector contributions may not appear equal to the total of each sector or the Industry.

¹² The Chamber of Minerals and Energy of Western Australia, [A Critical Juncture: Australia's Opportunities and Challenges in Nickel](#), viewed August 2024.

¹³ World Gold Council, [The Social and Economic Contributions of Gold Mining: Australia](#), viewed August 2024. Economic contribution converted from USD to AUD in August 2024 (with a conversion factor of 1 USD to 1.48 AUD)

The upstream sectors of the Industry generate the greatest value added to the Australian economy, with an estimated \$5.4 billion from bauxite mining and \$7.9 billion from alumina refining. These two sectors are highly interdependent, as refineries are designed to process specific grades of bauxite (for example, specialised equipment is required for refining bauxite from south-west Western Australia). This interdependency is further discussed in Chapter 4. The aluminium smelting and extrusion sectors also contribute significantly, adding another \$3.3 billion and \$1.4 billion, respectively.

The Industry's value added increases with each stage of production, from raw bauxite to finished products in the downstream sectors. The value added per tonne of production for each sector is detailed in Table 3.

Table 3: Economic Contribution per Production Volume (\$) (Direct, Indirect and Induced)

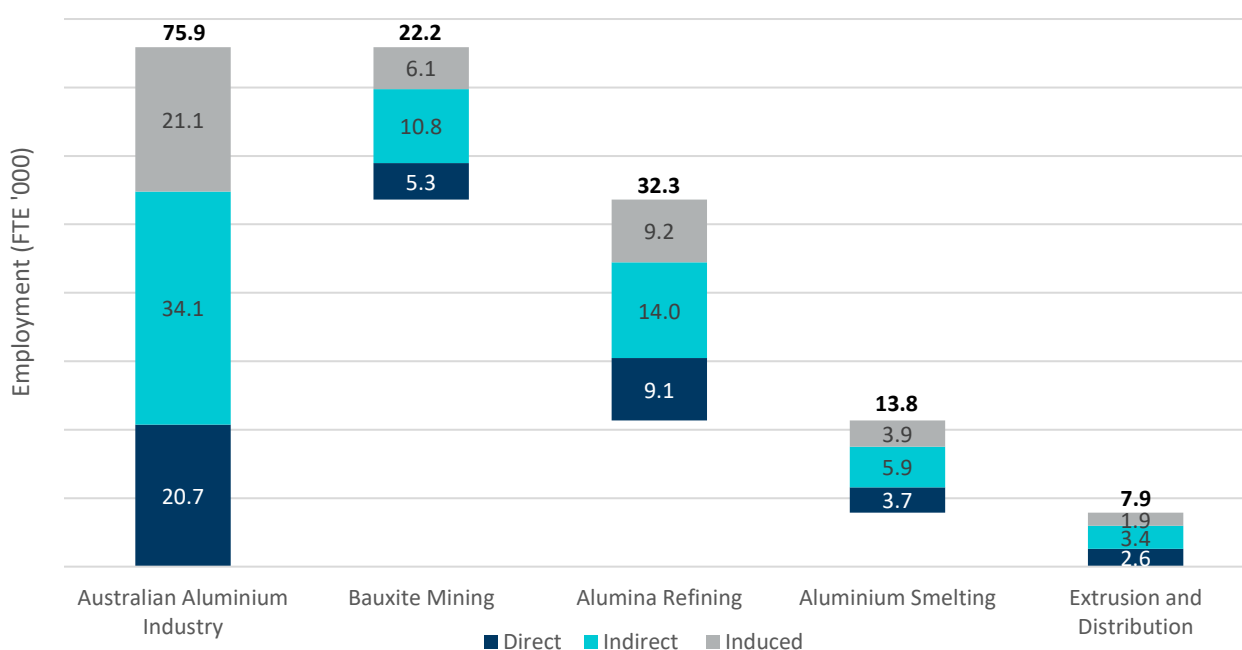
	Bauxite Mining	Alumina Refining	Primary Aluminium	Extruded Aluminium
Value Added / Tonne	52	418	2,135	5,113

This demonstrates that the growth of vertical integration and downstream production is crucial for enhancing the Industry's value added to the Australian economy. Approximately 86% of alumina was exported in 2023, generating significant revenue. However, if the Industry can be supported by government to overcome cost constraints and develop more downstream manufacturing (such as aluminium smelting and extrusion), its value added could grow significantly.

Employment

Employment in the Industry generates highly skilled jobs and relatively high earnings. The earnings are delivered to households, providing a living wage for Australian families to improve their living standards. The Industry supported an estimated 75,000 Australian jobs (FTE) in the 2023 calendar year. The Industry directly employed 20,725 highly skilled workers with a further 34,000 and 21,000 workers employed through indirect and induced activity, respectively.

Figure 4: Economic Contribution – Employment (FTE, '000s)¹⁴



¹⁴ Due to rounding the sum of sector contributions may not appear equal to the total of each sector or the Industry.

Direct employment in the Industry is highly skilled, with average earnings of \$134,000. This average is around \$50,000 or 60% higher than the national manufacturing average. These higher wages reflect the Industry's productivity and international competitiveness, as well as a higher level of capital investment per worker compared to the broader manufacturing sector.

The upstream sectors, including bauxite mining and alumina refining, offer the highest wages and employment volumes within the Industry. However, the downstream sectors—particularly aluminium smelting and extrusion—contribute more to employment relative to production volumes. For example, aluminium smelting and extrusion provide 2.4 and 12 FTE workers, respectively, per kilo-tonne of production. This demonstrates that the Industry's vertical integration and downstream production are crucial for generating significant employment benefits for the Australian economy.

States and Regions

The Industry is located in outer metropolitan manufacturing hubs, regional cities and remote townships across Australia. The direct and indirect contributions to each state have been measured as a subset of the national contribution.

The Industry contributes the largest estimated value added to Western Australia and Queensland, with \$5.7 billion and \$4.3 billion, respectively. The contribution in these two states is driven by bauxite mining and alumina refinery operations. Queensland also has contributions generated from aluminium smelting and aluminium extrusion. The Northern Territory contribution is generated from a single bauxite mine in the remote township of Gove. This operation generates an estimated \$420 million of value added to the state.

Victoria, New South Wales and Tasmania receive contributions from the Industry's downstream sectors. The aluminium smelters in New South Wales and Tasmania generates most of the Industry's contributions to these states (estimated at \$900 million and \$250 million respectively). However, the extrusion and distribution sector still add meaningful contributions, with an estimated \$180 million of economic value contributed to New South Wales. In Victoria, contributions by the aluminium smelter are more balanced against the extrusion and distribution sector (estimated at \$415 million and \$280 million respectively). The extrusion and distribution sector also contributes an estimated \$78 million to South Australia.

Table 4: Total State Value Added (Direct, Indirect and Induced) by Sector (\$ million)

	WA	QLD	NSW	VIC	NT	TAS	SA	Cross-border	Total
Bauxite Mining	2,036	1,532	0	0	420	0	0	1,452	5,439
Alumina Refining	3,631	1,732	0	0	0	0	0	2,488	7,851
Aluminium Smelting	0	755	892	415	0	249	0	1,008	3,320
Extrusion and Distribution	82	289	175	280	13	29	78	469	1,414
Australian Aluminium Industry	5,749	4,308	1,067	696	433	278	78	5,495	18,026

The direct value added to Western Australia and Queensland (\$2.6 billion and \$1.9 billion) is matched by induced and indirect value added from operational expenditure (estimated at \$3.2 billion and \$2.3 billion). In Victoria, New South Wales, and Tasmania, the indirect and induced contributions are estimated to exceed the direct contributions, indicating that Industry expenditure is a key driver of these economic outcomes.

Additionally, our analysis included cross-border contributions, that represent the indirect and induced effects of business and household purchases across regional borders. These contributions are significant

across all Industry sectors. Bauxite mining and alumina sectors make substantial interstate purchases, resulting in considerable benefits for states outside of Western Australia and Queensland.

Table 5: State Contribution by Direct, Indirect and Induced Value Added (\$ million)

	WA	QLD	NSW	VIC	NT	TAS	SA	Cross-border	Total
Direct	2,606	1,932	400	288	288	115	44	0	5,673
Indirect	2,487	1,811	501	297	122	137	25	3,342	8,722
Induced	656	565	167	111	23	25	9	2,075	3,630
Total Value Added	5,749	4,308	1,067	696	433	278	78	5,418	18,026

The employment contribution in each state reflects the sector operating in the region and the scale of those operations. The Industry supports the highest level of employment in Western Australia and Queensland at an estimated 18,500 and 16,500 jobs, respectively. This is due to the operation of several bauxite mines and alumina refineries with significant production volumes.

