Aluminium

Australia's aluminium sector

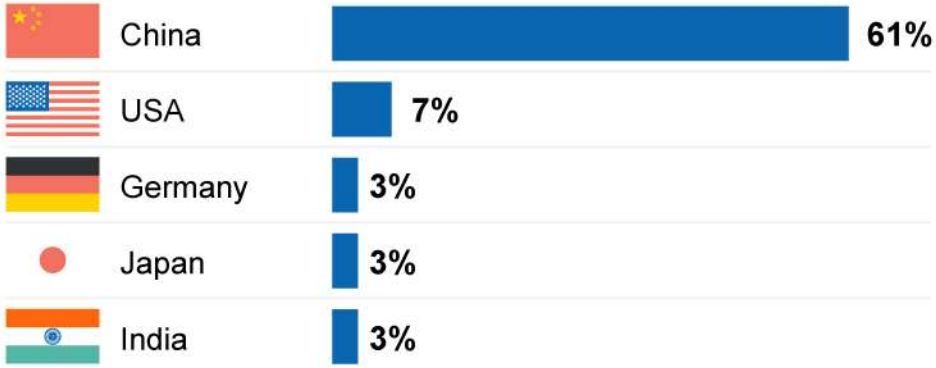
Largest bauxite producing nation: **102 million tonnes** in 2022

Largest alumina exporter: **17 million tonnes** in 2022

2nd largest alumina producer: **20 million tonnes** in 2022

Major Australian bauxite deposits, Gt

Primary aluminium top consumer markets, 2022



Aluminium facts

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

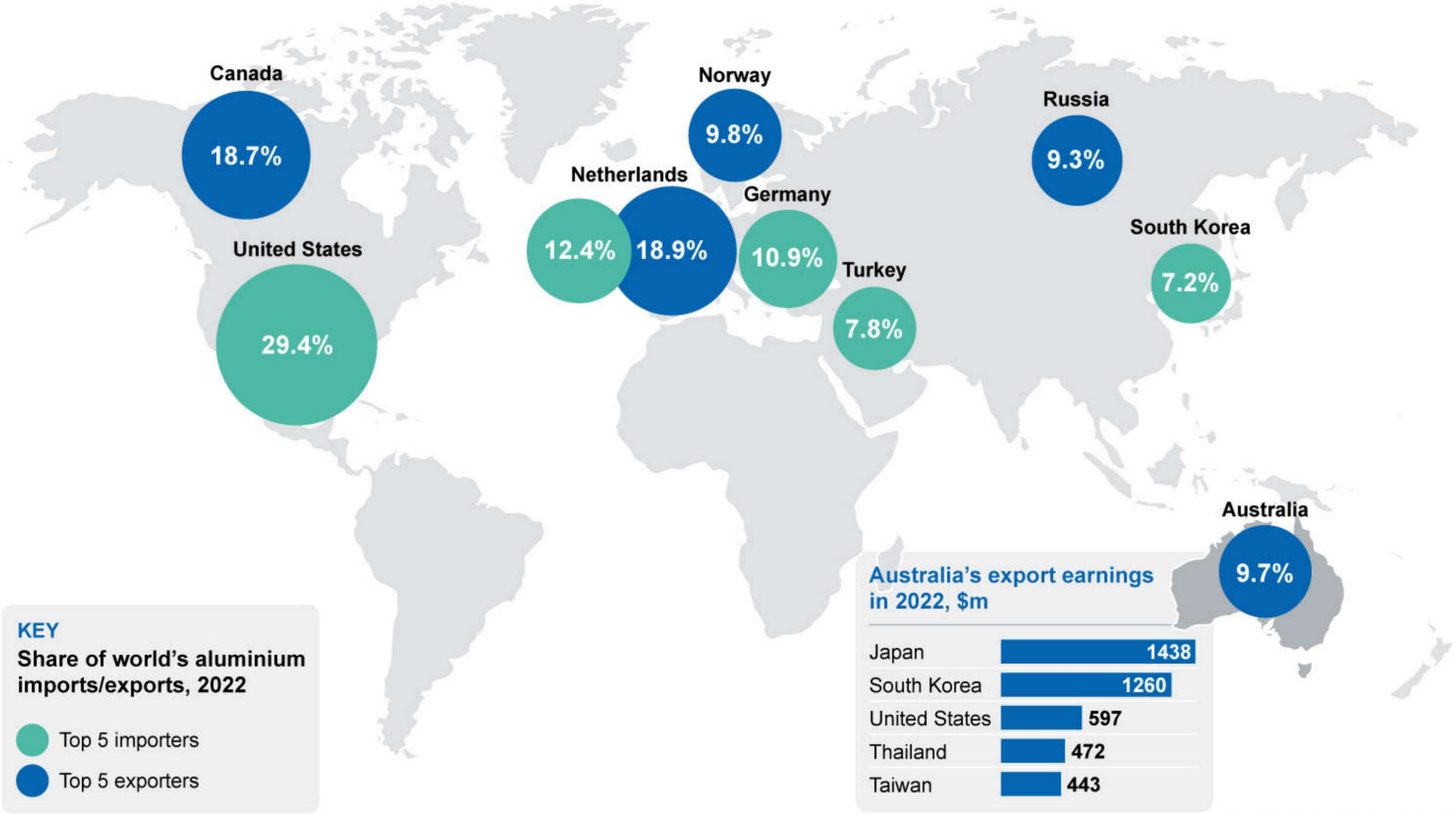
2-3 tonnes of bauxite is required to produce one tonne of alumina

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

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

SOURCE: BNEF; International Aluminium Institute; WBMS; ABS; OCE

Aluminium TRADE MAP



SOURCE: WBMS; ITC Comtrade; ABS

11.1 Summary

- Slower world growth is likely to push primary aluminium prices lower in 2023, to an average of US$2,462 a tonne. However, with low aluminium inventories and growing demand for new energy-efficient cars and technologies, aluminium prices are projected to reach US$2,505 a tonne by 2025, before falling to US$2,230 a tonne in 2028 (in real terms).
- Australia's primary aluminium output is projected to reach 1.6 million tonnes a year from 2023–24 and beyond. Over the outlook period to 2028, Australia's alumina output is projected to remain at about 21 million tonnes a year. The expansion of the Bauxite Hills mine, and the commissioning of Aurukun bauxite project in Queensland, are expected to boost Australian bauxite output to 119 million tonnes a year by 2027–28 (see Australia section).
- The ramp up of high purity alumina (HPA) output is expected to add $1 billion a year to Australia's aluminium, alumina and bauxite (AAB) exports from 2024–25. Australian AAB exports are projected to reach $16 billion (in real terms) by 2027–28.

