Aluminium

13 Al 26.982

Major Australian bauxite deposits, Gt

Aluminium

Bauxite ore is refined to recover alumina, smelted to make aluminium

2-3 tonnes of bauxite is required to produce one tonne of alumina

China is the **largest producer and consumer** of primary aluminium

Each electric vehicle **contains 0.25 tonne** of aluminium

Key consumer markets for primary aluminium, 2021

60% China

7% United States

3% Germany

3% Japan

2% Turkey

Australia's aluminium

World's 1st largest **bauxite** producing nation in 2021

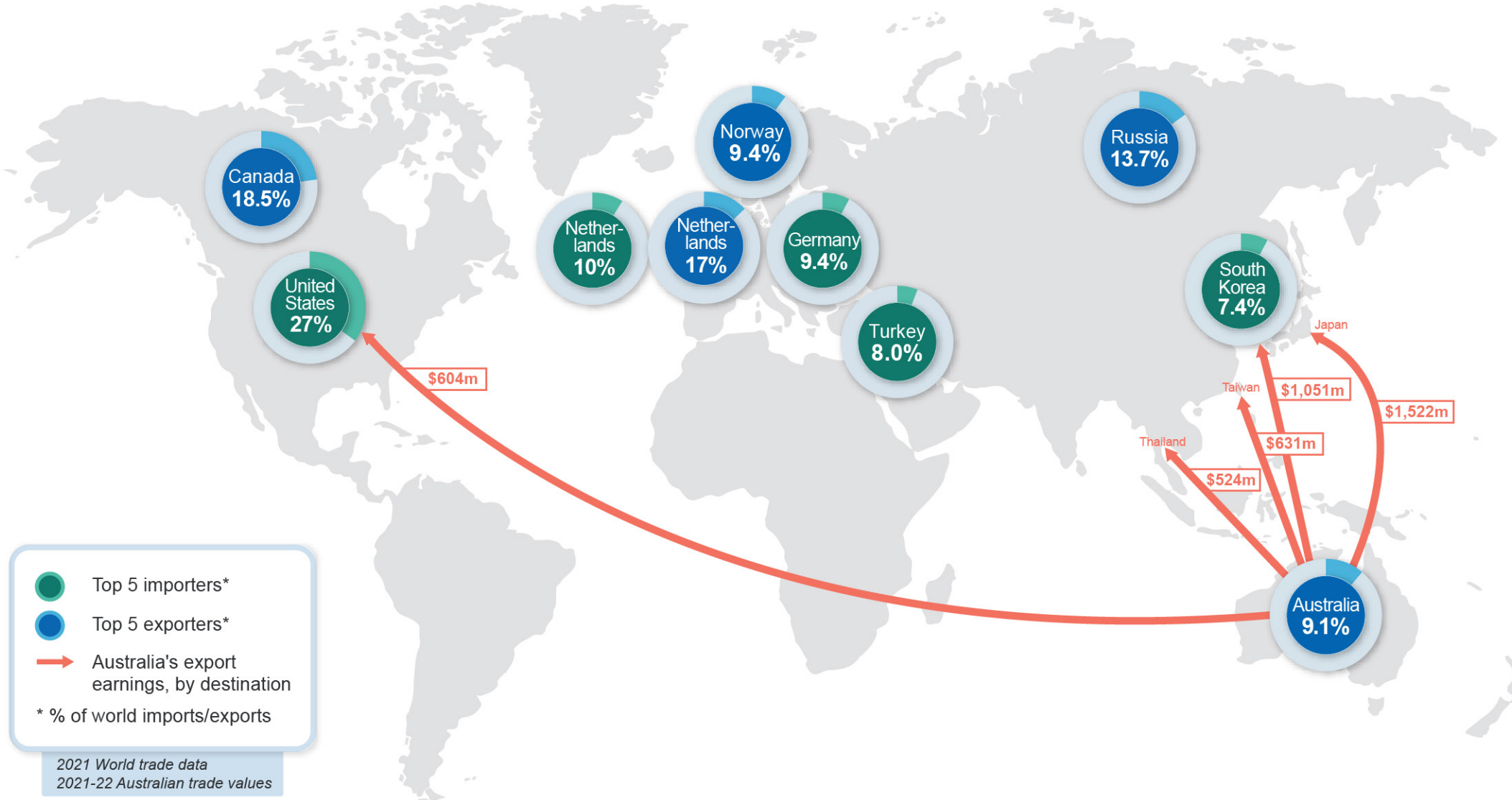
Largest alumina exporter, **18m tonnes** in 2021

2nd largest alumina producer, **21m tonnes** in 2021

Aluminium

13 Al 26.982

Trade map | September 2022



11.1 Summary

- Lower primary aluminium supply from China and Europe is expected to keep aluminium prices at high levels in 2022, averaging US$2,790 a tonne. Prices are forecast to drift down through the rest of the forecast period, averaging US$2,490 a tonne in 2024, getting some support from growing demand for new, energy-efficient cars and technologies.
- Australia's annual primary aluminium and alumina output is expected to be broadly steady over the outlook period: at around 1.6 million tonnes of primary aluminium and 21 million tonnes of alumina. Australia's annual bauxite output is expected to increase from 106 million tonnes in 2022–23 to nearly 109 million tonnes in 2023–24 (see Australia section).
- Australia's aluminium, alumina and bauxite export earnings are forecast to be steady at $15 billion a year in 2022–23 and 2023–24.

11.2 World consumption

China and the EU led lower primary aluminium consumption in H1 2022

Global primary aluminium consumption fell by 1.1% year-on-year to 34 million tonnes in the first half of 2022, largely due to a 2.0% year-on-year fall in demand in China — the world's largest aluminium consumer.

Weaker Chinese demand was due to a softening in GDP. In quarter-on-quarter terms, Chinese GDP contracted by 2.6% in the June quarter 2022 — the lowest quarterly result in more than two years. Over the year to the June quarter 2022, Chinese GDP grew by just 0.4%.

On top of the impacts of COVID-19 lockdowns, the Chinese property sector has continued to struggle. Financial stress has forced Chinese property developers to suspend work on projects for households who have purchased off-plan homes. As property developers delay projects, home buyers have also suspended their mortgage repayments. Property construction accounts for around 30% of China's aluminium consumption.

Outside of China, aluminium usage dropped in Spain (by 18% year-on-year to 244,000 tonnes), Sweden (down by 16% year-on-year to 52,000 tonnes), and the Netherlands (down by 46% year-on-year to 30,000 tonnes).

The European automotive sector has continued to be impacted by global supply chain issues. According to Auto Forecast Solutions (AFS), the semiconductor shortage has reduced European car output by over 1.0 million units in the year to 24 July 2022. This represents a loss of around 207,000 tonnes of aluminium consumption. Based on the data from the European Automobile Manufacturers' Association, passenger car registrations in Europe fell by 14% year-on-year in the first-half of 2022.

World alumina usage decreased by 0.5% year-on-year to 65 million tonnes in the first-half of 2022, due to lower global aluminium production, which was down by 0.5% year-on-year in the same period. China remains the world's largest alumina consuming country, accounting for 57% of global alumina consumption. Outside of China, alumina consumption in India and the UAE rose by 4.5% and 12%, to reach 4.0 and 2.4 million tonnes in the first-half of 2022, respectively.

World bauxite usage fell by 1.1% year-on-year in the first-half of 2022 to 179 million tonnes due to a fall in global alumina production (down 1.1% in the first-half of 2022). China remained the world's largest bauxite consuming country, accounting for 51% of global bauxite consumption.

Lower global primary aluminium, alumina and bauxite usage in 2022

Slowing global economic growth and rising inflation and interest rates in many parts of the world are expected to impact primary aluminium consumption over the rest of 2022.

A European Union agreement on 26 July 2022 to reduce the demand for natural gas by 15% in the 2022–23 winter season will dampen the Eurozone's industrial activity in the second-half of 2022. The result could be a further fall in primary aluminium consumption across the region.

In the US, there are signs of slowing construction activity: a 2.0% month-on-month drop in housing starts in the month of June 2022 followed a 12% month-on-month decline in May 2022. Housing permits also dropped to the lowest level since September 2021. The slowdown in construction activity indicates that the successive interest rate hikes by the US Federal

Reserve have begun to hit the US housing market. This is likely to reduce aluminium demand in the construction sector.