Despite lower production volumes, the downstream sectors are more labour intensive. The aluminium smelters and aluminium extrusion sectors provide meaningful employment to Victoria, New South Wales, Tasmania and South Australia.

The cross-border flows provide additional employment across all Australian states. The implications of cross-border employment result from sector expenditure that flow across state borders.

Table 6: Total State Employment (Direct, Indirect and Induced) by Sector (FTEs)

	WA	QLD	NSW	VIC	NT	TAS	SA	Cross-border	Total
Bauxite Mining	6,376	6,392	0	0	1,327	0	0	8,136	22,232
Alumina Refining	11,740	6,214	0	0	0	0	0	14,315	32,268
Aluminium Smelting	0	2,464	2,796	1,383	0	951	951	5,886	13,479
Extrusion and Distribution	402	1,386	819	1,310	68	145	390	3,366	7,887
Australian Aluminium Industry	18,518	16,457	3,615	2,694	1,395	1,096	390	32,093	75,866

Similar to value added, the direct employment contributions within Queensland and Western Australia are matched by indirect and induced contributions. However, Victoria, New South Wales, Tasmania and South Australia have more relative levels of indirect and induced employment compared to direct employment.

Table 7: State Contribution by Direct, Indirect and Induced Employment (FTEs)

	WA	QLD	NSW	NT	VIC	TAS	SA	Cross-border	Total
Direct	7,966	8,174	1,700	545	1,417	689	234	0	20,725
Indirect	7,441	5,787	1,344	706	1,010	312	156	17,309	34,064
Induced	3,111	2,496	570	144	267	95	0	14,394	21,077
Total Employment	18,518	16,457	3,615	1,395	2,694	1,096	390	31,703	75,866

4. Interdependencies

The Industry is vertically integrated from initial inputs to final extrusion products, making it unique globally. Consequently, each sector within the Industry relies on the others, either through the supply of key inputs or as demand from local customers. To assess these interdependencies, the FRIO model was used to estimate the impact of reduced output in one sector on the remaining sectors. This chapter explores the results of this hypothetical reduced output scenario.

4.1. Upstream and Downstream Linkages of Aluminium Manufacturing

Within each sector of the Industry, there are linkages to other domestic sectors that provide a reliable source of inputs or customers. The provision of reliable inputs and customers assists in maintaining each sector's production and economic contributions.

Upstream linkages refer to the sectors that provide essential inputs required for the operation of each Industry sector. By having a local source of inputs, there is an increased supply chain reliability and reduced transport costs for these sectors. Downstream linkages also provide benefit for each sector of the Industry. The downstream linkages serve as a reliable local market for the produced goods.

For the Industry, sector interdependency is established through the utilisation of:

- Australian bauxite in the alumina sector – with domestic purchases of \$3 billion annually or 37% of alumina production expenditure.
- Australian alumina in the aluminium smelter sector – with domestic purchases of \$1 billion annually or 39% of primary aluminium production expenditure.
- Australian aluminium in the extrusion and distribution sector – with purchases of \$350 million annually or 33% of extruded aluminium production expenditure.

The aluminium extrusion sector and the aluminium fabrication sector also have interdependencies, though these fall outside the scope of the vertically integrated Industry.

The linkages between Australian sectors establish a vertical integration that reduces supply chain risks, increases efficiencies and provides additional value to the Australian community. However, the linkages also create dependencies and a risk of flow-on consequences when one sector is experiencing challenges. The risk of integration is explored in the scenario below.

4.2. Analysis of an Industry Shock

This section illustrates a hypothetical scenario to demonstrate the interdependencies between the Industry sectors. The results demonstrate how a hypothetical shock on the production of one Industry sector affects the other Industry sector's output and the economic contribution of the entire value chain. The analysis below is not intended as a forecast, but rather a representation of the potential impacts of interdependencies.

Scenario

To demonstrate the interdependencies between the sectors, a shock was applied to an Industry sector. The scenario was chosen to be reflective of a possible shock to the Industry without identifying a specific site or operation.

A scenario of a one-third reduction in the total bauxite production from mines in south-west Western Australia was selected. This reduction in bauxite production impacts downstream alumina refineries and

aluminium smelters due to the Industry's vertical integration. The potential loss of alumina production highlights a realistic risk of future mine closures in this region. The reasons for the possible closure of a bauxite mine or alumina refinery are discussed in Chapter 7.

Implications

A reduction in south-west WA bauxite mining will have direct implications for the Industry's economic contribution to the state and national economy. Direct contribution would reduce through the loss of direct operational activity (including employee contributions, EBITDA and taxes on production). Indirect and induced contribution losses would occur through the loss of the sector's expenditure on goods and services used in production.

The reduction in south-west WA bauxite mining would affect the downstream alumina refining sector. The raw bauxite is supplied to refineries for processing into alumina. Alumina refineries are designed to process specific grades of bauxite, establishing a critical interdependency between the sectors. In south-west WA, alumina refineries are highly specialised to process the local bauxite that contains high silica content. The capability to process the high silica content makes WA alumina refineries unique globally. Industry members have stated there are currently no viable opportunities to process the raw material elsewhere in Australia or overseas. Thus, a reduction in the capacity of the south-west WA bauxite mining or alumina refining sectors will cause the other sector in this region to reduce production by the same proportion.

A reduction in bauxite mining could also impact the aluminium smelting sector further down the supply chain. If south-west bauxite mining and alumina refining was to lower production volumes, associated Australian aluminium smelters may have to establish new supply contracts. If the replacement alumina is sourced from an overseas refinery, the smelter would experience additional logistical risks. While this possible additional impact should be noted, the outcomes for aluminium smelters were not quantified in this illustrative scenario.

Results

A one-third reduction in bauxite mining capacity in south-west WA would also limit the capacity of the alumina refining sector.

Table 8 outlines the economic contributions for the Industry during the base case (Industry operations for 2023) and the scenario (a reduction in south-west WA bauxite mining capacity by one-third). The results from the scenario indicate that a reduction in south-west bauxite mining capacity could reduce the Industry's overall value added contribution by 15%. The reduced operations could also lead to lower levels of economic contribution in the aluminium smelting sector (excluded from calculations).

Table 8: Interdependency Scenario – Economic Contribution of the Industry

	Base Case	Scenario	Reduction	
Revenue (\$ million)	21,700	18,700	3,000	14%
Value added (\$ million)	18,000	15,300	2,700	15%
Employment (FTE)	75,900	65,300	10,600	14%

Table 9 outlines the reduction in economic contributions for the bauxite sector (direct), alumina refining sector (direct) and the economy (direct, indirect and induced) when the scenario is applied. The results demonstrate that a reduced bauxite mining capacity in south-west WA can have wider effects on the whole

economy. For example, the total reduction in industry-wide employment (direct, indirect and induced) is 17 times higher than the reduction in employment within the bauxite sector alone (direct).

Table 9: Interdependency Scenario – Reduction Compared to the Base Case

	Bauxite Mining	Alumina Refining	Economy-wide
Revenue (\$ million)	800	2,200	3,000
Value added (\$ million)	420	430	2,700
Employment (FTE)	620	2,000	10,600

At the first stage, south-west WA bauxite mining production decreases. The possible effect on the direct contribution of the bauxite mining sector is \$420 million in value added and a loss of support for 620 workers (FTE).

At the second stage, the production capacity of the south-west WA alumina refining sector is reduced by a proportional amount (due to the lost access to high silica bauxite from south-west WA and given their equipment is specialised to this grade of product). The direct contribution of the south-west WA alumina refining could be reduced by \$430 in value added and a loss of support for 2,000 workers (FTE).

At the third stage there is a loss of operational expenditure from both sectors that reduces economic activity across the state and country. The economy-wide results reflect the loss of direct contribution in the bauxite mining sector combined with the loss of direct contribution in alumina refining sector (because of lost access to the high silica WA bauxite), and the loss of operational purchases from both sectors (indirect and induced contributions). Thus, it is estimated that, at the economy-wide level, the loss of one-third of current south-west WA bauxite mining could reduce economic activity by \$2.7 billion and lead to a loss of support for 10,600 workers (FTE).

5. International Trade Challenges

The Industry demonstrates a sovereign capability that provides benefits to Australian society by providing downstream aluminum extrusion customers with reduced exposure to international supply chain risks. The Industry is internationally competitive with products that are generally able to compete effectively against foreign manufacturers. However, Industry Members have identified an exposure to products manufactured internationally that are being dumped on the Australian market.

The illustration of international trade exposure is specific to the aluminium extrusion and distribution sector. The vulnerabilities of the upstream sectors are analysed in a separate report commissioned by the AAC.