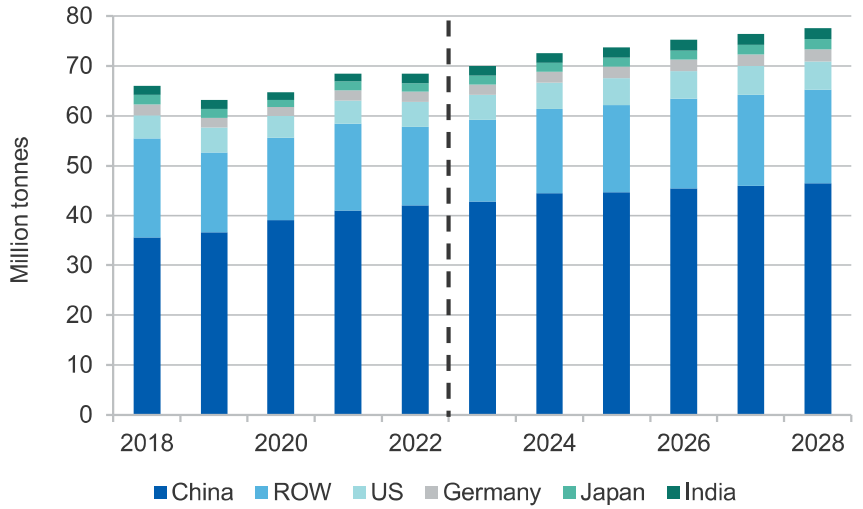
11.2 World consumption

China led higher alumina and bauxite consumption in 2022

World aluminium consumption in 2022 was almost unchanged from 2021 at 68 million tonnes (Figure 11.1). Over this period, consumption in China, the world's largest primary aluminium consuming country, rose by 2.3% year-on-year. A rise in the use of aluminium in China's automotive sector (helped by the Chinese government's stimulus package) contributed to a jump in Chinese aluminium demand in 2022.

Over this period, primary aluminium consumption also grew in the United States (up 6.2% year-on-year), India (up 22% year-on-year), and South Korea (up 1.5% year-on-year). The growth in primary aluminium consumption partly reflects increased aluminium use in new, energy-efficient car models. However, European consumption was hit by the impact of the Russian invasion of Ukraine, including rising energy and vehicle fuel costs in 2022. Vehicle sales in Europe fell by 9.9% year-on-year (to 12.5 million units), reducing aluminium demand. Over this period, demand for aluminium in Spain and France fell by 40% and 5.9% year-on-year to 483,000 and 620,000 tonnes, respectively.

Figure 11.1: World primary aluminium consumption



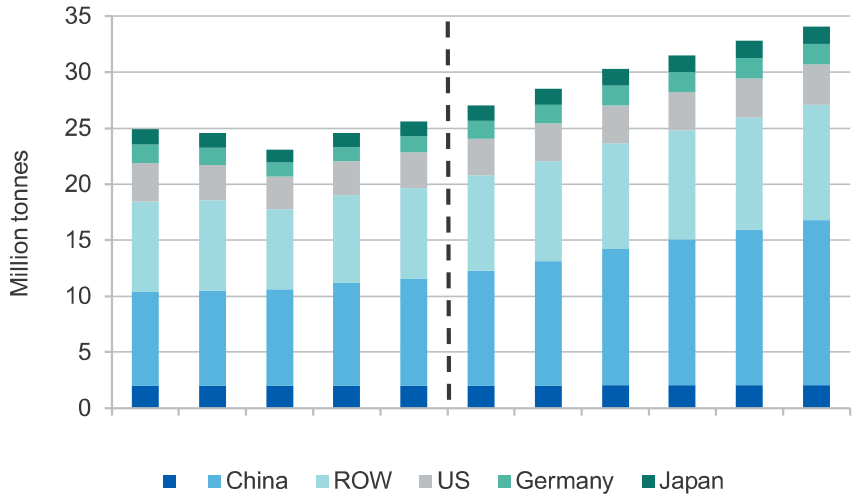
Notes: ROW: Rest of the world

Source: World Bureau of Metals Statistics (2023); Wood Mackenzie (2023); Macquarie Bank (2023); Department of Industry, Science and Resources (2023)

World secondary/recycled aluminium consumption rose by 4.9% year-on-year in 2022 to nearly 25 million tonnes (Figure 11.2), propelled by higher primary aluminium prices.

Automotive makers in Asia, Europe and the US sourced secondary — rather than primary — aluminium in order to cut costs. In Asia, secondary aluminium consumption in Japan and South Korea increased by 3.8% and 6.3% year-on-year in 2022, respectively, while in the US, secondary aluminium consumption increased by 5.4% year-on-year. Amongst major European purchasers, demand for secondary aluminium in Germany and Italy rose by 11% and 14% year-on-year in 2022, respectively.

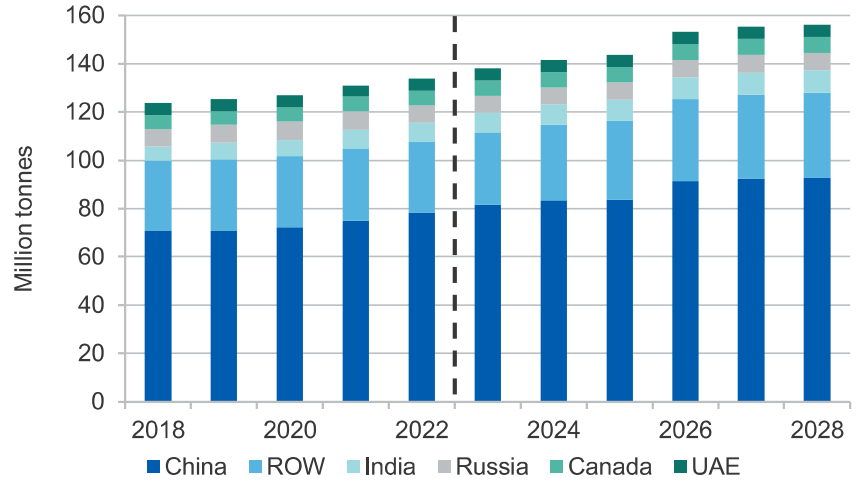
Figure 11.2: World secondary aluminium consumption



Notes: ROW: Rest of the world

Source: Wood Mackenzie (2023); Department of Industry, Science and Resources (2023)

Figure 11.3: World alumina consumption



Notes: ROW: Rest of the world

Source: Department of Industry, Science, Energy and Resources (2023)

World alumina usage increased by 2.3% year-on-year to 134 million tonnes in 2022, driven by higher global aluminium production (Figure 11.3). China remained the world's largest alumina consumer, accounting for 59% of global alumina consumption, and contributed most to this increase (up 4.4% year-on-year). Outside of China, alumina consumption in India and the UAE rose by 4.8% and 12% year-on-year in 2022, respectively.

World bauxite usage rose by 7.4% year-on-year in 2022 to 385 million tonnes, propelled by increased global alumina production (Figure 11.5). China remained the world's largest bauxite consuming country, accounting for 55% of global bauxite consumption.

Aluminium, alumina and bauxite demand to rise over the medium term

Demand for primary aluminium in 2023 is expected to be primarily driven by China, as the reopening of China's economy lifts demand for primary aluminium. As a result, global primary aluminium consumption is forecast to increase by 2.2% in 2023, to nearly 70 million tonnes (Figure 11.1).

Beyond 2023, world primary aluminium consumption is projected to grow at an annual average rate of 2.1% to nearly 78 million tonnes by 2028 (Figure 11.1).

A significant driver of aluminium demand is expected to come from world automakers, seeking to reduce vehicle weight by increasing the use of aluminium — which is 10-40% lighter than steel. Electric vehicle makers are particularly focused on reducing vehicle weight, since it impacts heavily on the recharging range.

It is estimated that EV sales will rise from 10.7 million units in 2022 to 30 million units in 2028. With an estimated average aluminium content of 250 kilograms per electric vehicle, aluminium usage in EVs is projected to increase from 2.7 million tonnes in 2022 to about 7.6 million tonnes in 2028 (Figure 11.4).

World secondary aluminium demand is forecast to increase by 6.3% year-on-year in 2023 to 26 million tonnes. After 2023, world demand is projected to increase at 4.9% a year over the outlook period (Figure 11.2).