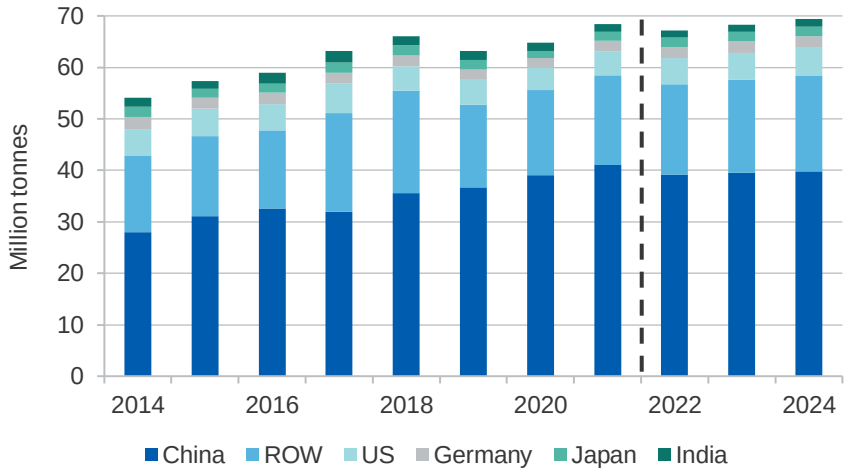
Since the June 2022 *Resources and Energy Quarterly* (REQ), the Chinese Government has rolled out a further series of measures to stabilise the economy. These measures should see sentiment/activity improve in 2023.

Global primary aluminium consumption is estimated to decrease by 1.9% in 2022, to 67 million tonnes (Figure 11.1).

World alumina usage is estimated to decrease by 0.5% in 2022 to 130 million tonnes (Figure 11.2). An expected 1.0% fall in global primary aluminium production in 2022 is likely to reduce global alumina demand. China is expected to attribute mainly to the fall in global alumina demand, with an estimated 0.9% decline in primary aluminium production in 2022.

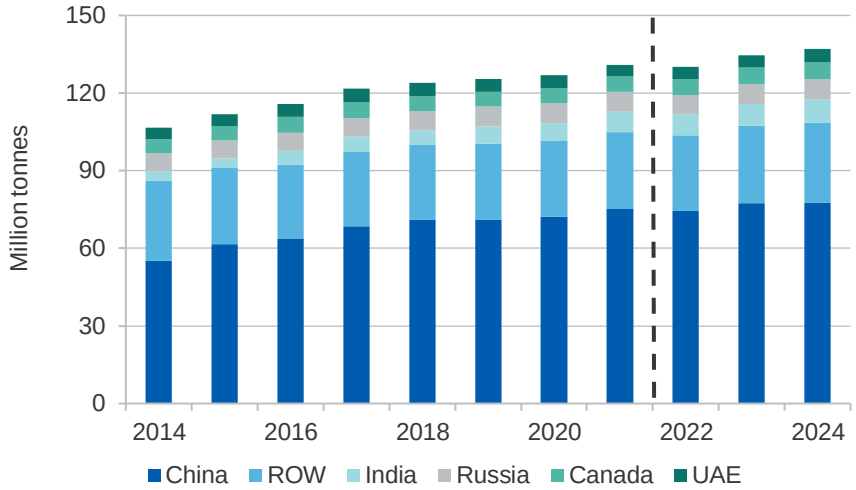
World bauxite usage is estimated to fall by 0.3% in 2022 to 357 million tonnes (Figure 11.3). The falls are expected to be due to lower alumina output from China.

Figure 11.1: World primary aluminium consumption



Source: World Bureau of Metal Statistics (2022); Macquarie (2022); Department of Industry, Science and Resources (2022)

Figure 11.2: World alumina consumption



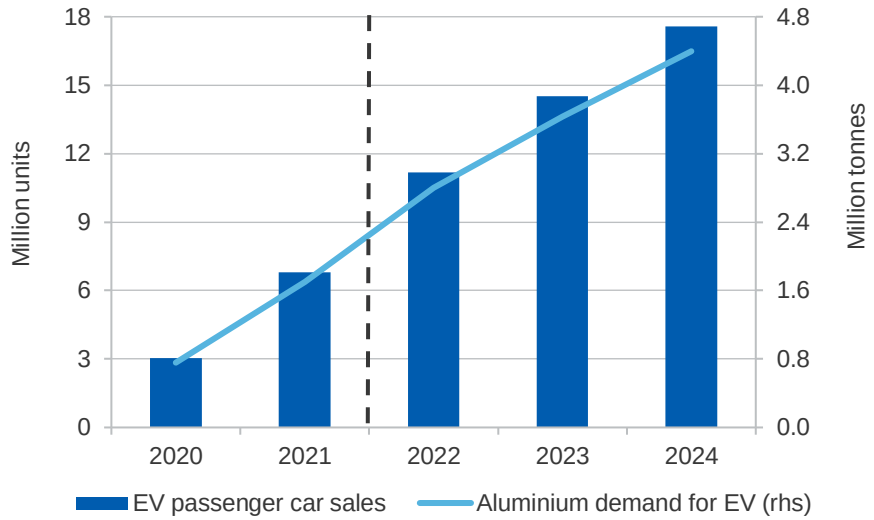
Notes: ROW: Rest of the world

Source: Department of Industry, Science and Resources (2022)

Beyond 2022, world primary aluminium consumption is forecast to grow at an annual average rate of 1.7%, to reach 69 million tonnes by 2024 (Figure 11.1). A significant driver of aluminium demand is expected to come from cars, particularly energy-efficient vehicles and electric vehicles (EVs) — which contain a higher proportion of aluminium. It is estimated that EV passenger car sales will rise from 6.8 million units in 2021 to 17.6 million units in 2024. With an estimated average aluminium content of 250 kilograms per electric vehicle, aluminium usage in EVs is forecast to increase from 2.8 million tonnes in 2022 to about 4.4 million tonnes in 2024 (Figure 11.3).

World alumina usage is forecast to rise at an average annual rate of 2.6% over the outlook period, reaching 137 million tonnes by 2024 (Figure 11.2). Alumina demand is driven by primary aluminium production, which is forecast to lift by an average of 2.8% a year between 2023 and 2024.

Figure 11.3: Global EV car sales vs aluminium demand



Source: Wood Mackenzie (2022); Department of Industry, Science and Resources (2022)

World bauxite usage is forecast to grow at an average annual rate of 2.0% over the outlook period to 372 million tonnes in 2024 (Figure 11.4). The gains are expected to be largely driven by higher alumina output from existing refinery capacities in China and India.

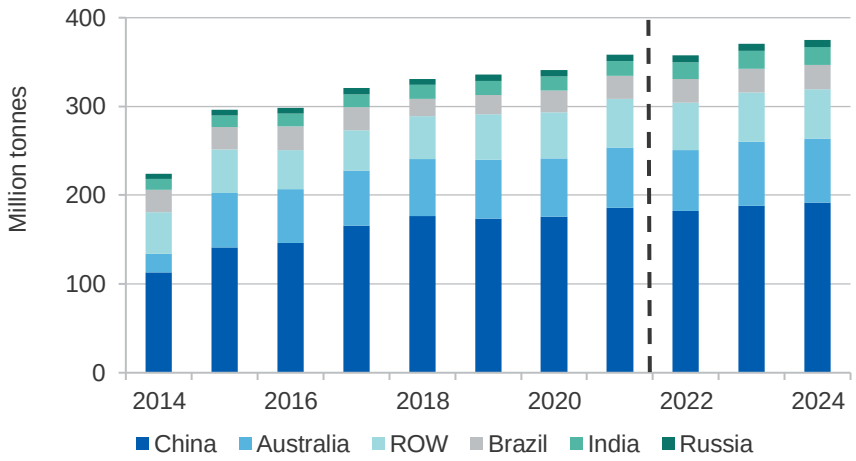
11.3 World production

Aluminium and bauxite output grew, but alumina output fell in H1 2022

World primary aluminium production fell by 0.5% year-on-year to nearly 34 million tonnes in the first-half of 2022, due to lower output in China and Brazil.

China produced over 19 million tonnes of primary aluminium in the first half of 2022, down by 0.8% year-on-year, as the COVID-19 containment measures and power restrictions in the March quarter 2022 affected smelting operations. Production recovered slightly in the June quarter 2022, driven by the removal of power restrictions and higher power supply.