Whilst the Industry's local products help in shielding customers from international supply chain risks, the Industry itself still faces some key global supply risks in its production processes. These are largely through the Industry's reliance on imported production inputs. In particular, essential materials and specialised manufacturing equipment, which are exclusively produced overseas, are crucial for the Industry's operations.

5.1. Exposure to Dumping, Subsidies and Import Surges

The Industry faces competition from international manufacturers of primary aluminium, extruded aluminium and aluminium fabricated products. The Industry remains internationally competitive, producing high-quality products at prices comparable to those of foreign manufacturers. However, the Industry can be exposed to international competitors who "dump" products on the Australian market below the price of production.

Industry Members have noted that the Australian importation of extruded and fabricated aluminium has increased with the dumping of aluminium products that have subsidised production costs. The Department of Foreign Affairs and Trade have reported a steady increase in the importation of extruded aluminium and fabricated aluminium structures since 2010.¹⁵

The aluminium extrusion sector has successfully applied to the Australian Anti-Dumping Commission for the implementation of trade remedies on imported products. At the time of writing, anti-dumping measures for aluminium extrusion products apply to China, Malaysia, and Vietnam, as well as named exporters from Thailand and Taiwan.¹⁶

For example, in August 2023 the Anti-Dumping Commission provided a reinvestigation report regarding the dumping of aluminium extrusions imported from Malaysia and Vietnam (referred to as RR591).¹⁷ The investigation conducted two modelled comparisons differentiating the response of the Australian sector to the response of international manufacturers when import duties are removed.

The first comparison investigated the difference between Australian production prices and import prices for the sale of extruded aluminium directly from mills to distributors. The first comparison found that import sources would undercut Australian producers by 15% on average.¹⁸ The second comparison investigated the difference between Australian production prices and import prices for the sale of extruded aluminium from

¹⁵ Department of Foreign Affairs and Trade, [Trade and statistical pivot tables](#), viewed 8 August 2024,.

¹⁶ Department of Industry, Science and Resources, *Dumping Commodity Register: Aluminium Extrusions*, 2024

¹⁷ Department of Industry, Science and Resources, *Reinvestigation of Certain Findings in Report No 591: Certain Aluminium Extrusions Exported from Malaysia and the Socialist Republic of Vietnam to Australia*, 2023.

¹⁸ Ibid.

distributors to customers (aluminium fabricators and Australian industries). The second comparison found that import sources would undercut Australian Industry by 3% on average.¹⁹

The RR591 found that volumes of imported extruded aluminium from Malaysia and Vietnam could and would increase in the scenario that anti-dumping measures are removed. Furthermore, there would be material harm to the Australian aluminium extrusion sector. As a result, the Anti-Dumping Commissioner and subsequently the Anti-Dumping Review Panel, recommended that measures should continue for extruded aluminium originating from Malaysia and Vietnam. Recommendations were adopted with current measures set to expire in June 2027.

Some Industry operators in the aluminium extrusion sector are considering pursuing additional anti-dumping action against aluminium imports. Dumping activities can result in the loss of the Industry's key customers and profitability. Industry members have stated that without continued government action to maintain a strong and robust anti-dumping system, the importation of discounted aluminium products are likely to continue flooding the Australian market. This could lead to reduced Australian production, significant losses in market share and profits, and a subsequent downturn in the sector.

Anti-dumping measures on aluminium extrusion and fabricated products already occur within international markets. Markets that apply an anti-dumping measure, such as import tariffs or quotas on aluminium extrusions, include the USA²⁰, UK²¹, Europe Union²², and Canada²³. These anti-dumping measures recognise that unfair trade practices are causing harm to domestic aluminium extruders. The US has applied its tariff rate on imported aluminium extrusions across almost all international markets, rather than targeting specific manufacturers or individual markets. Anti-dumping measures applied to all international markets can be more effective at ensuring the domestic Industry is not exposed to unfair trade practices compared to targeting individual producers of markets.

The economic contribution implications of increased 'unfair international trade' in the form of dumping and subsidy of imported product is explored in a scenario below.

5.2. Import Competition Analysis

An increase in the importation of extruded or fabricated aluminium products will negatively impact the Australian aluminium extrusion sector, diminishing its contribution to the Australian economy. The following import competition scenario has been designed to illustrate the reduction in the sector's economic contribution resulting from an increase of imported aluminium. The scenario and its impacts are derived from I-O modelling and are intended to provide an indication of how potential risks to the Industry could affect the economy.

The scenario estimated a 25% reduction in domestic market share of the Australian extrusion and distribution sector. Approximately two-thirds of the current Australian extrusion volumes are supplied by domestic production. Industry Members have stated that it is highly unlikely that the extrusion and distribution sector would supply to new international customers. As a result, domestic production of

¹⁹ Ibid.

²⁰ United States Federal Register, [Adjusting Imports of Aluminium into the United States](#), viewed August 2024.

²¹ United Kingdom Government, [UK Integrated Online Tariff: Section XV Chapter 76](#), viewed August 2024

²² European Commission, [Commission Imposes Anti-Dumping Duties on Imports of Aluminium Extrusion from China](#), viewed August 2024.

²³ Government of Canada, [Customs Tariff Chapter 76: T2023 – Aluminium and articles thereof](#), viewed August 2024.

extruded aluminium would decrease by approximately 25,000 tonnes, with a corresponding reduction in distribution volume.

The reduction in the domestic market share of the extrusion and distribution could cause a loss of \$349 million in value added and a loss in support for more than 1,900 FTE workers (in direct, indirect and induced terms).

Table 10: Import Competition Scenario – Value Added of the Extrusion and Distribution Sector

	Base Case	Scenario	Reduction
	Value added (\$M)		
Direct	504	380	124
Indirect	582	438	143
Induced	330	249	81
Total	1,416	1,068	349
	Employment (FTE)		
Direct	2,605	1,964	641
Indirect	3,364	2,536	828
Induced	1,919	1,446	472
Total	7,887	5,946	1,941

5.3. Sovereign Capability

The Industry provides a sovereign capability that increases the value added contribution to the Australian economy. With products available in Australia, the Industry and other sectors are less reliant on primary and extruded aluminium products from international sources. The local production of aluminium lowers logistic risks and improves the competitiveness of the vertically integrated Industry and other sectors.

For example, COVID-19 disrupted the import supply chain for customers of extruded and fabricated aluminium. The significant disruption in shipping logistics meant many companies with international supply chains needed local solutions. Australian aluminium extruders were able to replace imported products with domestic production to avoid more significant impacts within other sectors, such as building and construction (including residential, commercial and industrial). Solar, rail, window and door products reverted to Australian-based production to supply their businesses and customers. Australian aluminium extruders also supplied critical market segments including defence, heavy transport, ship building, medical equipment, medical, energy and infrastructure projects. A strong domestic aluminium extrusion sector helps ensure that broader economic activity can continue in times of national crisis.

The Industry can provide further sovereign capability and product reliability by minimising the dependency on foreign sourced long-term inputs used in the production of alumina and aluminium. By manufacturing production inputs within Australia, the Industry would provide additional value add and employment to the economy through:

- Reliable long-term inputs to assist the Industry resilience and reduce supply chain risks.
- Increased Industry price competitiveness with lower transportation costs for inputs.
- Support for sustainability objectives through the utilisation of manufacturing by-products.

While the Industry already has significant integrated sovereign capabilities, there are further opportunities for advanced manufacturing within it. For example, there are opportunities for the Industry to produce new products, including in the production of aluminium fluoride and HPA (outlined in Box 1).

Box 1: Future Manufacturing Opportunities for the Industry

To illustrate potential future manufacturing opportunities, Industry Members have highlighted two examples: aluminium fluoride and high-purity alumina (HPA). Aluminium fluoride is a key production input for aluminium smelters that can be manufactured in Australia. HPA can provide a new product that can be manufactured and exported.

Aluminium Fluoride

Aluminium fluoride is an essential input for Australia's four aluminium smelters. However, Australia does not produce aluminium fluoride, and the four Australian aluminium smelters purchase the essential input from international markets. Currently, Australia imports approximately 25,000 tonnes of aluminium fluoride annually, predominantly from China and the UAE. However, the Industry has the potential to produce aluminium fluoride from aluminium smelting bath waste in a novel process. A plant with capacity to produce 20,000 tonnes of aluminium fluoride annually is planned. The plant would also produce aluminium sulphate and sodium sulphate.

Aluminium smelter bath waste is currently exported to assist the construction of new smelters overseas. However, Industry Members have indicated that rate of smelters constructed globally has declined, leading to an excess of aluminium smelter bath waste in Australia and globally. To avoid the storage or landfill of the bath waste, the aluminium bath waste can be utilised to produce aluminium fluoride. Hence, the Industry has an opportunity to enhance its economic contribution whilst minimising potential waste by producing aluminium fluoride.