Rising primary aluminium prices and the use of low carbon aluminium are expected to be the drivers of higher secondary aluminium consumption.

In February 2023, Japanese packaging manufacturer Toyo Seikan Group Holdings Limited and a compatriot integrated aluminium manufacturer entered into a business alliance aimed at promoting the recycling of aluminium beverage cans.

In line with world primary aluminium production, world alumina usage is forecast to grow by 3.2% year-on-year in 2023 to 138 million tonnes. After 2023, world alumina demand is projected to rise at an average annual rate of 2.5% over the outlook period (Figure 11.3). Alumina demand is driven by primary aluminium production, which is projected to lift by an average 1.8% a year between 2024 and 2028.

World bauxite usage is forecast to increase by 2.3% in 2023 to 394 million tonnes. After 2023, world bauxite demand is projected to rise at an average annual rate of 2.4% over the outlook period (Figure 11.5). Bauxite demand is driven by alumina production, which is projected to lift by an average 2.5% a year between 2024 and 2028.

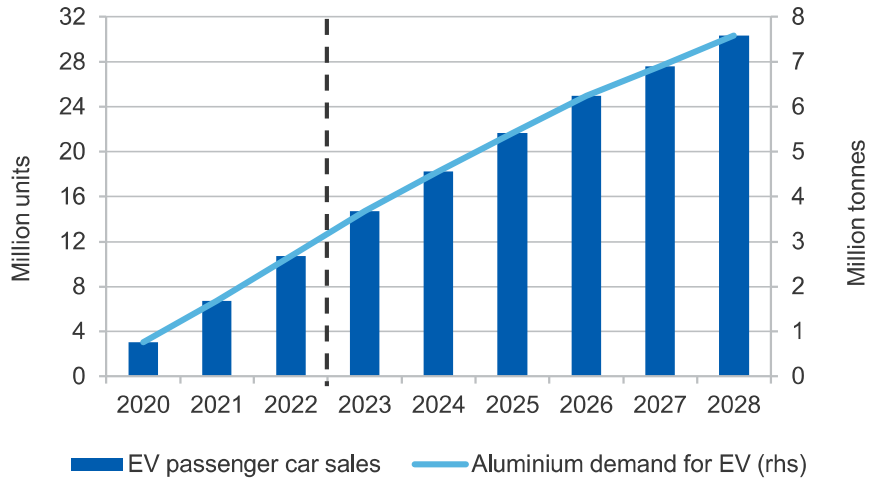
11.3 World production

Aluminium, alumina and bauxite output grew in 2022

In 2022, world primary aluminium output increased by 1.8% year-on-year. This was propelled by higher output from China — the world's largest primary aluminium producer — which rose by 4.0% (Figure 11.6). China's primary aluminium producers raised output in response to the removal of power restrictions and improved power supply in the second half of 2022.

Amongst other major producers, primary aluminium output in the United Arab Emirates (UAE) increased by 9.6% year-on-year in 2022, driven by the commission of new reduction cells at Emirates Global Aluminium's Al-Taweelah aluminium smelter. Production also rose in Iran — by 25% year-on-year — driven by the ramp up of production at the 1.0 million tonnes per year SALCO aluminium smelter.

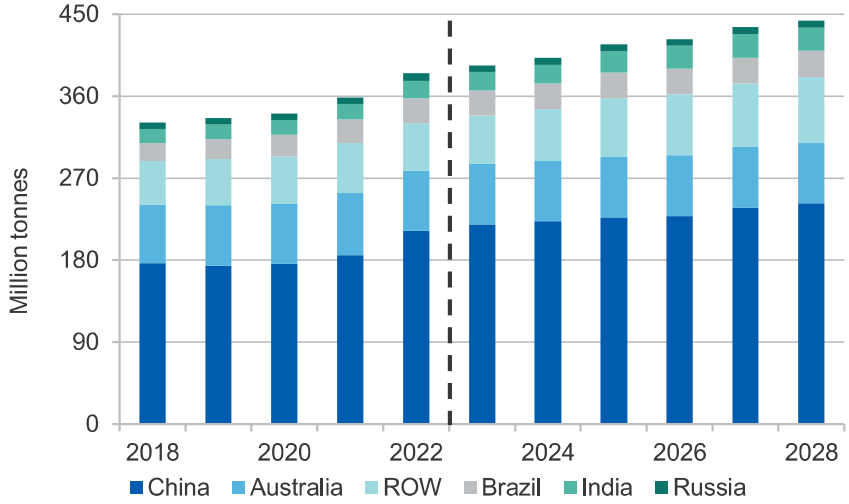
Figure 11.4: Global EV sales and aluminium demand



Notes: EV sales include all types of EV

Source: Wood Mackenzie (2023); Department of Industry, Science and Resources (2023)

Figure 11.5: World bauxite consumption



Notes: ROW: Rest of the world

Source: Department of Industry, Science and Resources (2023)

In Europe, primary aluminium production fell significantly in 2022 — including France (down by 22% year-on-year), Germany (down by 33%) and Romania (down by 34%). The fallout from Russia's invasion of Ukraine — including a spike in energy prices — was the main contributor to the fall in production.

World secondary aluminium production increased by 1.9% year-on-year in 2022 to nearly 34 million tonnes, propelled by higher output from China and the US (Figure 11.7). Over this period, China's secondary aluminium production rose by 4.7% year-on-year, while the US secondary aluminium production rose by 4.9% year-on-year.

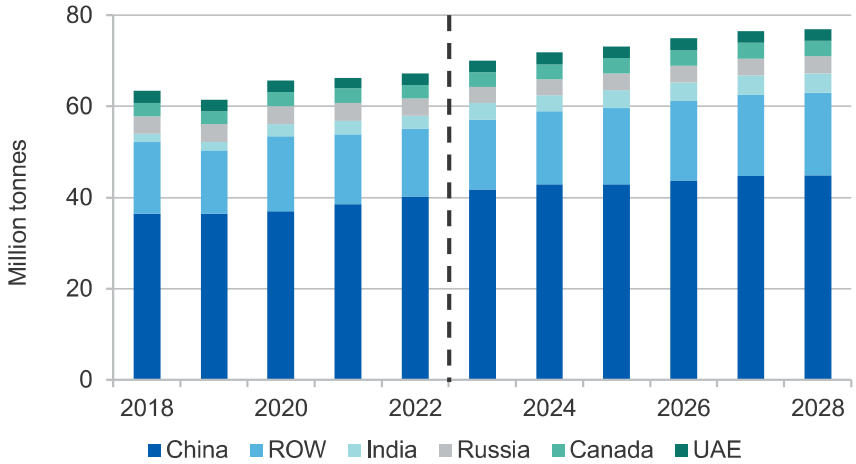
World alumina supply rose by 7.4% year-on-year to 152 million tonnes in 2022, driven by higher output in China (Figure 11.8). Production in China rose by 5.9% year-on-year, as Chinese refiners raised output to accommodate higher aluminium production. Outside of China, Indonesia's alumina output rose by 71% year-on-year in 2022, propelled by production ramp-up at the 300,000 tonnes a year Tayan alumina refinery. Alumina production in Australia — the world's second largest alumina producer — fell by 5.4% in 2022, due to lower production at Rio Tinto's Yarwun refinery.