Figure 11.4: World bauxite consumption



Notes: ROW: Rest of the world

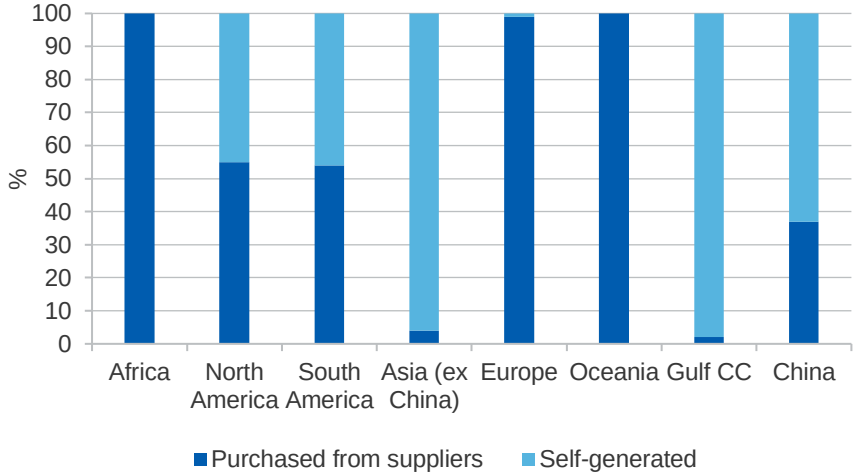
Source: Department of Industry, Science and Resources (2022)

Primary aluminium production in Brazil decreased by 8.9% year-on-year in the first-half of 2022 to 347,000 tonnes. The restart of Alcoa/South 32 447,000 tonnes a year Alumar aluminium smelter in Brazil was slower than expected, due to the need to stabilise the electrolytic bath. The smelter only produced 1,000 tonnes of primary aluminium in the June quarter 2022.

Primary aluminium production in the UAE increased by 12% year-on-year in the first-half of 2022 to 1.2 million tonnes, driven by the commission of 92 new reduction cells at Emirates Global Aluminium' Al-Taweelah aluminium smelter.

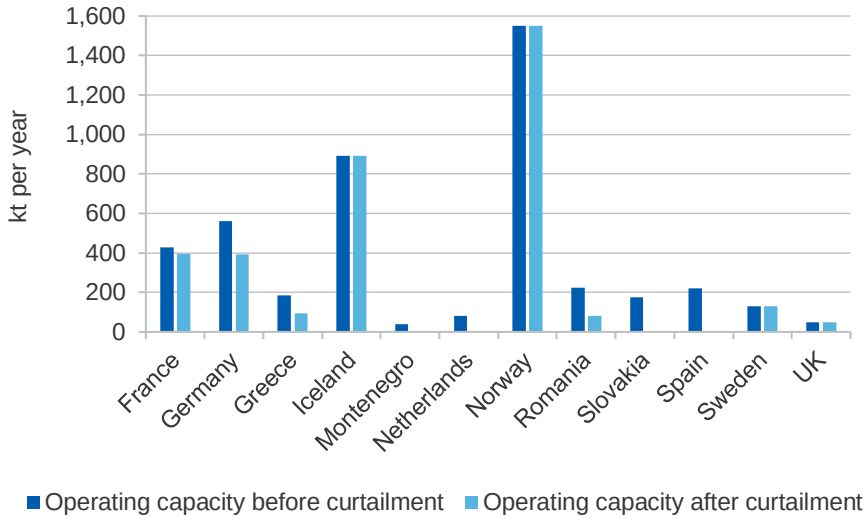
The spike in energy prices is a concern for aluminium smelting operations in Europe. The need to secure a competitive power price has become more difficult for European aluminium smelters, where they rely on third party power supply. Figure 11.5 shows the global aluminium smelting by power source. In Europe, nearly 100% of power is purchased from a third

Figure 11.5: Global aluminium smelting by power source



Source: Macquarie (2022); Department of Industry, Science and Resources (2022)

Figure 11.6: Ex-Russia European aluminium smelting capacity



Source: Macquarie (2022); Department of Industry, Science and Resources (2022)

party supplier. As a result, those aluminium smelters exposed to floating power prices are vulnerable to increased energy costs.

The big rise in power costs since the December quarter 2021 has resulted in around 755,000 tonnes a year of smelting capacity curtailments in ex-Russia Europe (Figure 11.6).

The curtailments account for over 17% of Europe's total operating capacity. An additional 201,000 tonnes a year of aluminium smelting capacity is expected to be curtailed in Europe before the end of 2022. Norsk Hydro has curtailed 40% capacity at its 174,000 tonnes a year Ziar nad Hro aluminium smelter in Slovakia since late 2021. On 17 August 2022, the company announced it would close the operation from the end of September 2022, due to high electricity prices.

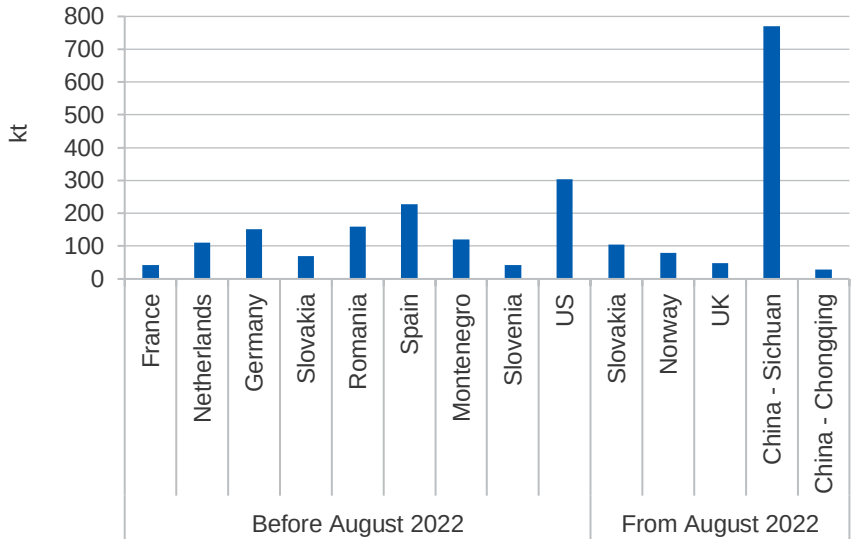
In Greece, the operation at Mytilineos Holdings' 186,000 tonnes a year Distomon aluminium smelter is likely to be impacted by the gas shortage in Europe.

In the US, the rise in energy costs has also affected the country's aluminium smelting capacity. Century Aluminium's 190,000 tonnes a year Hawesville aluminium smelter in Kentucky has been idled since 27 June 2022. The closure is expected to last for about a year until energy prices return to more normal levels.

On 1 July 2022, Alcoa announced a partial curtailment of 54,000 tonnes a year at its Warrick aluminium smelter in Indiana, citing labour shortages, higher energy and labour costs.

Figure 11.7 shows primary aluminium production curtailment in China, Europe and the US in 2022. Over 1.2 million tonnes of primary aluminium capacity were curtailed before August 2022. The US has the largest production curtailment (304,000 tonnes), followed by Spain (228,000 tonnes), Romania (159,000 tonnes), Germany (151,000 tonnes), Montenegro (120,000 tonnes), Slovakia (70,000 tonnes), France (43,000 tonnes) and Slovenia (43,000 tonnes).

Figure 11.7: Primary aluminium production curtailment in 2022



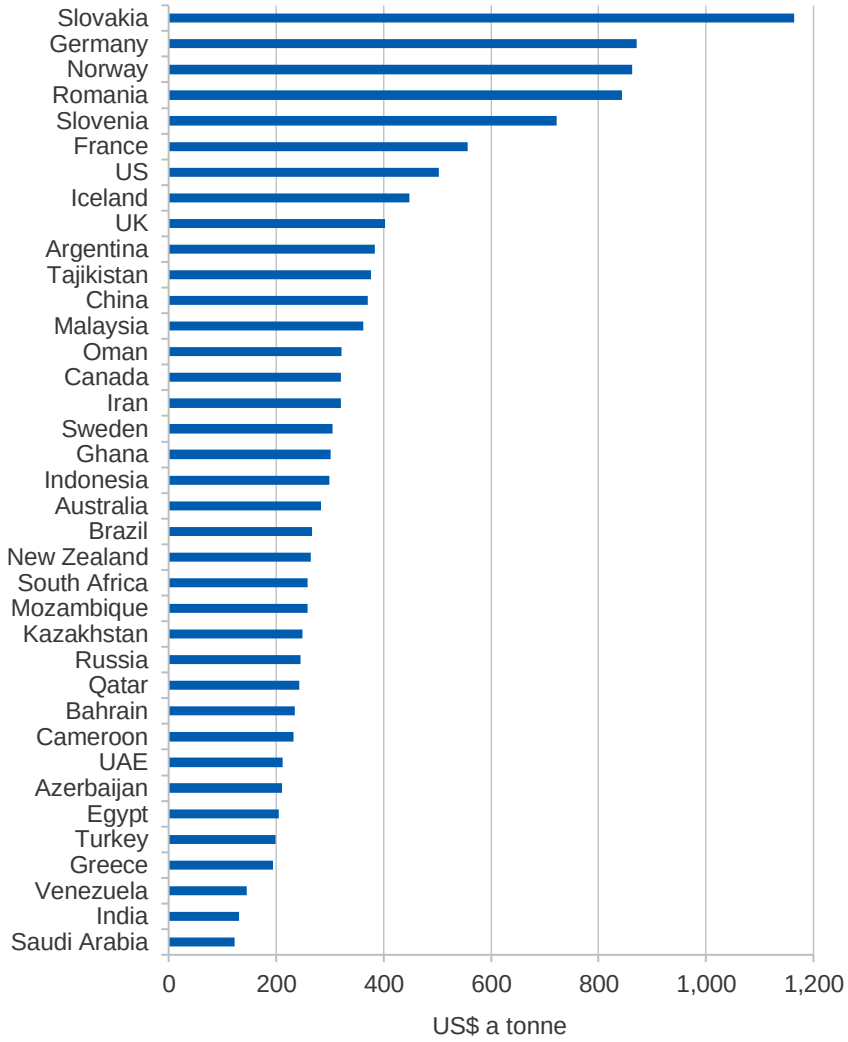
Source: SMM (2022)

Another 1.0 million tonnes of primary aluminium capacity have been curtailed from August 2022. China had the largest production curtailment (799,000 tonnes), followed by Slovakia (105,000 tonnes), Norway (80,000 tonnes) and the UK (48,000 tonnes).