HPA

HPA offers an emerging product category with a high value add prospect for the Industry and the Australian economy. HPA is a bespoke chemical compound that is generated from a by-product in aluminium smelting. The production cost is approximately \$10 per kg, while the transformed HPA can be worth up to \$50 per kg in current markets. HPA is product consumed in sectors including semi-conductors, LED-lighting and lithium-ion batteries. With the future growth of these sectors globally, the demand for HPA is expected to grow significantly.

Australia has a world-leading HPA facility that supplies bespoke compounds to the global market. This facility uses a unique, advanced process to achieve high purity and specialised compounds. The facility is currently expanding production to 350 tonne per annum and expected to reach 10,000 tonnes per annum by 2026.

HPA has received various government grants to support investment and to assist with the ramp-up of production capacity and is recognised on the Critical Minerals List.

Australia, through Alpha HPA, is making strides to enhance the value added to aluminium products. This represents a new frontier for advanced mineral processing in Australia and offers significant opportunities to contribute to the Future Made in Australia initiative. Moreover, this opportunity leverages Australia's comparative advantage and utilizes materials already within our supply chain, including aluminium products and chemicals supplied by Orica.

Manufacturing new aluminium products for commercial use in domestic or overseas markets will increase the Industry's value added. The operations would increase direct value added through increases to employment, taxes on production and gross operating surplus. The facilities would also generate indirect value added through operating expenditures that flow on to other sectors of the economy.

The benefits of sovereign capability align with current government policy. This includes the 'Future Made in Australia' strategy, that provides significant economic support packages to industries undertaking Australian manufacturing.²⁴ The 'Future Made in Australia' strategy emphasises the importance of domestic production to capture value add propositions within Australia and reduce reliance on foreign supply chains.

²⁴ Australian Government, *Budget 2024-25: Investing in a Future Made in Australia*.

6. Implications of Industry Contribution

The economic contribution analysis estimated that the Industry provided \$18 billion in value added to the Australian economy in 2023. As previously discussed, this contribution includes both direct, indirect and induced benefits.

This section explores how the contributions of the Industry extend beyond these broad financial metrics to offer additional advantages for Australian society, such as workforce upskilling and enhanced prosperity and cohesion within regional and indigenous communities.

6.1. Regional Contributions

The Industry is a key supporter of outer metropolitan manufacturing hubs, regional cities and remote townships. The Industry operates in areas across Australia that have traditionally low levels of investment activity. The operations generate direct community benefits through business activity and employment in the local area. Further indirect and induced benefits are generated from operational purchases that stimulate further business and household activity in the local area.

The Industry recognises that the economic value generated in these regions must not be at the expense of cultural heritage. Industry Members have indicated that they are working closely with regional and indigenous communities to protect cultural heritage while growing the local economy.

Industry activities in remote townships are particularly important. For example, the regional contributions in the Commonwealth Electoral Division of Leichhardt were estimated for 2023. Leichhardt is the most northern district of Queensland and has limited accessibility to the rest of the state and country. The Leichhardt electoral division includes the Weipa and Bauxite Hills bauxite mines that generate approximately 37% of Australia's annual bauxite production.

Figure 5: Map of Queensland Commonwealth Electoral Divisions



The Industry's direct contribution to remote townships in Leichhardt was estimated at \$324 million of value added and 2,963 workers (FTE) in 2023. The contribution provided opportunities for the region to generate economic outcomes and welfare benefits for the community.

Additionally, the expenditure occurring from Industry operations generated indirect and induced contributions estimated at \$51 million in value added and 696 workers (FTE) in 2023. The indirect and induced contributions demonstrate how the operational expenditure supports local businesses in the remote townships and the closest regional city of Cairns.

Table 11: Bauxite Mining Contribution in the Leichhardt Commonwealth Electoral District

	Direct	Indirect	Induced	Total
Value added (\$ million)	324	47	4	375
Employment (FTE)	2,936	640	56	3,632

Without the two bauxite mines, it is likely that businesses engaged with bauxite mining in remote townships and Cairns would lose significant activity. The loss of economic activity can affect incomes and broader community welfare outcomes.

6.2. Workforce Implications

Skills Training and Industry Robustness

The Industry directly employs more than 20,700 Australians in highly skilled positions. The average earnings of workers in the Industry is greater than \$134,000. This is \$50,000 more than the national average earnings for the manufacturing industry.

The Industry upskills the Australian workforce by providing extensive training to apprentices and graduates. The Industry has a workforce that is reflective of its diverse operations in mining, manufacturing and business. As a result, the Industry offers training that covers the operation of mining equipment through to advanced manufacturing techniques, the management of supply chains and the management of business finances.

The Industry also generates indirect and induced employment within the Australian economy. Indirect and induced employment occurs from the Industry's operational expenditure that flows into other businesses and households. The indirect/induced employment resulting from the Industry's activity was estimated at just over 55,000 FTE jobs in 2023.

The loss of the Industry as a leading producer would have significant implications for the labour force. The workforce skill uplift provided by the Industry has flow on effects to the remainder of the workforce and other sectors. In addition, the loss of expenditure would potentially lower the need for current staff levels in sectors that produce the goods and services purchased by the Industry.

Gender Equity Leadership

The Industry is a key employer of a diverse and inclusive workforce. This includes programs and policies that support gender equity and the promotion of women into leadership positions. Currently, the gender pay-gap within the AAC's Industry Members is approximately 9.9% at the median salary – less than half of the national average at 19%.²⁵

Industry Members have strong equal gender programs. Alcoa, as significant employer in the Industry, is recognised as an Employer of Choice for Gender Equality by the Workforce Gender Equality Agency.²⁶

²⁵ Workplace Gender Equity Agency, [WGEA Data Explorer](#), accessed July 2024. The Industry's gender pay gap was calculated by obtaining the results of individual Industry Members and collating the respective outcomes.

²⁶ Australian Government, [WGEA Employer of Choice for Gender Equality Citation Holders](#), accessed August 2024.

Rio Tinto as another key Industry employer who conducts a Women In Aluminium Program. The Rio Tinto program offers tailored mentoring, networking and educational sessions to enhance the leadership, technical and business capabilities for aspiring women. Similar to the Women In Aluminium Program, many other Industry Members conduct individual programs for women to achieve leadership positions.

6.3. Indigenous Communities

The bauxite sector provides significant investment and employment to Australia's remote and regional areas with high indigenous populations. These remote operations support employment for indigenous Australians. Remote bauxite mines in Australia hire between 17-30% of staff from local indigenous populations.

The remote operations in Queensland and in the Northern Territory townships generate a mutual benefit for the Industry and the local community. Firstly, Industry operations support the local economy of a region through investment into services and the local workforce. The Industry also provides support to the broader community through employment and the sponsorship of local community initiatives. Secondly, successful operations rely on a strong local community that hold long-term knowledge and skills related to a project or sector. Without a strong local community, remote operations would lose substantial knowledge and skills that enable the sector to operate efficiently. This relationship between the Industry and regional communities is essential to maintaining the level of the community welfare achieved in these areas and economic outcomes for Australia.

Box 2: Aurukun and Weipa – Local Employment and Community Engagement

Aurukun and Weipa in northern Cape York, Queensland (and the Leichhardt electoral division), hosts two large bauxite operations with an additional bauxite project awaiting approval. The 2021 Australian Census found the population of the Aurukun local indigenous area included 977 Aboriginal and Torres Strait Islanders. Similarly, the Weipa indigenous area was found to have an Aboriginal and Torres Strait Islander population of 814.

The direct indigenous employment resulting from Industry operations in Aurukun and Weipa is greater than 550 workers (FTE). As a result, the Industry contributes significantly to the total Aboriginal and Torres Strait Islander employment rates in the regions (total indigenous employment is 20% in Weipa and 89% in Aurukun).

In addition to directly employing Indigenous individuals, bauxite mining operations also support local community initiatives, including but not limited to:

- Health programs - designed to improve fitness and wellbeing whilst maintaining the job readiness of the community.
- School engagement - to explore career opportunities and pathways. Engagement activities range from presentations to on-site visits. The Industry offers school-based traineeship programs for hands-on experience and the provision of qualifications.
- Local community traineeships and apprentices - that offer highly recognised qualifications and opportunities for long-term employment.
- Sponsorship of local community groups - sporting clubs and educational foundations and local council programs.

7. Policy and Regulatory Barriers

The Industry has provided significant value to the Australian economy and has the potential to sustain and grow its economic contribution into the future. However, Industry Members have stated that the Industry must overcome key risks affecting the current and future status of the Industry as a key contributor to Australia and remote regions.