World bauxite production increased by 7.6% in 2022 to 396 million tonnes, propelled by higher output in Guinea — the world's second largest bauxite producer (Figure 11.9). Over this period, bauxite production in Guinea increased by 13% year-on-year to 99 million tonnes, as the ramp up of production capacity continued. Output in Australia — the world's largest bauxite producing country — decreased by 0.9% year-on-year to 102 million tonnes in 2022 (see *Section 11.4 Australia's exports and production*).

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

World primary aluminium output is forecast to grow by 3.7% year-on-year to nearly 71 million tonnes in 2023 (Figure 11.6). The gain is expected to be driven by production ramp-up in China and India, as well as the restart of idled capacity in Europe.

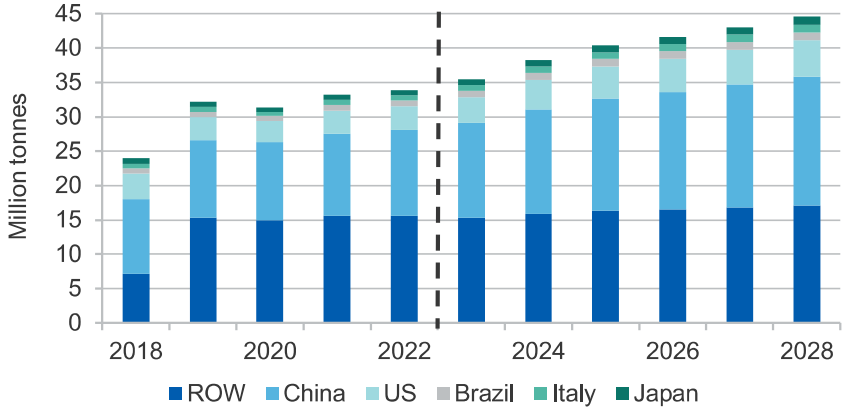
Figure 11.6: World primary aluminium production



Notes: ROW: Rest of the world

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

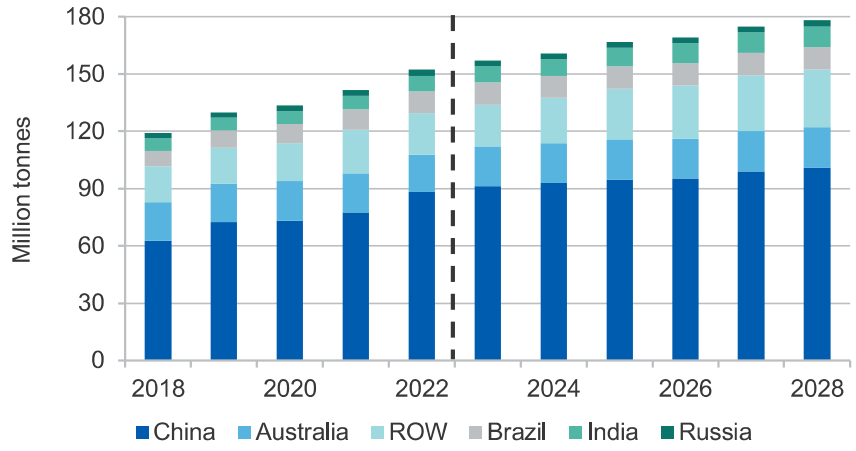
Figure 11.7: World secondary aluminium production



Notes: ROW: Rest of the world

Source: International Aluminium Institute (2023); World Bureau of Metal Statistics (2023); Department of Industry, Science and Resources (2023)

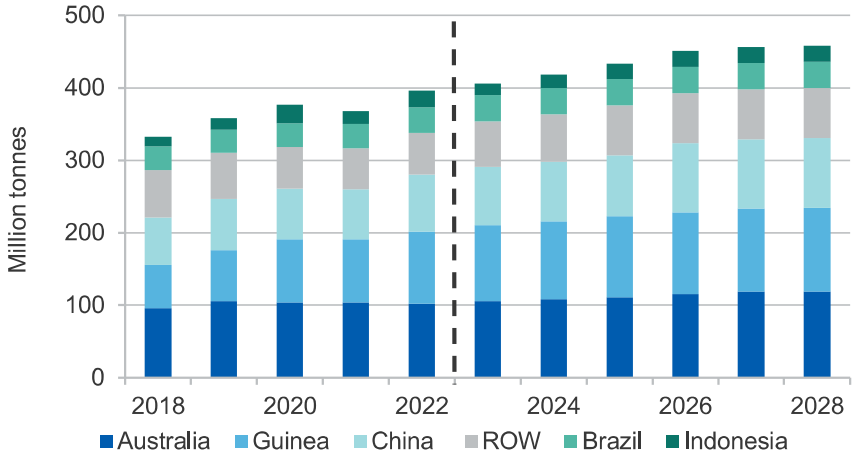
Figure 11.8: World alumina production



Notes: ROW: Rest of the world

Source: World Bureau of Metals Statistics (2023); CRU (2023); Department of Industry, Science and Resources (2023)

Figure 11.9: World bauxite production



Notes: ROW: Rest of the world

Source: World Bureau of Metals Statistics (2023); Department of Industry, Science and Resources (2023)

China's primary aluminium output is forecast to reach 42 million tonnes by 2023, up 4.0% year-on-year. Outside of China, primary aluminium production in India is forecast to increase by 5.0% year-on-year to reach 4.3 million tonnes in 2023. Aluminium Dunkerque, which operates the Dunkerque aluminium smelter in France, has started bringing back production capacity that was idled in 2022 due to high energy costs.

After 2023, world primary aluminium production is projected to rise by 1.8% a year over the outlook period, reaching 77 million tonnes by 2028 (Figure 11.6). The gains will be driven by China, as more output is produced from greenfield aluminium smelters. China's primary aluminium production is projected to reach nearly 45 million tonnes by 2028. This is edging closer to the capacity cap of 45 million tonnes per year, a policy introduced by the Chinese Government in 2017, in response to environmental and oversupply concerns. As China edges closer to its primary aluminium capacity cap, other primary aluminium producing nations — such as India, Canada, Brazil and the UAE — will get the chance to fill any market gaps that develop.

Outside of China, the Alba Aluminium smelter in Bahrain completed a prefeasibility study for its Line 7 expansion project in the September quarter 2022. It is highly likely that the proposed Line 7 project will commence in 2023. Once completed, it will increase the smelter's output from 1.56 million tonnes in 2021 to 1.68 million tonnes in 2024.

World secondary aluminium output is forecast to increase by 4.6% year-on-year in 2023 to 35 million tonnes, driven by higher output from China (up by 10% year-on-year) and the US (up by 9.4% year-on-year). After 2023, world secondary aluminium is projected to rise at 4.7% a year, reaching 45 million tonnes by 2028 (Figure 11.7).

According to a report — *Making Net-Zero Aluminium Possible: An Industry Backed 1.5°C Aligned Transition Strategy* — released in September 2022 by Mission Possible Partnership, carbon emissions from secondary aluminium is about 97% lower than emissions from the production of primary aluminium from bauxite.

World alumina output is forecast to grow by 3.2% year-on-year to 157 million tonnes in 2023, driven by rising output from new/existing refineries in China, Australia, Brazil and India (Figure 11.8). Australian output is forecast to rise by 5.9% year-on-year to nearly 21 million tonnes in 2023, driven by improved operating performance by alumina refineries.

After 2023, world alumina output is projected to rise by 2.5% a year over the outlook period, reaching 178 million tonnes by 2028 (Figure 11.8). The gains are forecast to be driven by China, Australia, India, and Indonesia. This will include 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. In August 2022, the eastern Indian state of Odisha approved Adani's 4 million tonnes a year alumina refinery project. The cost of the project is estimated to be US$5.2 billion. Start and completion dates for the project are still unknown.