The cost of producing a tonne of primary aluminium is estimated to go up in 2022 in all aluminium producing countries. In China — the world's largest aluminium producer — the cost of production is expected to increase by US$371 a tonne in 2022. Outside of China, the cost is expected to rise by US$284 a tonne in 2022.

Figure 11.8 shows the aluminium smelters' cash costs difference between 2021 and 2022. In Saudi Arabia, the cost of producing a tonne of primary aluminium is expected to increase by US$123 in 2022. In Europe, the cost of producing a tonne of primary aluminium is expected to rise by US$1,164 in Slovakia, US$871 in Germany, US$863 in Norway, US$844 in Romania

Figure 11.8: Aluminium smelters' cash costs difference between 2021 and 2022



Notes: Cash costs difference is the difference in the costs of producing a tonne of primary aluminium in 2021 and 2022. 2022 figures are estimated.

Source: CRU (2022); Department of Industry, Science and Resources (2022).

and US$556 in France in 2022. Energy now accounts for around 80% of the cost of producing aluminium in Europe.

Rusal — the world's largest aluminium producer outside China — reported a 33% (to US$2,028 a tonne) jump in production costs in the first-half of 2022. The ban on alumina exports to Russia imposed by the Australian Government and the suspension of production at its Nikolaiev alumina refinery in Ukraine, have been the main contributors to increased production costs.

According to Wood Mackenzie, at a price of US$2,450 a tonne, around 16% of ex-China primary aluminium smelters are losing money on a commercial cash cost basis. If the LME spot price for primary aluminium falls to US$2,000 a tonne, it is estimated that 37% of ex-China primary aluminium smelters will make losses.

World alumina supply fell by 1.1% year-on-year in the first half of 2022 to nearly 71 million tonnes, due to lower output in Europe and China — the world's largest alumina producer. Over this period, production in China fell by 1.0% year-on-year to 39 million tonnes. Alumina refinery output declined in northern China, but rose in southern China. In the northern China region, the 1.2 million tonnes a year Liulin Senze alumina refinery cut 400,000 tonnes of alumina capacity in June and July 2022 for environmental upgrades.

The 2.1 million tonnes a year Kaiman alumina refinery in Henan province lost nearly 20,000 tonnes of alumina output in June 2022, due to maintenance activity. In the southern China region, the 2.8 million tonnes a year Jiaokou alumina refinery restarted a 700,000 tonnes a year production line in June 2022 that was curtailed in 2021, due to a bauxite shortage.

High energy prices have hit the European alumina sector severely, with production curtailments occurring across the region. In Romania, Alro Slatina's 600,000 tonnes a year Alum Tulcea alumina refinery — Romania's sole alumina producer — temporarily suspended production from August 2022, due to high energy prices. According to the company, the cost of producing a tonne of alumina has reached US$900, whereas the spot alumina is trading at around US$330 a tonne.

In Spain, in early July 2022 Alcoa announced a 15% production cut to its 1.6 million tonnes a year San Ciprian alumina refinery, due to high energy prices. Another 45% of production capacity was cut in August/September 2022. The cost of natural gas at the refinery has increased from US$45 a tonne in early 2021 to US$245 a tonne in the June quarter 2022.

World bauxite supply increased by 3.0% year-on-year in the first half of 2022, to nearly 189 million tonnes, driven by higher output in Guinea — the world's second largest bauxite producing country. Over this period, bauxite production in Guinea increased by 2.1% year-on-year to nearly 47 million tonnes, as the ramp up of production continued.

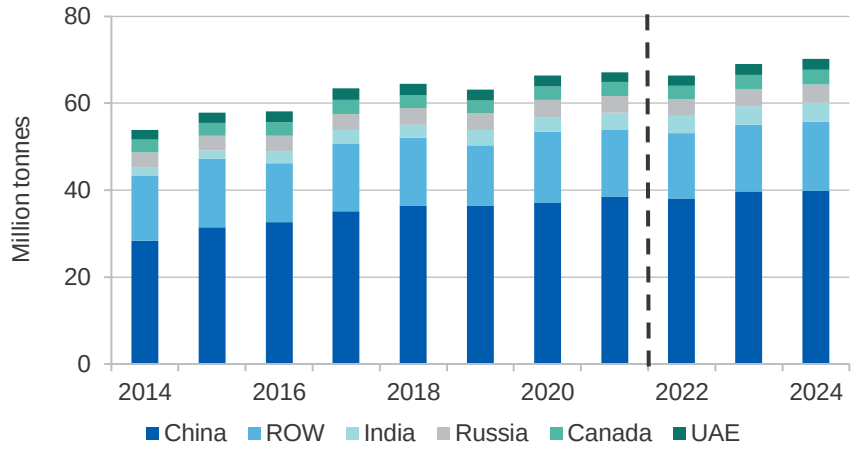
Over the first-half of 2022, production in Australia fell by 1.3% year-on-year to 51 million tonnes, due to lower bauxite mine output in the Northern Territory and Western Australia.

World primary aluminium output is estimated to fall by 1.0% year-on-year to 66 million tonnes in 2022, due to lower primary aluminium output from China and Europe (Figure 11.9).

China's primary aluminium production is forecast to fall by 0.9% year-on-year in 2022 to 38 million tonnes. A tighter power market in the second half of 2022 (amid soaring temperatures during summer) is the main factor in the decline of primary aluminium output. A number of hydropower stations have been impacted. This has led the aluminium hubs of Sichuan and Chongqing to announce that they will prioritise electricity for residential users.

Facing a huge electricity shortage, the provincial government of Sichuan ordered local industrial companies to suspend production from 15 to 20 August 2022. In a similar move, the local administrator of Chongqing city decided to suspend all production at some industrial enterprises for one week, from 17 to 24 August 2022.

Figure 11.9: World primary aluminium production



Notes: ROW: Rest of the world

Source: World Bureau of Metal Statistics (2022); Macquarie (2022); Department of Industry, Science and Resources (2022)

The power shortage issue is likely to spread through other areas of China. Zhejiang, Anhui, Hubei and Jiangsu provinces have also issued alerts about potential shortages, with some industrial enterprises being asked to use electricity judiciously.

In Europe, over half of European (ex-Russia) aluminium smelting capacity has been curtailed so far in 2022. More capacity is expected to go offline by the end of 2022, due to power supply crisis in winter (as discussed above).

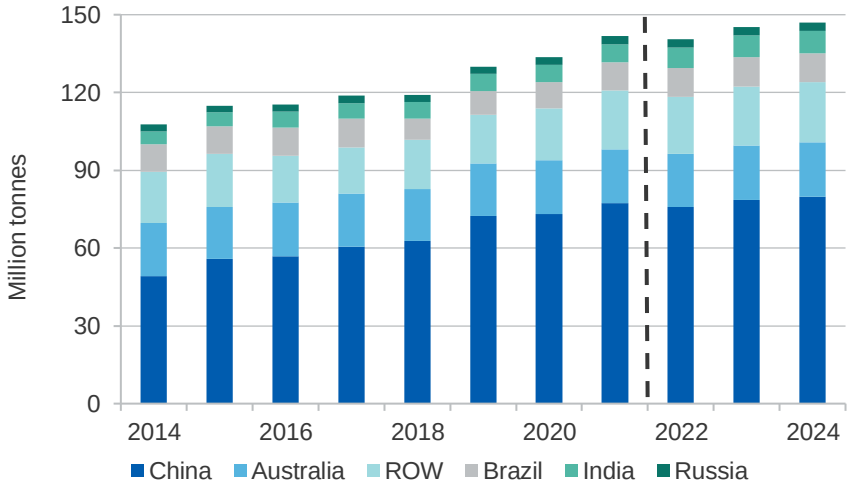
Primary aluminium production in India is forecast to increase by 3.2% year-on-year to reach nearly 4.1 million tonnes in 2022.