To inform the Industry's future potential and key risks, FTI Consulting has engaged with the AAC Industry Members. The Industry Members have provided a clear understanding of the potential investment and production available in the future, alongside the challenges that may destabilise the Industry.

7.1. The Industry's Future Potential

The Industry has the opportunity to maintain and grow its economic contribution. Opportunities for the Industry can be expressed right across the vertically integrated supply chain, from bauxite mining to aluminium extrusion, in response to a changing global supply environment and customer demands. Where opportunities materialise, there is likely to be significant medium and long-term growth for the Industry and benefits for Australian communities.

International Demand Growth and the Green Metals Opportunity

The Industry exports significant volumes to international markets. The use of aluminium globally is expected to grow in the medium and long-term. This could result in substantial Australian growth where expansion opportunities are realised. However, new players in the global Industry are emerging, including Guinea on the supply-side, and India on the demand side.²⁷

Guinea has seen significant growth in its bauxite operations in recent years and is seeking to ramp up bauxite production in the future, to meet expected demand growth. Indonesia also remains a key supplier for bauxite for key markets, including China. Both countries are attempting to expand alumina production and capture additional economic activity. In 2023, Indonesia banned the export of bauxite to encourage downstream processing of the resources. Additionally, political challenges in Guinea and Indonesia have contributed to enhanced risks in the supply chain for countries like China.²⁸ Therefore, although Australia is a higher-cost producer, the domestic Aluminium Industry has remained globally competitive due to historically lower exposure to sovereign risks and the vertically integrated supply chain.

In the short to medium term, global primary aluminium demand is expected to grow 3.8% per annum to 2029.²⁹ This is due to the maintenance of current demand levels and new demand for products that support the green economy. Under International Aluminium Institute's Reference Scenario, total demand for extruded aluminium purchased for aluminium fabrication is expected to increase by 2.1% per annum to 2030.³⁰

FTI Consulting considers that global policies supporting decarbonisation and the expansion of the green economy will be a driver of the increased global aluminium demand over the medium term. For example, the use of aluminium in green economy products includes solar panels where aluminium can account for

²⁷ Department of Industry, Science and Resources, *Resources and Energy Quarterly March 2024*.

²⁸ Mining Technology, [Growing demand for bauxite highlights risk of dependence on Guinea Supplies](#), viewed August 2024

²⁹ Department of Industry, Science and Resources, *Resources and Energy Quarterly March 2024*.

³⁰ International Aluminum Institute, [The Global Aluminum Cycle: Historic and Forecasted Volumes](#), viewed August 2024.

85% of solar PV components.³¹ Aluminium will continue to be an input for wind, energy storage systems, transmissions lines and expanded use in the automotive industry. The importation of Industry products to countries that produce green economy products is expected to grow in line with production of green energy infrastructure and electric vehicles within these countries.³²

Notwithstanding the potential issues outlined above, there is an opportunity for the Australian Industry to grow production volumes in the future. A consideration for the Industry in accommodating the aluminium demanded for the green economy will be the ability to decarbonise. Industry Members have noted that customers are expecting the Industry to decarbonise. The emissions associated with aluminium products may become a key consideration for customers when choosing between suppliers.

The willingness of customers to pay a 'green premium' will depend on the level of demand for green aluminium and the available supply. A green premium would only occur if demand for green aluminium exceeds supply. Government policy (requirements and incentives) to adopt green aluminium (in Australia and overseas) is likely to be a significant determinant of the demand for green aluminium.

The Industry has progressed with decarbonisation and committed to emission reductions targets. However, large capital costs to decarbonise the Industry should be supported to ensure that competitiveness is not lost in the short-term. To better allow the Industry to capture new aluminium demand and production opportunities, Members believe that Australian governments need to improve efficiency in the regulatory process and assist more directly in the transition to a low carbon future. This is outlined in Chapter 8.

Transition of Bauxite Mining Operations

The bauxite mining sector is crucial to providing the Industry's raw materials and sustaining the operation of sectors further downstream.

The Rio Tinto Gove bauxite operation will successfully conclude mining operations later this decade. The Weipa bauxite operation is the largest in the world, however, mining at the East Weipa mine concluded in 2024. The Weipa bauxite operation's Andoom mine is also scheduled to cease mining later this decade. Amrun, the newest and largest Weipa bauxite operation mine is expected to continue benefiting the Weipa community for decades to come. While Rio Tinto is investigating the expansion of the Amrun mine to offset production from Gove, East Weipa and Andoom, there is a risk of reduced bauxite production capacity in Australia due to the long lead times and complex project approval processes.

Opportunities exist for new bauxite mines to maintain and expand Australia's overall capacity. However, timely approval for exploration and development of new bauxite mining projects is crucial to ensure a smooth transition between operations and prevent a loss in overall production capacity. Mining projects with advanced planning development that are still awaiting approvals include:

- The Sunrise bauxite project in Binjour, Queensland.
- The Aurukun bauxite project in Cape York, Queensland.
- The Wuudagu bauxite project in the North Kimberly, Western Australia.

Additionally, several existing bauxite mines are awaiting approval for requests to expand production into new areas.

³¹ World Bank, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*, 2020

³² Department of Industry, Science and Resources, *Resources and Energy Quarterly March 2024*.

The Future State of the Industry and a New Frontier

The future of the Industry is one that is defined by continued product innovation and the aim to reduce the environmental impact of operations across the entire supply chain.

As outlined above, Australia is making strides and changing its product mix to support domestic operations and to meet higher expectations of consumers. The emergence of domestic production of aluminium fluoride and HPA – still in the early stages of production – will allow for additional potential for value added in Australia and for higher levels of resilience in the Industry supply chain.

Producing aluminium fluoride in Australia will make us less reliant on imports of the product from China and other countries. While aluminium fluoride is a small input, it is a critical input into aluminium smelting, and operations would be at risk without it. Producing it domestically not only bolsters Australia's sovereign capability but offers an alternate source of the product for the global market.

As outlined earlier in Box 1, advancements in HPA provides Australia with an opportunity to expand and diversify our aluminium-derived products, reaching a broader customer base. Given the complex processing involved, HPA products that attract high premiums generate significantly greater levels of value added.

In addition, the Industry will contribute to the Australian (and global) efforts to decarbonise. Aluminium is critical in the supply of solar panels and in the development of lightweight, durable electric vehicles.

Finally, Industry Members have ambitions to achieve net-zero by 2050 with interim targets and decarbonisation initiatives. The Industry Members have already taken steps to decarbonise operations, including:

- The significant direct investment in renewable electricity generation. For example, the Rio Tinto Gove Solar project with a capacity of 10.5 MW and set to begin in 2025, will complement three upcoming solar projects in Weipa. The most recent of these projects aims to reduce diesel electricity consumption at the Amrun mine by 37 percent and reduce annual emissions by 14,000 tonnes. This addition will enhance the existing 5.6 MW of solar capacity and 4 MWh of battery storage, benefiting both the Weipa operations and the local electricity network.
- The decarbonisation of processes at alumina refineries. For example, Alcoa's decarbonisation initiatives include the Refinery of the Future™, which aims to design a refinery that eliminates carbon emissions, reduces freshwater use, and ultimately eliminates bauxite residue. With support from the Australian Renewable Energy Agency and the WA government, Alcoa is exploring electric calcination technology that would allow for the substitution of natural gas in the final stage of the refining process. South32 has also converted the Worsley alumina refinery to natural gas from coal-fired boilers to reduce carbon emissions.
- The support of external renewable energy generation projects. The majority of Australia's aluminium smelters will require new power contracts between 2025 and 2029, with the right support there are opportunities to support additional renewable generation. For example, Rio Tinto and the Queensland government recently entered into a partnership to support investment in renewable energy projects to power Gladstone's Boyne Smelter. This will pave the way for a Boyne Smelter powered by green energy that lowers Australia's carbon footprint whilst contributing to the economy and supporting employment.

7.2. Policy and Regulatory Barriers Affecting the Aluminium Industry

Industry Members have emphasised that numerous policy and regulatory barriers may prevent future investment into the maintenance and growth of operations. Without overcoming these challenges, the current and future value of the Industry is likely to be impacted.

International investment into aluminium production will occur in the markets with the least risk to production and operating surplus. The Industry is capital intensive – with requirements for large upfront purchases of production equipment and frequent maintenance. Without new international investment, the Industry may have difficulty in maintaining current levels of production. Therefore, Industry Members indicate that Australian policy needs to continue to assist the Industry to attract investment, whilst recognising the extent of policy or regulatory barriers relative to international markets.

In fact, these policy and regulatory barriers are seen as one of the core challenges to Industry. This sentiment was a key theme across Industry Member consultations. Whilst the nature and scope of this engagement did not include consultation with other stakeholders outside of the ACA, these challenges outlined by Members hold merit and further consideration of these challenges is required.