World bauxite output is forecast to grow by 2.4% year-on-year to 405 million tonnes in 2023 (Figure 11.9). The gains are expected to be driven by the ramp up of new capacity in Guinea, where output is forecast to increase by 5.9% year-on-year in 2023 to 105 million tonnes. Indonesian production is forecast to fall by 33% in 2023, as the bauxite export ban — scheduled to start in June 2023 — will have an impact on the country's bauxite production. Production at the Tayan bauxite operation and the Ketapang bauxite operation are forecast to fall by 79% and 33% year-on-year in 2023 to 0.7 and 7.2 million tonnes, respectively.

After 2023, world bauxite production is projected to increase by 2.5% a year, reaching 458 million tonnes by 2028 (Figure 11.9). Australia and Guinea are expected to contribute most to this rise. In Guinea, Alliance Mining Commodities launched the 1.5 billion tonnes (estimated reserve) Koumbia bauxite project in mid-February 2023. A recent feasibility study found that the project is commercially viable, and will require a capital investment of over US$1 billion. Work on construction of a 1 million tonne a year bauxite mine in the southern Lao province of Sekong began on 19 December 2022. The mine is expected to operate for 50 years. A start date is not available at the time of writing.

Green aluminium, alumina and bauxite

'Low carbon' aluminium is expected to become more popular over the outlook period. Producers across the globe are also expected to increase their use of renewable energy. Countries with an abundance of cheap, reliable renewable energy will be the most desirable investment destinations for aluminium producers.

In the Middle East, Europe and Asia, investing in solar and wind farms has intensified over the last few years. In Australia, Rio Tinto, Alcoa and South32 are working to replace fossil fuels with renewable sources at their alumina operations.

Alcoa's Wagerup alumina refinery in Western Australia (WA) is the first in Australia to trial a steam recycling technology aimed at reducing emissions. In November 2022, the trial found the technology was feasible, and in February this year, the company announced the project has progressed to the next stage with the installation of a 4 megawatt MVR module at Wagerup.

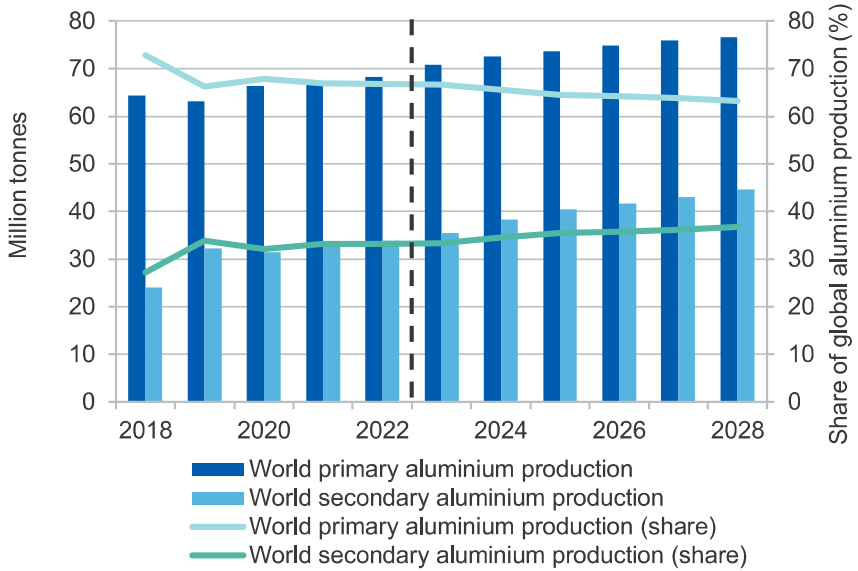
Under a collaboration agreement with Marubeni Corporation from Japan, Rio Tinto supplies low carbon aluminium to Marubeni to meet growing consumer demand. The first batch is high purity aluminium produced from the renewable-powered smelter operation in New Zealand.

In China, the government vowed to include carbon emissions from aluminium smelting into the national emissions trading scheme (ETS). Linking carbon emissions to publicly traded carbon prices is a way to encourage low carbon aluminium.

In Europe, aluminium producers are expected to increase the use of renewable sources to produce low carbon aluminium. In 2023, Norsk Hydro in Norway will start supplying Mercedes-Benz Group with low carbon aluminium — defined as having a carbon footprint below 3.0 kilograms CO2 per kilogram of aluminium. Mercedes-Benz will use the Hydro REDUXA 3.0 aluminium product in its EQS platform of electric vehicles and in other models.

The share of secondary aluminium output in the total global aluminum output is forecast to rise from 33% in 2022 to 37% in 2028. Over the same period, the share of primary aluminium output in total global aluminium output is to fall from 67% in 2022 to 63% in 2028 (Figure 11.10).

Figure 11.10: Share of global primary aluminium and secondary aluminium output



Source: International Aluminium Institute (2023); World Bureau of Metal Statistics (2023); Department of Industry, Science and Resources (2023)

11.4 World trade

Weak aluminium and alumina exports in 2022

World primary aluminium exports fell by 7.7% year-on-year in 2022 to 14 million tonnes, largely due to lower exports from Russia (Figure 11.11). The fallout from the Russian invasion of Ukraine reduced Russian primary aluminium exports by 37% year-on-year in 2022. Despite no direct sanctions on Russian aluminium by the US and other western nations, Russia's share of world primary aluminium exports fell from 14% in 2021 to 9.5% in 2022.

Offsetting the fall in aluminium exports from Russia was higher primary aluminium exports from China, with the country's primary aluminium exports increasing 20-fold in 2022. Of this, 30% was exported to the Netherlands, 17% to Turkiye and 15% to South Korea.

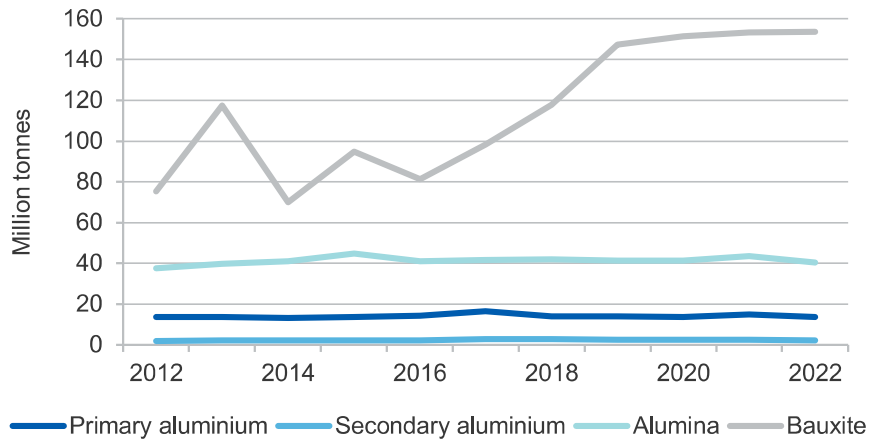
World secondary aluminium exports fell by 8.4% year-on-year to 2.0 million tonnes in 2022, driven by lower exports from Europe (Figure 11.11). Rising energy costs in Europe stunted primary aluminium output, forcing European aluminium users to turn to secondary aluminium as a substitute. Exports from Italy and Poland fell by 9.0% and 8.1% year-on-year in 2022, respectively.