In Australia, Alcoa Corporation restarted 35,000 tonnes a year idled capacity at its Portland Aluminium smelter in Victoria in September 2022. The reactivated capacity is expected to raise Australian primary aluminium output to over 1.6 million tonnes a year.

World alumina output is estimated to decrease by 0.9% year-on-year to 140 million tonnes in 2022, due to lower alumina output in China (Figure 11.10). Like aluminium smelters, Chinese alumina refineries face energy shortages that lead to production suspension or cuts. The 800,000 tonnes a year Chongqing alumina refinery shut down production completely in August 2022.

The rise in production costs is another concern for alumina refineries in China. Bauxite and caustic soda are the key ingredients in the refining of alumina. In China, the prices for both commodities have increased since April 2022, particularly in Shanxi and Henan provinces, where bauxite is scarce. The 3.2 million tonnes a year Lingshi alumina refinery cut 1.0 million tonnes of alumina capacity in July 2022, due to bauxite shortages. The 1.5 million tonnes a year Huaqing alumina refinery cut 200,000 tonnes of alumina capacity in July 2022, due to a shortage of caustic soda supply.

Figure 11.10: World alumina production



Notes: ROW: Rest of the world

Source: World Bureau of Metal Statistics (2022); Macquarie (2022); Department of Industry, Science and Resources (2022)

World bauxite supply is estimated to rise by 3.0% to 379 million tonnes in 2022, driven by higher production in Guinea (up 5.5% year-on-year to 92 million tonnes) (Figure 11.11).

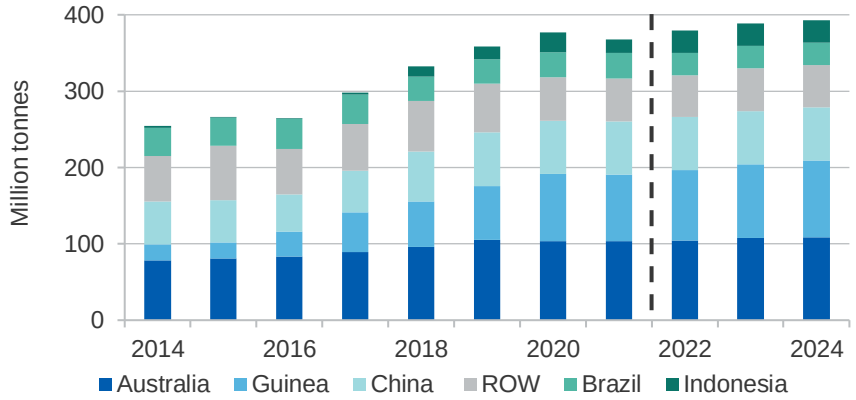
In Guinea, the Compagnie des Bauxites de Guinée mine is due to expand further to 28 million tonnes by the end of 2022, after expanding from 13 to 18 million tonnes a year in 2019. Emirates Global Aluminium is also ramping up output at its 12 million tonnes a year bauxite mine in Guinea.

The Indonesian Government has revoked 2,065 mining permits for various minerals, including bauxite, due to non-compliance or because they have not been used. This revocation is likely to reduce Indonesian bauxite production capacity from 2022 and beyond. In 2021, Indonesia produced 18 million tonnes of bauxite, accounting for 4.9% of total global bauxite output.

Aluminium, alumina and bauxite output set to rise over the outlook period

World primary aluminium production is forecast to increase at an average annual rate of 2.8% in 2023 and 2024, to reach 70 million tonnes by 2024 (Figure 11.9).

Figure 11.11: World bauxite production



Notes: ROW: Rest of the world

Source: World Bureau of Metal Statistics (2022); Department of Industry, Science and Resources (2022)

The gains are expected to be driven by increased aluminium output from China and Indonesia. After a 0.9% fall in 2022, China's primary aluminium output is forecast to resume growing by 4.0% in 2023 to nearly 40 million tonnes, followed by a further 0.5% growth in 2024.

Zhongrui Aluminium is expected to commence the construction of stage 2 of its Gansu aluminium smelter in Baiyin City, Guangdong province before the end of 2022. The expansion is expected to lift the smelter's output from 100,000 tonnes a year in 2022 to 292,000 tonnes a year in 2024.

New Zealand Aluminium Smelter is exploring potential pathways with electricity suppliers that would see its 350,000 tonnes a year Tiwai Point aluminium smelter stay open beyond the end of 2024.

In Indonesia, the first phase (500,000 tonnes) of the 1 million tonnes a year Huaqing aluminium project in the Qingshan Industrial Park on Sulawesi Island is expected to come online by the end of 2022. The completion date of the 500,000 tonnes a year second phase is uncertain.

World alumina output is forecast to increase by 2.3% a year over the outlook period, reaching 147 million tonnes by 2024 (Figure 11.10). The gains are forecast to be driven by China, Australia, India, Indonesia, and other small alumina refining nations.

China Aluminium Company and the Indonesian joint-venture partners' 2 million tonnes a year Mempawah alumina refinery in Indonesia is expected to come online in 2024. The project could be delayed or terminated if there is no agreement between the operators and contractors by October 2022.

In August 2022, the eastern Indian state of Odisha approved Adani's 4.0 million tonnes a year alumina refinery project. The cost of the project is estimated to be US$5.2 billion. The start and completion dates of the project are still unknown at the time of writing.

After 2022, world bauxite production is forecast to increase by 1.8% a year over the outlook period, reaching 393 million tonnes by 2024 (Figure 11.11). Australia and Guinea are expected to contribute most to this rise.

Low carbon aluminium, alumina and bauxite

At the end of June 2022, Rio Tinto and Corona Canada launched Canada's first low carbon beverage can pilot program. This pilot is a step towards a fully traceable beverage can that will allow consumers to use the QR codes to see how their products were made from mine to the market.

On 14 July 2022, Rio Tinto unveiled a plan to spend US$188 million to boost the production of low carbon aluminium billets (to 202,000 tonnes a year) at its Alma smelter in Lac-Saint-Jean in Quebec, Canada. The expansion will allow the company to meet the surging demand for high quality aluminium alloys and value-added products made with renewable hydroelectricity.

On 21 July 2022, Rio Tinto signed a non-binding memorandum of understanding with Ford Motor Company to supply low carbon materials — such as aluminium, lithium and copper — to be used in Ford lightweight and electric trucks. Rio aims to produce the first commercial batches of near zero aluminium from its ELYSIS joint-venture with Apple in Canada in 2024. The near carbon-free aluminium is made by using Canada's abundant hydroelectricity and the ELYSIS smelting process which employs non-carbon anodes to electrolyse raw alumina.

In Australia, Rio Tinto has contracted EDL (a global producer of sustainable distributed energy) to build a 4.0 megawatt solar farm and a 4.0 megawatt battery to complement its existing 1.6 megawatt farm at its Weipa bauxite mines in Queensland.

Following its call for proposals to develop large scale wind and solar power in central and southern Queensland to power its Boyne aluminium smelter, Yarwun alumina refinery and Queensland alumina refinery in June 2022, Rio Tinto said in August 2022 that it had received several offers. Despite it being early in the process, the initiative is likely to help Rio Tinto to meet its climate change commitments.

Brisbane based Graphene Manufacturing Group (GMG) has recently signed an informal partnership with Rio Tinto to develop a graphene aluminium-ion battery. GMG claims the battery can charge up to 70 times faster, with three times more battery life than lithium-ion batteries. GMG is working on a pilot plan to start producing graphene aluminium-ion batteries by 2024. Rio Tinto will supply aluminium from its alumina refinery in Gladstone.

11.4 World trade

Strong aluminium and alumina exports from China in the first half of 2022

World primary aluminium exports decreased by 13% year-on-year in the first half of 2022 to 6.5 million tonnes, due to lower exports from Russia, Canada and the Netherlands.

The fallout from the Russian invasion of Ukraine has reduced Russian primary aluminium exports by 88% (or 439,000 tonnes) year-on-year in the March quarter 2022. Export data for the June quarter 2022 is not publicly available.