Policy and Regulatory Barrier 1 – Regulatory Approval Concerns

Australian policy and regulation ensure that the community receives fair value from the Industry by ensuring safe operations. However, Industry Members have indicated that the approval process for the Industry is rigorous compared to foreign aluminium industries. The long and uncertain regulatory process in Australia creates a barrier for investment. Issues raised by Industry Members include:

1. **Cost of long lead times:** The timeframes for approvals processes for mines and refineries are significant and, in some cases, Industry stated a decade or longer. Long approvals processes can distort strategic or financial plans with delays that lessen investment returns. As a result, investors can favour opportunities in overseas aluminium industries that present lower approval timeframes.
2. **Cost of process uncertainty:** Industry Members stated low transparency in the approval process can significantly hinder efforts to achieve the desired outcome for government and Industry. Industry is willing to cooperate with government and align with government policy, however, Industry should be kept informed of expectations. Process uncertainty and costs tend to increase when different Australian government jurisdictions are not aligned on expectations. Industry Members have highlighted that Australian governments frequently present conflicting expectations.

Reducing uncertainty is particularly important when expectations change during the course of an approvals process. Members believe that improving transparency can assist the efficiency of the approval process and ensure positive outcomes for government and the Industry. The consistency of regulatory processes within and between jurisdictions is important to attract investment.

3. **Appropriate balance of environmental impacts and other policy objectives:** Industry members outlined that holistic approvals processes are required with consideration of both the initial and net environmental impacts, alongside a project's contribution to other policy objectives (such as climate change and economic diversification). Members believe that a more balanced approach, considering both economic benefits and costs, should be applied when evaluating a projects viability.
4. **Understanding and acknowledgement of the Industry:** To efficiently and effectively evaluate projects, governments should have a detailed understanding of the Industry and each project. Industry Members stated that a significant loss of sector and project understanding occurs when government employees transition roles. As a result, there can be significant delays due to the loss of industry specific knowledge within State and Federal Departments

Policy and Regulatory Barrier 2 – Decarbonisation and Energy Transition

Australia has significant potential in the green metals sector, but Industry Members indicated that there was a risk of losing international competitiveness due to higher energy capital costs compared to international competitors. These elevated energy costs may also reinforce Australia's reputation as a higher cost producer, potentially deterring the international investment required to maintain and expand the Industry.

Industry Members have ambitions to achieve net-zero by 2050 with interim targets and decarbonisation initiatives. Australian renewable energy costs are expected to fall in the long-term. However, in the short and medium term the Industry Members highlighted the challenge of high energy costs combined with a high cost to decarbonise the industrial processes. The relatively high energy costs are a challenge for attracting the international investment required to maintain and grow the Industry operations and value added in Australia.

Additionally, the Industry Members described the negative implications of regulatory complexity and uncertainty within state and national energy planning. Without a reliable and competitively priced renewable energy supply prioritised for Industry use, they believe that the future of green metals and aluminium production could be uncertain. Members emphasised that it is important that the renewable energy planning is undertaken effectively to attract investment seeking to produce green aluminium.

Policy and Regulatory Barrier 3 – International Trade

Members have indicated that downstream sectors of Industry are exposed to foreign competitors, that at times sell below the price of production. The importation of extruded and fabricated aluminium from foreign sources that hold production subsidies can reduce the market share of domestic producers. A reduction in the customer market share for domestic producers will reduce revenue, reducing future investment and production levels. As a result, the community will receive lower levels of value and reduced sovereign capability. Further discussion of the risk resulting from unfair import competition is presented in Chapter 5.

Policy and Regulatory Barrier 4 – Supply of Industry Materials

The supply of key materials used for Industry production can be vulnerable to external and internal risks.

Firstly, a vertically integrated supply chain establishes interdependencies between the Industry's four sectors. The vertical integration increases efficiencies and is a comparative advantage for Australian aluminium production. However, a disruption in one sector can cause negative implications for the downstream sectors. Lower levels of production in the upstream sector can cause a disruption in the supply of key materials for the downstream sectors. The effect of a shock in one sector across interdependent sectors was presented in Chapter 4.

Secondly, Industry Members stated that inputs sourced from international markets can be unreliable over the long-term. Industry Members have indicated that key manufacturing and processing inputs, such as aluminium fluoride, are purchased from international suppliers. However, the international manufacturers and transportation services can be exposed to international shocks and supply chain issues. This can make Australian production vulnerable. Members believe that the government should support the Industry to manufacture these key inputs and reduce the Industry exposure.

8. Observations for Policy and Regulatory Improvements

The Industry provides a significant economic contribution to Australian and regional communities. There is an opportunity to maintain and expand the Industry's economic contribution, however, the Industry Members stated several key challenges that must be overcome.

The extensive consultations with Industry Members outlined a set of potential policy and regulatory improvements that may address the policy and regulatory barriers. Industry Members stated that the policy and regulatory improvements are important for establishing a more stable policy environment that generates future investment. FTI Consulting recognises that the observations hold merit, and further in-depth analysis is required on the Industry's observed policy issues to make informed policy decisions.

Observation 1 – Timely, Clear and Consistent Approvals Processes

Members response to Policy and Regulatory Barrier 1 – Regulatory Approvals

To entice new investment, Members indicated that the Australian regulatory approval process for the Industry should be timely, clear and consistent. Without a simplified and efficient regulatory approvals process, Industry Members stressed that there is a risk of dissuading future Industry investment from the Australian economy.

Industry Members have noted long lead times and uncertainty in regulatory approvals. Similarly, Industry Members highlight that there needs to be an increased recognition of a project's economic benefits when evaluating the project. These are the drivers for investment risks discussed in Chapter 7. The following sub-level observations outline statements from Industry Members that stress how policy changes may improve the efficiency and effectiveness of the regulatory process:

1. **A single point of contact:** Governments should ensure a single point of contact with Industry throughout regulatory approval processes. The aim of a single point of contact is to improve transparency of expectation and collaboration with Industry. The single point of contact would have a detailed understanding of the Industry and the individual project.
2. **Holistic consideration of impacts and benefits** Industry Members have stated that a holistic approvals processes is required with consideration of both the initial and net environmental impacts, alongside a project's contribution to other policy objectives (such as climate change and economic diversification). Members believe a more holistic approach will improve the approvals process, encourage investment and increase the Industry's economic contribution to the Australian economy.
3. **Consideration of shortened and more transparent approval lead-times:** Long-lead times for approval can significantly deter investment. Government should increase capacity of departments to evaluate projects and act to substantially shorten approval lead-times.

One Industry criticism of the current system is that the environmental approvals process is a "black box" and there is a lack of engagement with Industry, and there are rapidly changing requirements. The Industry prefers a collaborative approach with government that works to achieve policy objectives. Collaboration and transparency also ensure that Industry is not surprised by changes in government expectations and allows the Industry to effectively plan to achieve approval requirements.

4. **Improved consistency within and between levels of government:** Industry Members have expressed willingness to provide government with a strong and transparent evidence base to support project outcomes. However, Industry Members have identified a level of inconsistency between the expectations of different levels of government and different government agencies. It would be beneficial

for governments to reciprocate this level of engagement and provide greater consistency regarding the expectations that are need to be met to secure approvals from government.

5. **Early engagement with Industry on regulatory design:** The Industry aims to provide the best environmental and community outcomes. Industry members stated that governments should consider the knowledge and experience of the Industry in designing the best approaches for improving community outcomes whilst maintaining investment. Industry Members have indicated a willingness to engage government on an enhanced cost-recovery system for additional resourcing in return for pre-determined lead times and greater transparency.

Observation 2 – Critical Minerals List

Members response to Policy and Regulatory Barrier 1 – Regulatory Approvals

Members response to Policy and Regulatory Barrier 4 – Supply of Industry Materials

Industry Members have indicated that bauxite, alumina and aluminium should be recognised on the Australian Critical Minerals List. These products have a vulnerable supply chain and are key resources for Australia.

Including these resources on the Critical Minerals List would help the government mitigate key risks to future production. Such inclusion would streamline the regulatory process, enhance funding for decarbonisation initiatives, and support the development of advanced manufacturing capabilities. Additionally, members believe that recognising these materials on the Critical Minerals List would bolster the Industry's ability to attract international investment in a competitive market.

Observation 3 – Decarbonisation and Energy Transition Support

Members response to Policy and Regulatory Barrier 2 – Decarbonisation and Energy Transition

The Industry is undertaking decarbonisation initiatives and is implementing a broad transition to renewable energy. However, transitioning to renewable energy within the Industry requires significant capital investment. Industry Members stated there is a risk that the Industry may lose price competitiveness in the short-term or, lose customers in the long-term.