World alumina exports declined by 6.9% year-on-year to nearly 41 million tonnes in 2022 (Figure 11.11). Over this period, exports from Australia — the world's largest alumina exporter — declined by 6.5% year-on-year. This followed a 5.4% fall in Australian alumina production over the same period (see Australia's exports and production). Offsetting the decline in Australia's alumina exports from Australia was an increase in exports from China, rising 206% year-on-year in 2022.

World bauxite exports increased by 0.3% year-on-year to nearly 154 million tonnes in 2022. This was propelled by a 3.9% year-on-year rise in Guinea — the world's largest bauxite exporter (Figure 11.11). Over the same period, bauxite exports from Australia — the world's second largest bauxite exporter — increased by 1.6% year-on-year, while exports from Brazil and Indonesia decreased by 17% and 10%, respectively.

In January 2023, the Indonesian Government confirmed that it will ban bauxite exports from 1 June 2023. The decision is reported to be part of the government's efforts to support domestic supply chains and increase the country's alumina production. The decision is likely to benefit Australian bauxite exporters, with tighter global supply expected to push up bauxite prices. However, the Indonesian's determination to raise its alumina refining capacity is likely to impact Australia's status as the world's largest alumina exporter.

Figure 11.11: World aluminium, alumina and bauxite exports



Source: World Bureau of Metal Statistics (2023); UN Comtrade (2023); Department of Industry, Science and Resources (2023)

Lower output led to higher aluminium imports in Europe and the US

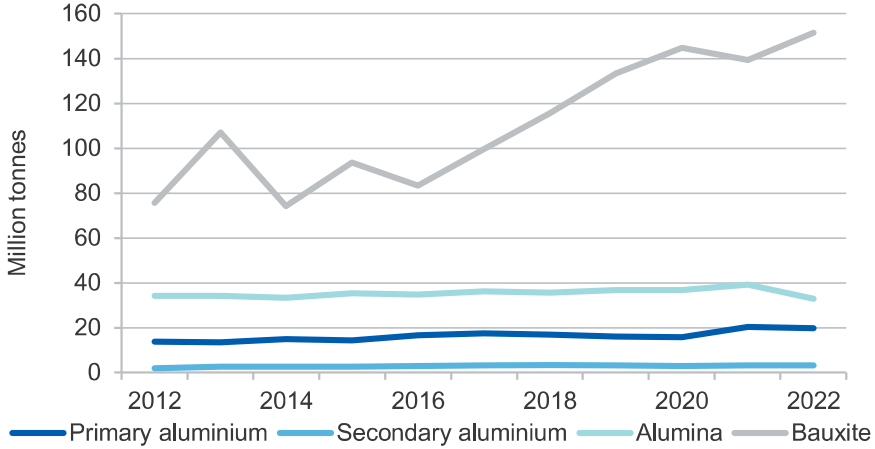
World primary aluminium imports rose by 1.1% year-on-year in 2022 to 21 million tonnes, driven by higher imports from Europe and the US (Figure 11.12).

In Europe, primary aluminium output declined in 2022, due to energy shortages and higher power costs, with many nations turning to imports to meet primary aluminium demand. This saw German and Netherlands imports rise 12% and 21%, respectively.

In the US, primary aluminium imports rose by 6.1% year-on-year, primarily due to lower primary aluminium production.

World secondary aluminium imports fell by 2.4% year-on-year in 2022 to 3.2 million tonnes, due to lower imports from the Netherlands and Poland (Figure 11.12). In the Netherlands, secondary aluminium imports in 2022 fell by 16% year-on-year to 395,000 tonnes. Over this period, secondary aluminium imports from Poland decreased by 3.2% year-on-year to 361,000 tonnes.

Figure 11.12: World aluminium, alumina and bauxite imports



Source: World Bureau of Metal Statistics (2023); Department of Industry, Science and Resources (2023)

World alumina imports fell by 16% year-on-year in 2022 to 33 million tonnes, due to a 39% year-on-year fall in alumina imports from China (Figure 11.12). Imports fell due to higher Chinese alumina production.

World bauxite imports rose by 8.8% year-on-year in 2022 to 152 million tonnes, driven by higher imports from China — the world's largest bauxite importer (Figure 11.12). China imported nearly 126 million tonnes of bauxite in 2022, a 17% year-on-year rise from 2021.

Over this period, Guinea was the largest supplier of bauxite to China accounting for 56% of China's total bauxite imports, followed by Australia (accounting for 27%), and Indonesia (accounting for 15%).

The US Government has imposed 200% tariffs on aluminium imports from Russia from 10 March 2023. As Russia accounts around 2% of US primary aluminium imports, the impacts from increased tariffs on Russian aluminium are expected to be limited. US primary aluminium importers would easily source their supply from countries such as Canada and Australia.

11.5 Prices

Aluminium prices rose slightly in 2022

Aluminium prices were highly volatile in 2022, driven by the Russia-Ukraine war, China's zero-COVID policy, as well as growing recessionary fears in the second half of the year. The London Metal Exchange (LME) aluminium spot price averaged US$2,708 a tonne in 2022 (Figure 11.13), reaching a 34-year high of US$3,985 a tonne on 7 March 2022, as the market reacted to the Russian invasion of Ukraine. However, rising concerns over COVID lockdowns in China, and the impact of rising interest rates, then saw prices fall sharply over the rest of 2022.

Supply cuts (due to rising input costs) led to a fall in primary aluminium stocks in 2022. LME stocks fell by 52% year-on-year to 450,300 tonnes. Shanghai Future Exchange stocks fell by 70% to 95,881 tonnes. LME off-warrant stocks fell by 30% year-on-year to 239,386 tonnes (Figure 11.14).

The free on board (FOB) Australian alumina price grew by 2.9% year-on-year to US$377 a tonne in 2022 (Figure 11.3). The growth was driven by higher alumina demand, as world aluminium output rose by 1.7% in 2022.

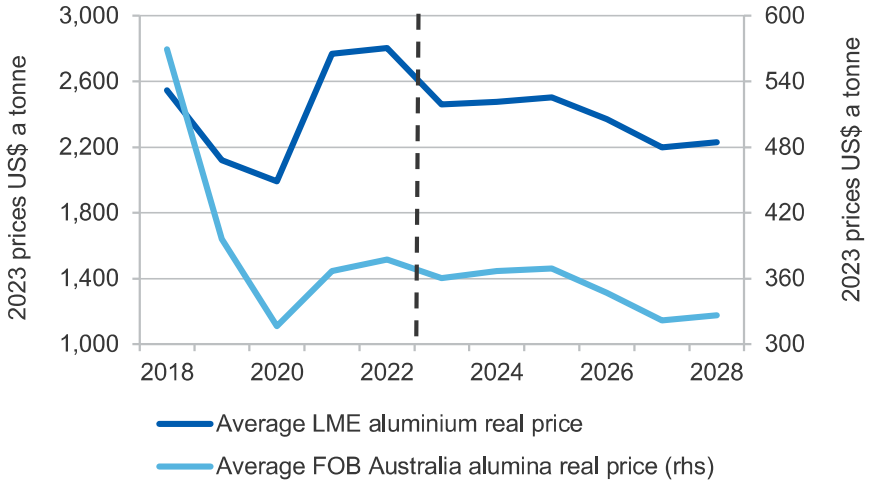
China's reopening lifts aluminium price forecasts in 2023

In China, the removal of COVID-19 containment measures and the relaxation of regulations on lending in November 2022 are expected to provide some support for global primary aluminium demand and prices in 2023. China is the world's largest aluminium consuming country, accounting for almost 60% of global primary aluminium demand.