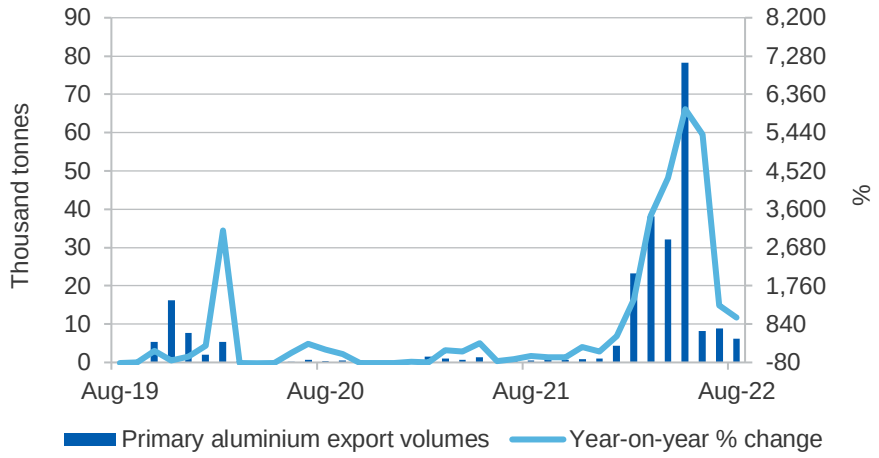
In Canada, primary aluminium exports fell by 6.2% year-on-year in the first-half of 2022 to nearly 1.4 million tonnes, as the slowdown in the US construction activity affected primary aluminium demand from Canada.

In the Netherlands, primary aluminium exports fell by 0.5% year-on-year in the first half of 2022 to 1.2 million tonnes. Over this period, the Netherlands imported 58,658 tonnes of primary aluminium from China, and re-exported it to other European countries.

Offsetting the fall in aluminium exports from Russia, Canada and the Netherlands was higher primary aluminium exports from China.

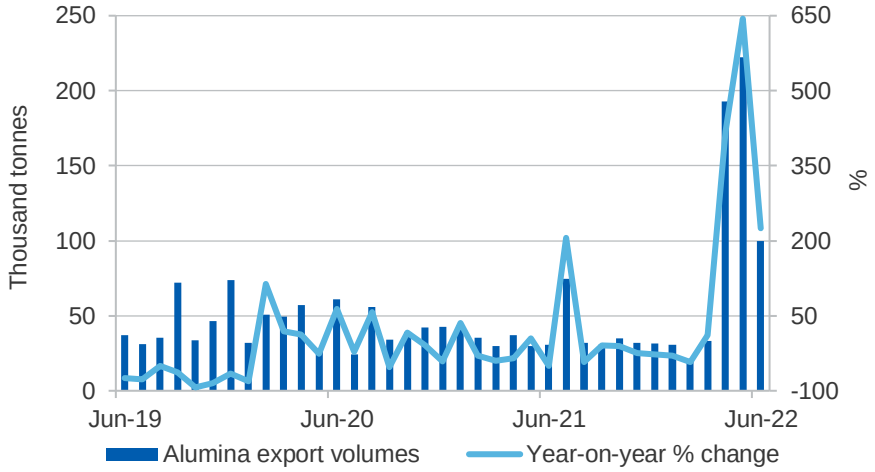
China's primary aluminium exports accelerated in the first eight months of 2022. Over this period, China exported 199,386 tonnes of primary aluminium, up 2,912% year-on-year (Figure 11.12), of which 31% were exported to the Netherlands, 17% to Turkey and 15% to South Korea. In particular, exports in May 2022 jumped by 6,004% year-on-year to over 78,000 tonnes. Most of the metal was exported from bonded warehouses, and was not subject to the 15% export tax.

Figure 11.12: China's primary aluminium exports (monthly)



Source: China Customs (2022); Department of Industry, Science and Resources (2022)

Figure 11.13: China's alumina exports (monthly)



Source: World Bureau of Metal Statistics (2022); Department of Industry, Science and Resources (2022)

World alumina exports decreased by 8.4% year-on-year in the first half of 2022 to 20 million tonnes due to lower alumina exports from Australia and Ukraine. Over this period, Australia — the world's largest alumina exporter — recorded a 6.8% year-on-year fall in alumina exports. The Australian Government's decision to ban alumina exports to Russia in March 2022 impacted Australian alumina export earnings in the June quarter 2022.

The conflict with Russia has hit Ukraine's alumina exports. The country used to export 1.8 million tonnes of alumina a year before the war. In the first half of 2022, Ukraine's alumina exports fell by 71% year-on-year to 255,000 tonnes, with no exports at all in the June quarter 2022.

Offsetting the decline in alumina exports from Australia and Ukraine was an increase in alumina exports from China. In the first half of 2022, China exported 716,782 tonnes of alumina, a rise of 247% year-on-year (Figure 11.13).

World bauxite exports increased by 5.1% year-on-year in the first half of 2022 to 79 million tonnes, propelled by a 3.7 year-on-year rise in Australia — the world's second largest bauxite exporter — and a 56% rise in Indonesia — the world's third largest bauxite exporter. Indonesian bauxite exporters ramped up their exports ahead of an export ban likely to be imposed by the Indonesian Government before the end of 2022. Over this period, bauxite exports from Guinea — the world's largest bauxite exporter — rose by 0.5% year-on-year.

Higher aluminium and bauxite imports, but lower alumina imports

World primary aluminium imports rose by 3.0% year-on-year in the first-half of 2022 to over 10 million tonnes, driven by increased imports from the US, European countries and China.

In the US, primary aluminium imports increased by 25% year-on-year in the first half of 2022 to over 3.2 million tonnes. Strong economic activity in the March quarter 2022 — prior to the US Federal Reserve's first rate hike in 2022 — and increased aluminium use in new energy efficient cars and technologies were contributing factors to higher aluminium imports.

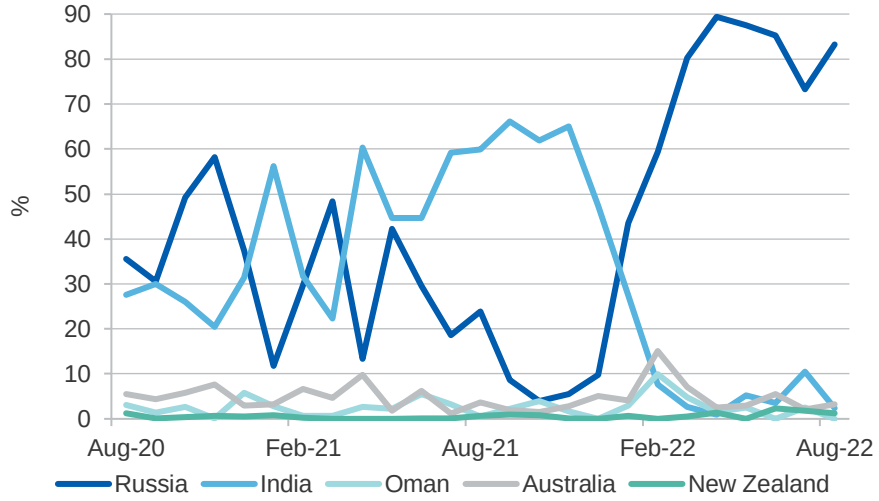
In Europe, primary aluminium output has been declining since mid-2021, due to energy shortages and higher power costs, with many countries turning to imports to meet primary aluminium demand. In the first half of 2022, primary aluminium imports by Germany rose by 7.2% year-on-year to 1.0 million tonnes, Italy (up 11% year-on-year to 594,000 tonnes), France (up 9.4% year-on-year to 245,000 tonnes), and Greece (6.5% year-on-year to 213,000 tonnes).

China's imports of primary aluminium decreased by 73% year-on-year in the first half of 2022 to 200,000 tonnes, due to lower domestic primary aluminium consumption.

Russia's share of China's primary aluminium imports accelerates in 2022

Russia's share of China's primary aluminium imports has accelerated since the start of 2022. As at August 2022, Russia accounted for 83% of China's total primary aluminium imports. It reached a peak of nearly 90% in April 2022 (Figure 11.14).

Figure 11.14: Shares of China's primary aluminium imports



Source: China Customs (2022)

After reaching a peak of 15% in February 2022, Australia's share of China's primary aluminium imports fluctuated between 2.2% and 7.0% (Figure 11.14).

India was China's largest primary aluminium supplier in 2021, reaching a peak share of 66% in September 2021. However, its share of China's primary aluminium imports has tumbled to less than 10% in 2022 (Figure 11.14).

World alumina imports fell by 22% year-on-year in the first half of 2022 to nearly 15 million tonnes, due to a 37% and 6.7% year-on-year fall in alumina imports from China and Norway, to 912,000 and 1.3 million tonnes, respectively. Lower primary aluminium production in China (down by 0.8% year-on-year) and Norway (down by 6.7% year-on-year) was the main reason for lower alumina imports.

World bauxite imports increased by 10% year-on-year in the first-half of 2022 to nearly 78 million tonnes, driven by higher imports from China — the world's largest bauxite importer.