To decarbonise Australian manufacturing and establish a green aluminium Industry in Australia, Members indicated that a suite of government policies and frameworks are required, including:

1. Additional policy and financial support for the Industry that targets specific energy transition projects. Government support may present itself in a combination of production credits and transformational capital funding.
2. Increased renewable electricity planning and coordination across the network. This will ensure competitively priced renewable energy is available and prioritised for use by industries such as alumina and aluminium.

Observation 4 – International Trade

Members response to Policy and Regulatory Barrier 3 – Import Competition

Unfair import competition in the downstream sectors of the Industry is understood by Industry Members to be threatening future production and community outcomes. The importation of extruded and fabricated aluminium manufactured with production subsidies is discussed in Chapter 5.

Industry Members stated that the Australian government should take further action to ensure Australian manufacturers are not exposed to cost subsidised imported aluminium. This should include further strengthening the trade remedies process to better support free and fair trade.

Appendix A – Methodology to Economic Contribution Analysis

FTI Consulting have completed the economic analysis using our bespoke framework, the *FRIO*. The *FRIO* is a modelling tool that is well suited to conducting regional economic contribution analysis and includes several distinct features:

1. The framework is based on the last ABS national I-O table, using the most up-to-date national accounting measures.
2. Inclusion of a module for bespoke regional disaggregation, including Australian state and sub-state regions. For the estimates of the Aluminium Industry, FTI Consulting has defined the model to include the state level and key Commonwealth Electoral Divisions.
3. Covers all Australian industries and demonstrates the trade interdependence between all industries.

The *FRIO* model is used to estimate the Industry's **direct, indirect and induced** contribution to value added (including wages and gross operating surplus) at the region, state and national level in 2023.

Direct Contribution

FTI consulting customised the *FRIO* and validated the model internally, before it was populated with data from the Industry. The Industry economic database provides a picture of the **direct contribution** of the Industry. The database included important metrics for all sectors of the Industry – bauxite mining, alumina refineries, aluminium smelting and fabricators.

For each of the Industry's four sectors, FTI Consulting accumulated data to represent:

- Economic output or turnover – including domestic and export production volumes and sales
- Production expenditure – including identification of cross sector expenditure
- Profits – as represented by EBITDA
- Wages paid
- Employment – as represented by full-time equivalent workers
- Taxes paid on production

The database was populated from a variety of different sources. Information was first collected directly from the AAC and Industry Members, that informed the size and operations of the Aluminium Industry - examples include trade metrics and information on the Industry workforce. Where data gaps were present, FTI Consulting utilised information from government sources - examples include, the ABS's Australian Industry publication (cat. no 8155.0), International Trade in Goods (including cat. no. 5368.0), the Australian Census, and the Department of Industry, Science and Resources Energy Quarterly. For all data sources, FTI Consulting validated the data from the Industry and government sources to ensure the metrics are reflective of the industry and appropriate for the contribution analysis.

Indirect and Induced Contribution

From the database of the direct contribution, the *FRIO* framework estimates the **indirect and induced contribution** of the Aluminium Industry. Indirect contribution measures the flow of economic activity in business operations that result from an industry expenditure. The induced contribution includes economic activity that occurs within the household sector.

To measure the indirect and induced contribution, the *FRIO* framework utilised the I-O tables developed by the ABS. The industry classifications within the I-O tables are based on the ANZSIC, with 114 industries in the modelling framework.

The I-O tables determine the economic value added from Australian industry through flow-on impacts. The flow-on contribution is the economic benefits received from industry expenditure, namely the payments for the supply of primary input goods or services. This expenditure on other Australian industries then generates economic value add in the supply sector through further compensation to employees, gross operating surplus (EBITDA) and the taxes on production. The portion of employee compensation, EBITDA and taxes on production compared to the Industry production by each sector of the economy is referred to as the share of value added.

The I-O tables also account for the intermediate flows between industries, which are broken down by the source industry of each input. The intermediate flow between the use and source industry can be compared to the total intermediate inputs of the use industry to derive the amount of economic activity that occurs from activity of the use industry. These are referred to as 'the multipliers'. The cumulation of multipliers between one sector and all other sectors in the economy should be less than one, representing that there is some value lost to imported production inputs and profits.

The FRIO framework allows for the disaggregation of economic contribution at a state and regional level. At a high level, the regional disaggregation utilises location quotients to estimate the size of each sector in a particular region relative to the size of the total sector at the national level. There are multiple methods for calculating location quotients. The FRIO framework has taken the most robust and conservative method in order to not over- or under-estimate the size of each sector in each region.

Our experience demonstrates that care needs to be taken when estimating the indirect and induced contribution – in particular, to avoid double counting. Hence, the share of value added from direct contribution was separated within the I-O tables. As the Aluminium Industry is highly interdependent, the separation of direct contribution included the Industries' inter-industry-trade. Therefore, FTI Consulting have developed a number of techniques to avoid double counting, including identifying those industries in the FRIO model that are related to the Industry, then netting out the contribution for those industries.

FRIO Outputs

Overall, the FIRO framework produces estimate of the direct, indirect and induced contribution of the Australian Aluminium Industry at a point in time. The economic contribution represents the turnover, value added (wages and EBITDA), and the employment contribution by the desired regions, states and the national economy. The outputs also include the level of intra-industry-trade between each of the Industry's sub-sectors.

Table 12 - Components of Economic Impact Assessments Utilising Input-Output Tables

Category	Definition and Components
Value Added	Value added measures the level of output (income) generated by the Industry's factors of production (labour and capital). The sum of value added across all entities in the economy equals gross domestic product (GDP). The value added measure can be thought of as the contribution to the economy.
Employment	Employment is the measure of workers that are employed as a result of Industry operations and flows to the remainder of the economy. Employment is measured on the basis of full time equivalent (FTEs) hours.
Direct Contribution	The direct contribution is the value added or employment generated from the operation of the Industry. The direct contribution is the sum of gross operating surplus (EBITDA), employment contributions (wages paid) and taxes on production (including royalty payments and payroll taxes).
Indirect Contribution	The Indirect contribution is the value added or employment in commercial economic activity generated from the operational expenditure of the Industry. The Industry operating expenditure is the purchases of goods or services utilised for production purposes. The indirect contribution only measures the flow of expenditure to commercial operations and excludes the household sector.
Induced Contribution	The induced contribution is the value added or employment in household economic activity generated from the operational expenditure of the Industry. The Industry operating expenditure is the purchases of goods or services utilised for production purposes. The induced contribution only measures the flow of expenditure to households.
Total Contribution	The total contribution is the sum of value or employment from direct, indirect and induced contributions.
Input-Output (I-O) Tables	<p>The Australian Input-output (I-O) tables are developed by the Australian Bureau of Statistics (ABS) with industry classifications based on the ANZSIC.</p> <p>The I-O tables measure the expenditure for production inputs (goods and services) between two industries. This expenditure is referred to as the intermediate flow.</p>
Multipliers	The intermediate flow between the consumption and source industry can be taken as a proportion of the total intermediate flows. This will derive the change in economic activity that occurs from a change in the activity of a selected industry. These are referred to as 'the multipliers'. The cumulation of multipliers between one sector and all other sectors in the economy should be less than one, representing that there is some value lost to imported production inputs and profits.

Appendix B – Economic Contribution by State

The following appendix outlines the economic contribution of the Industry at a state level. A high-level discussion of Industry contributions by state is provided in Chapter 3.2. The following tables provide the opportunity for further detailed analysis of Industry and sector contributions.

Western Australia

In Western Australia, the Industry provided an economic contribution of \$5.7 billion in value added and supported 18,500 workers (FTE) for 2023.

The direct economic benefit from the Industry was \$2.6 billion and support for 8,000 workers (FTE) (including wages paid, taxes on production, and gross operating surplus). The indirect benefit was \$2.4 billion and support for 7,400 workers (FTE), representing the flow-on contributions to other commercial activities. The flow-on impact to the household sector with induced benefits was \$650 million and support for 3,100 workers FTE.

Three bauxite operations generate a total of \$2 billion in economic value. This includes royalty payments of \$180 million to the Western Australian government. A further bauxite development near Kalambaru and expanded operations at existing sites are awaiting government approvals.

Due to the high silica content in south-west Western Australian bauxite, Western Australian refineries contain specialist equipment and are unique globally. As a result, there is a strong interdependency between south-west Western Australian bauxite mines and alumina refineries. The economic contribution of alumina refineries was \$3.6 billion and support for 11,700 workers (FTE).³³ The alumina contribution included a further \$107 million in royalty payments to the state government.