In 2023, the LME aluminium spot price is forecast to fall by 9.1% year-on-year to average US$2,462 a tonne (in real terms) (Figure 11.13). Slowing world growth is expected to be a significant driver of lower aluminium prices. The free on board (FOB) Australian alumina price is forecast to decrease by 1.1% in 2023 to average US$360 a tonne (Figure 11.13).

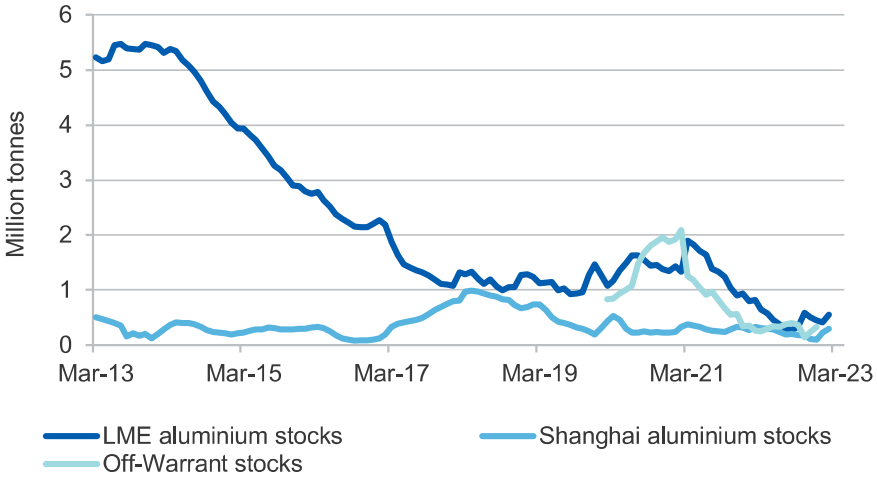
A risk to the 2023 price assessment is the ongoing tightening of monetary policy by major central banks. The higher interest rates go, the softer will be the global economy.

Figure 11.13: Primary aluminium and alumina prices



Source: LME (2023); Department of Industry, Science and Resources (2023)

Figure 11.14: Exchange aluminium stocks



Source: London Metal Exchange (2023); Bloomberg (2023)

The price and the availability of energy will continue to have a heavy influence on aluminium/alumina prices. There will be more turbulence in aluminium prices if coal prices remain high and/or hydropower shortages in China return. Gas shortages in Australia and concerns around energy security in Europe could also impact on production and prices.

Higher aluminium and alumina prices in the short term

After 2023, the LME aluminium price is projected to rise to average US$2,505 a tonne in real terms in 2025, before falling to average US$2,229 a tonne in real terms in 2028 (Figure 11.13). Growing demand for new, energy-efficient cars and technologies will boost aluminium usage. This is projected to see the FOB Australian alumina price increase to US$369 a tonne in real terms in 2025, before falling to average US$326 a tonne in real terms in 2028 (Figure 11.13).

11.6 Australia's exports and production

Higher aluminium prices drove aluminium and alumina exports in 2022

A 9.3% year-on-year rise in the LME aluminium price in 2022 and stronger demand for primary aluminium boosted Australian primary aluminium export values by 13% year-on-year to $5.9 billion in real terms in 2021. Australia's aluminium, alumina and bauxite (AAB) exports increased by 9.0% year-on-year in 2022 to nearly $18 billion in real terms, driven by higher primary aluminium prices.

Primary aluminium exports to South Korea increased by 88% year-on-year in 2022 to $1.3 billion (in real terms). Australian primary aluminium exports to the US (in real terms) rose by 48% year-on-year in 2022 to $625 million.

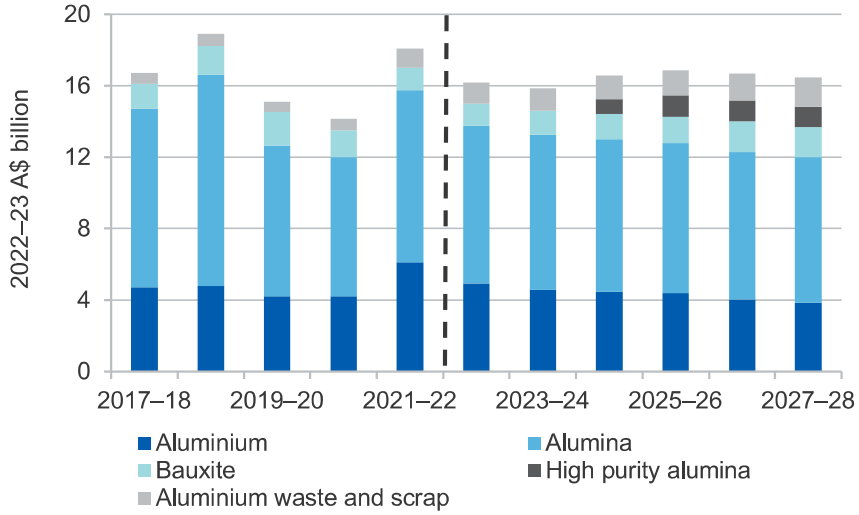
Australian alumina export volumes fell by 6.5% year-on-year to 17 million tonnes in 2022. However, high prices led to export values rising by 8.1% over the same period to $9.3 billion (in real terms).

Australian bauxite export volumes increased by 1.6% year-on-year to nearly 36 million tonnes in 2022, but export values fell by 15% year-on-year over the same period to nearly $1.2 billion (in real terms).

A weak earnings year for Australia's AAB exports in 2022–23

An expected fall in aluminium and alumina prices in 2023 is likely to reduce earnings for Australian aluminium smelters, alumina refiners and bauxite miners. Australia's AAB exports are forecast to decrease by 10% in 2022–23 (in real terms) to $16 billion (Figure 11.15).

Figure 11.15: Australian aluminium/alumina/bauxite exports



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

High purity alumina to add more income to Australia

After 2022–23, Australia's AAB exports are projected to be about $16 billion a year (real terms) over the outlook period. The primary aluminium price is projected to be relatively high in the outlook period (Figure.11.15). It is estimated that high purity alumina (HPA) will add about $1.0 billion of export income to Australia's AAB exports from 2024–25 and onwards.

The addition of HPA to Australia's critical minerals list in 2022 reflects its broad-ranging economic and strategic importance. HPA is used in the automotive and aerospace sectors, and is an important component of

high-performance electronics and optics. HPA is also a key input for ensuring the stability of lithium-ion batteries. As the world's second-largest producer, and the world's largest exporter of smelting grade alumina, Australia is well placed to build capacity in HPA.

There are 4 HPA major projects in Australia, with a total estimated capacity of around 28,000 tonnes a year. Phase 1 (of three phases) of the 9,000 tonnes a year HPA refining project in Kwinana (jointly funded by Alcoa and FYI Resources) progressed to the committed stage in 2022. In February 2023, Alcoa announced the termination of the joint development project, making uncertain the progress of the last two stages of the project.

King River Resources' 9,000 tonnes a year project, also in Kwinana, is currently at the feasibility stage. Commercial production is expected to start in 2025. Another HPA project is Alpha HPA's 10,000 tonnes a year Gladstone facility. The project is expected to come online in 2024.