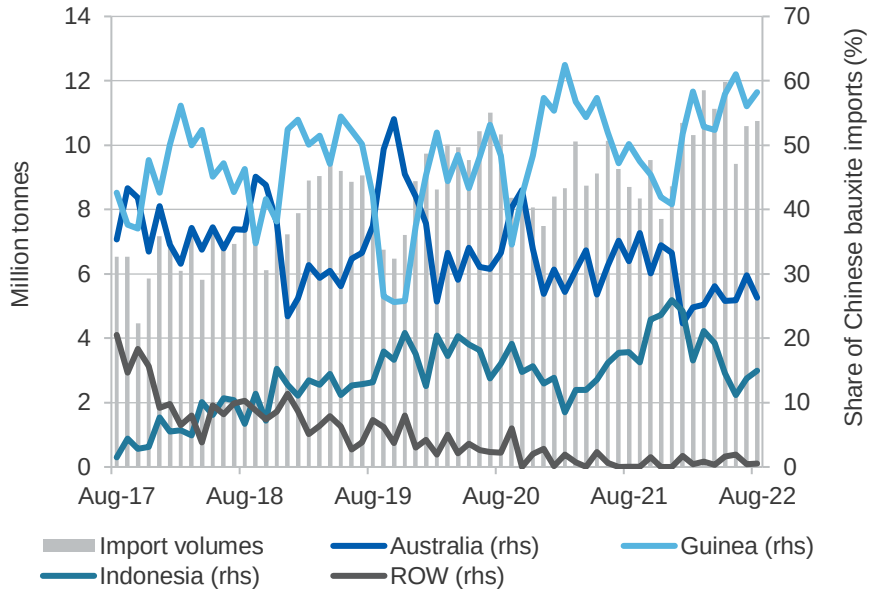
China imported 87 million tonnes of bauxite in the first eight months of 2022, an 18% year-on-year rise from 2021. The largest ever monthly import volume was in May 2022 at 12 million tonnes (Figure 11.15).

Guinea is China's largest bauxite import source, accounting for 56% of China's total bauxite imports.

Australia is China's second largest bauxite import source, accounting for 26% of China's total bauxite imports. Australia's share of China's bauxite imports has fallen to less than 30% since the start of 2022.

Indonesia is China's third largest bauxite import source, accounting for 17% of China's total bauxite imports. Indonesia's share of China's bauxite import is likely to fall further over the coming months: the Indonesian Government is expected to implement a bauxite export ban before the end of 2022. This is part of the Indonesian Government's push to refine more of its mine production domestically, in order to create more employment in Indonesia.

Figure 11.15: China's bauxite import volumes and sources



Notes: ROW: Rest of the world

Source: Bloomberg (2022)

11.5 Prices

Falling demand pushed aluminium prices lower

The London Metal Exchange (LME) spot price for primary aluminium has decreased 25% so far in 2022, sitting at US$2,106 a tonne on 27 September 2022 — compared to an average of US$2,384 a tonne in the first nine months of 2021. Falling demand from key primary aluminium consuming countries or regions — Europe and China — was the main driver of the weakening in the primary aluminium price in the June quarter 2022 (see *World Consumption* section).

LME stocks reached a 39-year low in July 2022, at 277,050 tonnes, and remained low at 335,625 tonnes in late September 2022. A high proportion of cancelled warrants further reduced availability, with 51% of stocks booked for removal. Shanghai Futures Exchange stocks fell to a 2.5-year low in July 2022, at 185,358 tonnes, and remained low at 209,998 tonnes in late September 2022. LME off-warrant stocks have risen from their lowest level in March 2022, at 381,394 tonnes in July 2022 (Figure 11.16).

Despite a gloomy outlook for the global economy, the LME spot price for primary aluminium has remained stable since August 2022 amid lower supply from China and Europe. In China, primary aluminium producers have been asked to suspend or cut their production in responding to power shortages. In Europe, about half of aluminium smelting capacity has been curtailed, and more is set to go offline before the end of 2022 amid power supply issues (see *World Production* section).

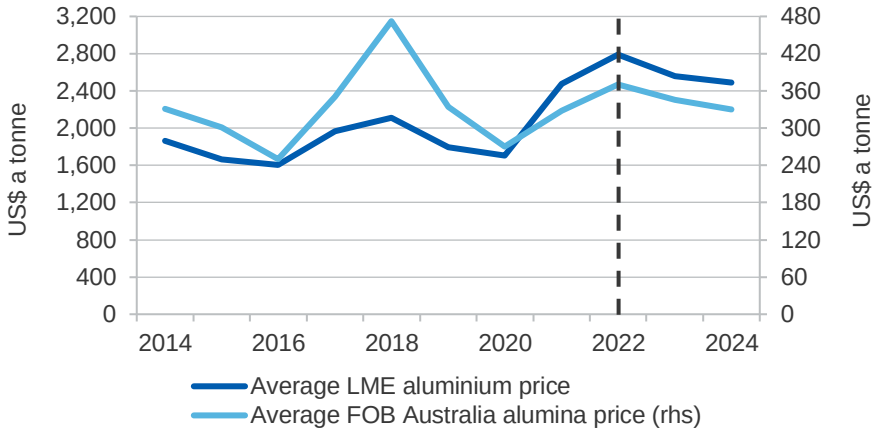
As a result of lower supply, the LME primary aluminium spot price is estimated to average US$2,790 a tonne in 2022, a rise of 13% year-on-year (Figure 11.17).

Inflation, rising interest rates and weakening global economic growth remain risks to aluminium prices over the outlook period. Higher inflation rates have forced central banks around the world to increase interest rates, which are likely to have dampening effects on economic activity.

Figure 11.16: Exchange aluminium stocks

Source: London Metal Exchange (2022); Bloomberg (2022)

Figure 11.17: World primary aluminium and alumina prices



Source: LME (2022); Bloomberg (2022); Department of Industry, Science and Resources (2022)

The strong US dollar — which reached parity against the Euro in July 2022 — is also likely to be a headwind for all commodity prices. The LME spot price for primary aluminium is no exception.

The free on board (FOB) Australian alumina price has increased 0.3% so far in 2022, at US$346 a tonne on 28 September 2022 — compared to an average of US$367 a tonne in the second half of 2021. Alumina supply from ex-Russia markets, including Australia, is in abundant and putting downward pressure on alumina prices.

The FOB Australian alumina price is forecast to US$370 a tonne in 2022 (up 13%), driven by higher aluminium production in China (Figure 11.17).

Primary aluminium and alumina prices to fall in 2023 and 2024

After 2022, the LME aluminium price is forecast to drift down to an average of US$2,560 and US$2,490 a tonne in 2023 and 2024, respectively (Figure 11.17). Despite this fall, primary aluminium prices are expected to remain at relatively high levels, as growing demand for new, energy-efficient cars and technologies supports aluminium usage. As a result, the FOB Australian alumina price is forecast to fall to US$330 a tonne in 2024 (Figure 11.17).

11.6 Australia's exports and production

Higher aluminium and alumina prices drove exports in 2021–22

Australia's aluminium, alumina and bauxite exported increased by 32% year-on-year in 2021–22 to nearly $16 billion, propelled by higher primary aluminium prices. A 42% year-on-year rise in the LME aluminium price in 2021–22 helped boost Australian primary aluminium export values by 54% year-on-year to nearly $5.8 billion in 2021–22.

Over this period, primary aluminium exports to Japan and Taiwan rose by 57% and 48% year-on-year to $1,505 million and $618 million, respectively, as manufacturing of energy efficient technologies (requiring higher aluminium content) picked up.

Australian alumina export values rose by 29% year-on-year in 2021–22 to nearly $9.0 billion, driven by a 35% year-on-year rise in alumina prices in 2021–22. Alumina export volumes were down by 4.6% year-on-year in 2021–22 to nearly 18 million tonnes.

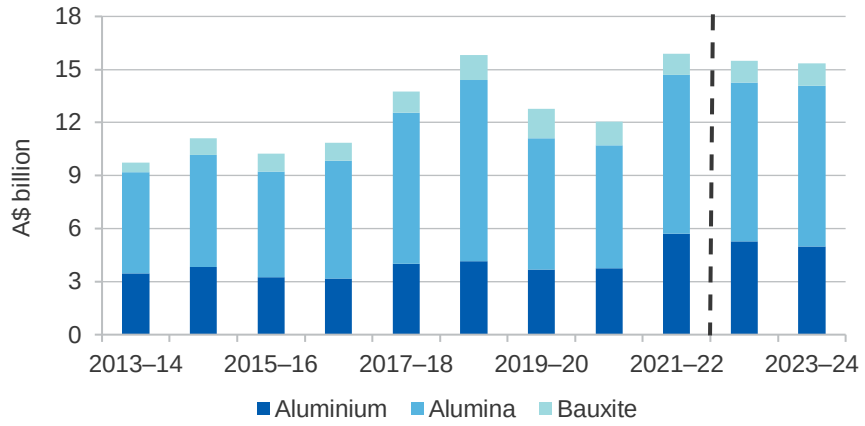
Australian bauxite export values decreased by 12% year-on-year in 2021–22 to nearly $1.2 billion, despite a 0.5% year-on-year rise in bauxite export volumes. China remained the main market for Australian bauxite, accounting for 98% of total Australian bauxite exports in 2021–22.