Downstream operations including an extrusion plant and distribution activities in the south-west of the state contributed a further \$82 million and support for 402 workers (FTE).

Table 13 – Industry Value Added by Sector for Western Australia (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	1,264	564	207	2,036
Alumina Refining	1,295	1,897	439	3,631
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	46	26	10	82
Australian Aluminium Industry	2,606	2,487	656	5,749

Table 14 – Industry Employment by Sector for Western Australia (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	1,878	3,238	1,260	6,376
Alumina Refining	5,848	4,040	1,851	11,740
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	239	162	0	402
Australian Aluminium Industry	7,966	7,441	3,111	18,518

³³ The analysis included four aluminum refineries in Western Australia based on 2023 production volumes. The Kwinana alumina refinery is included in the economic contribution data. The refinery ceased alumina production in 1H 2024 as part of a phased curtailment. However, three refineries still remain in Western Australia and the Industry has the opportunity to maintain and grow production into the future with new investment.

Queensland

In Queensland, the Industry provided an economic contribution of \$4.3 billion in value added and supported 16,000 workers (FTE) in 2023.

The direct economic benefit resulting from Industry operations was \$1.9 billion and support for 8,000 workers (FTE) (including wages paid, taxes on production and gross operating surplus). The indirect benefit was \$1.8 billion and support for 5,800 workers (FTE), representing the flow-on contributions to other commercial activities. The flow-on impact to the household sector with induced benefits was \$500 million and support for 2,500 workers FTE.

Two bauxite operations generate a total of \$1.5 billion in economic value to the remote region of Cape York. This includes royalty payments of \$146 million to the Queensland government. A further two bauxite developments are awaiting government approvals, presenting an opportunity for the state to benefit from additional Industry activity.

The largest contribution is generated from the two alumina refineries located in Gladstone with an economic value of \$755 million and support for 6,214 workers (FTE). The Boyne aluminium smelter generates a contribution of \$755 million and support for 2,464 workers. The four extrusion plants in south Queensland also provide an economic benefit of \$289 million and support for 1,386 workers (FTE).

Table 15 – Industry Value Added by Sector for Queensland (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	937	419	176	1,532
Alumina Refining	570	917	245	1,732
Aluminium Smelting	270	382	103	755
Extrusion and Distribution	156	93	41	289
Australian Aluminium Industry	1,932	1,811	565	4,308

Table 16 – Industry Employment by Sector for Queensland (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	2,936	2,405	1,052	6,392
Alumina Refining	3,237	1,968	1,009	6,214
Aluminium Smelting	1,197	838	429	2,464
Extrusion and Distribution	804	576	6	1,386
Australian Aluminium Industry	8,174	5,787	2,496	16,457

New South Wales

In New South Wales, the Industry provided an economic contribution of \$1 billion in value added and supported 3,600 workers (FTE) for 2023.

The aluminium smelter in Tomago provided \$900 million and supported 2,800 workers (FTE). This included a direct contribution of \$300 million and 1,200 workers (FTE). An additional benefit of \$580 billion and supported 1,600 workers (FTE) was provided from the indirect and induced activity generated by the aluminium smelter.

The distribution of extruded aluminium from plants in other states contributed \$175 million to the economy and supported 800 workers (FTE) in the state.

Table 17 – Industry Value Added by Sector for New South Wales (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	310	444	138	892
Extrusion and Distribution	89	57	29	175
Australian Aluminium Industry	400	501	167	1,067

Table 18 – Industry Employment by Sector for New South Wales (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	1,241	994	561	2,796
Extrusion and Distribution	459	350	9	819
Australian Aluminium Industry	1,700	1,344	570	3,615

Victoria

In Victoria, the Industry provided an economic contribution of \$700 million in value added and supported 2,700 workers (FTE) in 2023.

The aluminium smelter in the regional city of Portland provided \$400 million in economic value and support for 1,400 workers (FTE). This included a direct contribution of \$146 million and support for 678 workers (FTE). An additional \$270 million and 700 workers (FTE) were supported from the indirect and induced activity generated by the aluminium smelter.

Downstream operations including four aluminium extrusion plants and aluminium distribution operations provided an economic contribution of \$280 million and supported 1,300 workers (FTE).

Table 19 – Industry Value Added by Sector for Victoria (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	146	205	64	415
Extrusion and Distribution	143	91	46	280
Australian Aluminium Industry	288	297	111	696

Table 20 – Industry Employment by Sector for Victoria (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	678	450	256	1,383
Extrusion and Distribution	739	560	12	1,310
Australian Aluminium Industry	1,417	1,010	267	2,694

Northern Territory

In the Northern Territory, the Industry provided an economic contribution of \$430 million in value added and support for nearly 1,400 workers in 2023.

The economic contribution is driven by the Gove bauxite operation. The Gove site provided a direct contribution of \$280 million in economic activity and support for 1,300 workers (FTE). This included \$40 million in royalties paid to the Northern Territory government. An additional \$140 million and 820 workers (FTE) were supported from the indirect and induced activity generated by the bauxite mine.

The distribution of extruded aluminium to the Northern Territory from extrusion plants in other states provided an economic contribution of \$13 million and supported 68 workers (FTE).

Table 21 – Industry Value Added by Sector for Northern Territory (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	280	118	22	420
Alumina Refining	0	0	0	0
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	8	4	1	13
Australian Aluminium Industry	288	122	23	433

Table 22 – Industry Employment by Sector for Northern Territory (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	504	680	144	1,327
Alumina Refining	0	0	0	0
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	41	26	0	68
Australian Aluminium Industry	545	706	144	1,395

Tasmania

In Tasmania, the Industry provided an economic contribution of \$280 million in value added and supported 145 workers (FTE) in 2023.

The aluminium smelter in Bell Bay provided an economic value of \$250 million and supported 950 workers (FTE). This included a direct contribution of \$98 million and supported 600 workers (FTE). An additional benefit of 150 million and supported 350 workers (FTE) was provided from the indirect and induced activity generated by the aluminium smelter.

Downstream operations, including three aluminium extrusion plants and aluminium distribution operations, provided an economic contribution of \$30 million and supported 150 workers (FTE).

Table 23 – Industry Value Added by Sector for Tasmania (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	98	128	23	249
Extrusion and Distribution	17	9	3	29
Australian Aluminium Industry	115	137	25	278

Table 24 – Industry Employment by Sector for Tasmania (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	601	255	95	951
Extrusion and Distribution	88	57	0	145
Australian Aluminium Industry	689	312	95	1,096

South Australia

In South Australia, the Industry provided an economic contribution of \$78 million in value added and supported 390 workers (FTE) for 2023.

The economic benefit was generated from an aluminium extrusion plant and aluminium distribution activities. This included a direct contribution of \$44 million and support of 234 workers (FTE). An additional benefit of \$30 million and support of 156 workers (FTE) was provided from the indirect and induced activity generated by the aluminium extrusion and distribution sector.

Table 25 – Industry Value Added by Sector for South Australia (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	44	25	9	78
Australian Aluminium Industry	44	25	9	78

Table 26 – Industry Employment by Sector for South Australia (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	0	0	0
Alumina Refining	0	0	0	0
Aluminium Smelting	0	0	0	0
Extrusion and Distribution	234	156	0	390
Australian Aluminium Industry	234	156	0	390

Cross-border flows

Industry expenditure that occurs within a state can flow across state borders, generating an additional benefit for other states. Under this modelling framework, these cross-border flows are not attributable to any particular state. The cross-border flows should be perceived as the measure of business and household activities that are additional to the individual state contributions presented above.

The value added from cross-border flows is significant across all Industry sectors. The bauxite mining and alumina sectors generate the largest volume of purchases from interstate locations. As a result, states outside of Western Australia and Queensland are likely to receive significant benefits from the bauxite mining and alumina operations.

The downstream sectors of aluminium smelting and aluminium extrusions also generate purchases across state borders. The operation of these downstream sectors is more dispersed across the states. As a result, the cross-border benefits from the downstream sectors would likely be spread across all states.

Table 27 – Industry Value Added by Sector for Cross-Border Flows (\$ million)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	805	647	1,452
Alumina Refining	0	1,589	899	2,488
Aluminium Smelting	0	671	337	1,008
Extrusion and Distribution	0	277	192	469
Australian Aluminium Industry	0	3,342	2,075	5,418

Table 28 – Industry Employment by Sector for Cross-Border Flows (FTEs)

	Direct	Indirect	Induced	Total
Bauxite Mining	0	4,485	3,650	8,136
Alumina Refining	0	7,987	6,328	14,315
Aluminium Smelting	0	3,362	2,524	5,886
Extrusion and Distribution	0	1,475	1,891	3,366
Australian Aluminium Industry	0	17,309	14,394	31,703

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