Steady alumina, aluminium and bauxite exports over the outlook period

Over the outlook period, Australia's aluminium, alumina and bauxite exports are forecast to be steady, at $15 billion a year, with the prices of primary aluminium forecast to remain relatively high over the outlook period (Figure 11.18).

On 12 August 2022, South 32 reached a 10-year alumina supply agreement with Aluminium Bahrain BSC. Under the agreement, South 32's Worsley alumina refinery in WA will supply up to 1.25 million tonnes a year of alumina.

Figure 11.18: Australian aluminium/alumina/bauxite exports



Source: ABS (2022) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2022)

Australia's alumina/aluminium/bauxite production fell in 2021–22

Australia's primary aluminium output fell by 3.1% in 2021–22, to 1.53 million tonnes, due to lower production at Rio Tinto's Boyne Island aluminium smelter operations in Queensland. The COVID-19 related unplanned absences have taken a hit to the smelter's production (down by 6.3% year-on-year in 2021–22).

Australia's alumina output fell by 3.9% to 20.1 million tonnes in 2021–22. The fall is attributed to lower alumina production (down by 5.6% year-on-year in 2021–22) at Rio Tinto's Queensland Alumina Limited (QAL) refinery in Queensland. The refinery operations were badly affected by COVID-19 related absences, bad weather and unplanned outages in the June quarter 2022. Offsetting the production decline at the QAL was improved output from South 32, Japan Alumina and Sojitz Alumina joint-venture Worsley Alumina refinery in Western Australia. In 2021–22, production at Worsley rose by 1.3% year-on-year to 4.6 million tonnes.

Australia's bauxite production fell by 0.4% year-on-year to 103 million tonnes in 2021–22, due to lower production at the Boddington bauxite mine in WA (down by 2.0% year-on-year to 18.8 million tonnes) and Gove bauxite mine in the Northern Territory (down by 4.6% year-on-year to 11.6 million tonnes).

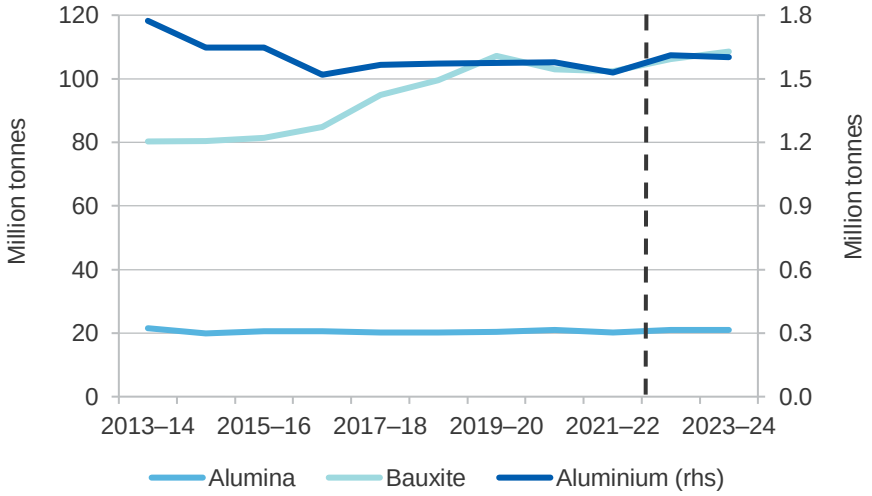
Higher bauxite output over the outlook period

On 7 November 2021, Alcoa announced a restart of 35,000 tonnes a year idled capacity at its Portland Aluminium smelter in Victoria. The reactivated capacity came online in September 2022, and will bring Australia's primary aluminium output to 1.6 million tonnes a year from 2022–23 and beyond (Figure 11.19).

No expansions or major disruptions are expected at existing alumina operations in Australia over the outlook period. Australia's alumina output is forecast to remain at about 21 million tonnes a year over this time (Figure 11.19).

Australia's bauxite output is forecast to increase at 2.9% a year between 2022–23 and 2023–24, reaching 109 million tonnes in 2023–24 (Figure 11.19). On 29 June 2022, Metro Mining's board approved a final

Figure 11.19: Australian aluminium/alumina/bauxite output



Source: Department of Industry, Science and Resources (2022)

investment decision (subject to financing) to expand the capacity of its Bauxite Hills mine in Queensland from 4 million tonnes a year to 7 million tonnes a year. The expansion is expected to be completed in the September quarter 2023.

In August 2022, the Western Australian Environmental Protection Authority gave stakeholders and community groups an additional two weeks (from 16 to 29 August 2022) to comment on South 32's proposed expansion at its Worsley alumina operations in WA. This proposal will allow for the expansion of existing activities at the refinery, which has production capacity of 4.7 million tonnes a year, while allowing the impacts to be assessed and increasing the effectiveness and efficiency of environmental management.

Revisions to the outlook

The forecast for Australia's aluminium, alumina and bauxite export earnings has been revised down from the June 2022 *Resources and Energy Quarterly*: by $942 million in 2022–23 and by $808 million in 2023–24. The revision reflects lower forecast prices for primary aluminium over the outlook period.

The forecast for world primary aluminium production has been revised down from the June 2022 *Resources and Energy Quarterly* — by 1.9 million tonnes in 2022, 2.1 million tonnes in 2023 and 2.2 million tonnes in 2024. The revision reflects larger than expected primary aluminium production curtailments in China and Europe in 2022.

Table 11.1: Aluminium, alumina and bauxite outlook

						Annual percentage change		
World	**Unit**	**2021**	**2022 s**	**2023 f**	**2024 f**	**2022 s**	**2023 f**	**2024 f**
Primary aluminium								
Production	kt	67,119	66,447	69,063	70,244	-1.0	3.9	1.7
Consumption	kt	68,467	67,185	68,302	69,453	-1.9	1.7	1.7
Prices aluminium c								
- nominal	US$/t	2,477	2,790	2,560	2,490	12.6	-8.2	-2.7
- real d	US$/t	2,667	2,790	2,484	2,363	4.6	-11.0	-4.9
Prices alumina spot								
- nominal	US$/t	328	370	345	330	12.7	-6.7	-4.3
- real d	US$/t	353	370	335	313	4.7	-9.4	-6.4
Australia	**Unit**	**2020–21**	**2021–22**	**2022–23 f**	**2023–24 f**	**2021–22**	**2022–23 f**	**2023–24 f**
Production								
Primary aluminium	kt	1,579	1,525	1,610	1,603	-3.5	5.6	-0.4
Alumina	kt	20,949	20,113	20,906	21,011	-4.0	3.9	0.5
Bauxite	Mt	103.0	102.5	106.2	108.6	-0.4	3.6	2.2
Consumption								
Primary aluminium	kt	284	245	209	208	-13.7	-14.6	-0.3
Exports								
Primary aluminium	kt	1,357	1,369	1,449	1,443	0.9	5.9	-0.4
- nominal value	A$m	3,763	5,721	5,269	4,971	52.0	-7.9	-5.6
- real value e	A$m	4,205	6,122	5,269	4,770	45.6	-13.9	-9.5
Alumina	kt	18,600	17,736	18,188	18,280	-4.6	2.5	0.5
- nominal value	A$m	6,948	8,977	9,008	9,098	29.2	0.3	1.0
- real value e	A$m	7,765	9,605	9,008	8,730	23.7	-6.2	-3.1
Bauxite	kt	35,782	35,957	35,128	35,902	0.5	-2.3	2.2
- nominal value	A$m	1,339	1,177	1,222	1,261	-12.1	3.8	3.2
- real value e	A$m	1,496	1,259	1,222	1,210	-15.9	-3.0	-0.9
Total value								
- nominal value	A$m	12,050	15,875	15,498	15,331	31.7	-2.4	-1.1
- real value e	A$m	13,466	16,985	15,498	14,710	26.1	-8.8	-5.1

Notes: **c** LME cash prices for primary aluminium; **d** In 2022 calendar year US dollars; **e** In 2022–23 financial year Australian dollars; **f** Forecast; **s** Estimate
Source: ABS (2022) International Trade in Goods and Services, 5464.0; LME (2022); Department of Industry, Science and Resources (2022); World Bureau of Metal Statistics (2022).