Australia's alumina, aluminium and bauxite production fell in 2022

In 2022, Australia's primary aluminium output fell by 3.4% year-on-year to 1.51 million tonnes. This was primarily due to a 10% year-on-year decline (to 450,000 tonnes) at Rio Tinto's Boyne Island smelter in Queensland, and a 2.1% decline (to 185,000 tonnes) at Rio Tinto's Bell Bay aluminium smelter in Tasmania. Australia's alumina output fell by 5.4% year-on-year in 2022 to nearly 20 million tonnes, due to a 6.2% year-on-year fall (to 6.4 million tonnes) at Rio Tinto's QAL and Yarwun alumina refineries in Queensland. Australia's bauxite output fell by 0.2% year-on-year in 2022 to nearly 103 million tonnes, due to a 2.2% year-on-year decline (to nearly 12 million tonnes) at Rio Tinto's Gove mine in the Northern Territory.

Higher bauxite output over the outlook period

Portland Aluminium smelter's return to full capacity is expected to boost Australia's primary aluminium output to 1.6 million tonnes a year from 2023–24 (Figure 11.16). Absent major disruptions, Australia's alumina output is projected to remain about 21 million tonnes a year (Figure 11.16).

At the time of writing, it is unknown when Alcoa will receive an approval from the WA Government to clear 9,000 hectares of forest to mine enough bauxite to increase the output of its Pinjarra alumina refinery from 5.0 to 5.25 million tonnes a year.

Australia's bauxite output is projected to increase at 2.8% a year between 2023–24 and 2027–28, reaching 119 million tonnes in 2027–28 (Figure 11.16). The expansion of Metro Mining's Bauxite Hills mine in Queensland from 3.5 million tonnes a year to 6 million tonnes a year, and the commissioning of Glencore Bauxite Resources and Mitsubishi's 8.0 million tonnes a year Aurukun bauxite project in Queensland (estimated start of commercial operation in 2025) are the main drivers of this increased output.

Australia's operating costs are below the world average

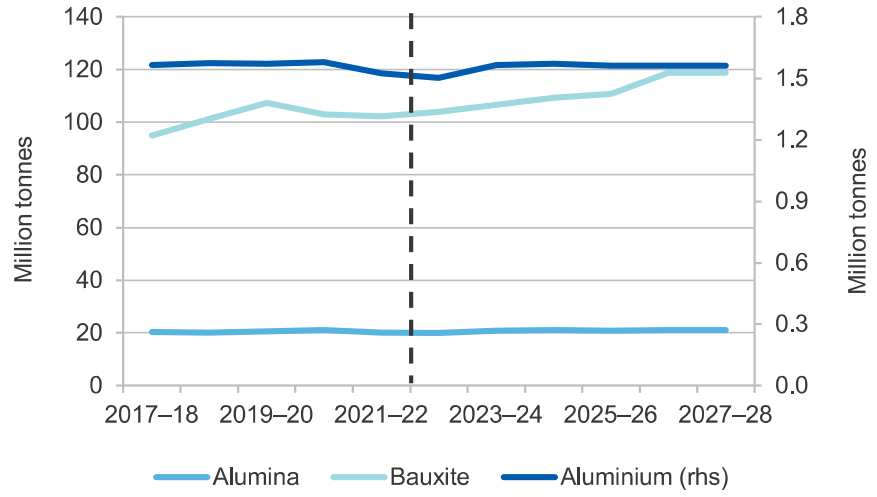
Figure 11.17 shows the operating cash costs of aluminium smelters in select major primary aluminium producing nations. Australian smelters' operating costs are below the world average, and those in the US and China (of US$2,327 a tonne in 2023). Figure 11.18 shows the operating cash costs of alumina refinery in selected major alumina producing nations. Australian refiners' operating costs are below the world average of US$377 a tonne in 2023. Figure 11.19 shows the operating cash costs of bauxite mine in selected major bauxite producing nations, including Australia, Guinea, China, Brazil and Indonesia. Australian miners' operating costs are below the world average of US$21 a tonne in 2023.

Revisions to the outlook

The forecast for Australia's AAB export earnings in 2023–24 has been revised up $2.1 billion from the December 2022 *Resources and Energy Quarterly (REQ)*. The revision reflects a smaller than expected fall in aluminium prices in 2023, and the inclusion of Australian aluminium waste and scrap exports. 2023–24 earnings are forecast at $16.5 billion, compared to $14.4 billion in the December 2022 *REQ*.

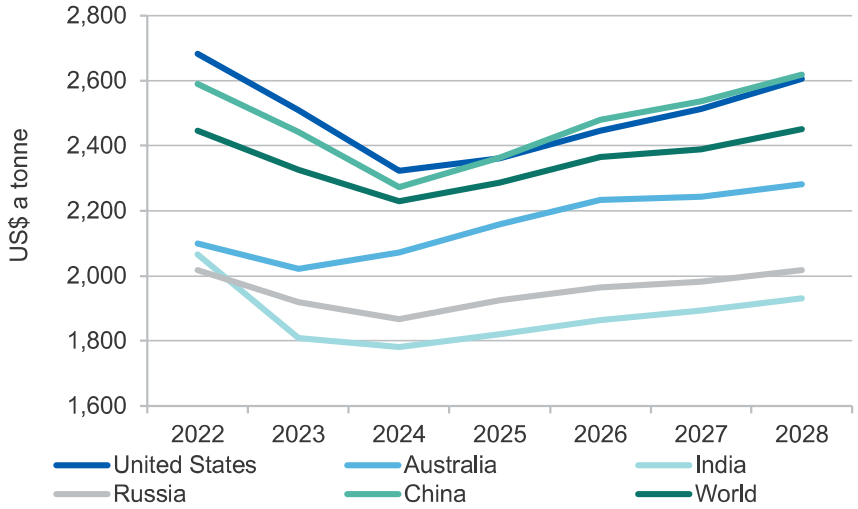
Compared with the March 2022 *Resources and Energy Quarterly*, forecast Australian earnings in 2026–27 (in nominal terms) has been revised up by 11% to $19.0 billion. This reflects the inclusion of HPA and aluminium waste and scrap.

Figure 11.16: Australian alumina/aluminium/bauxite output



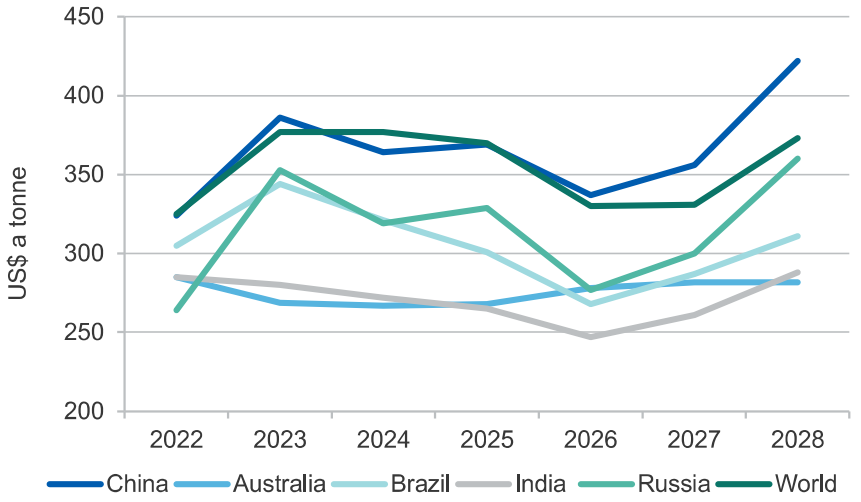
Source: Department of Industry, Science, Energy and Resources (2023)

Figure 11.17: Aluminium smelter total operating cash costs



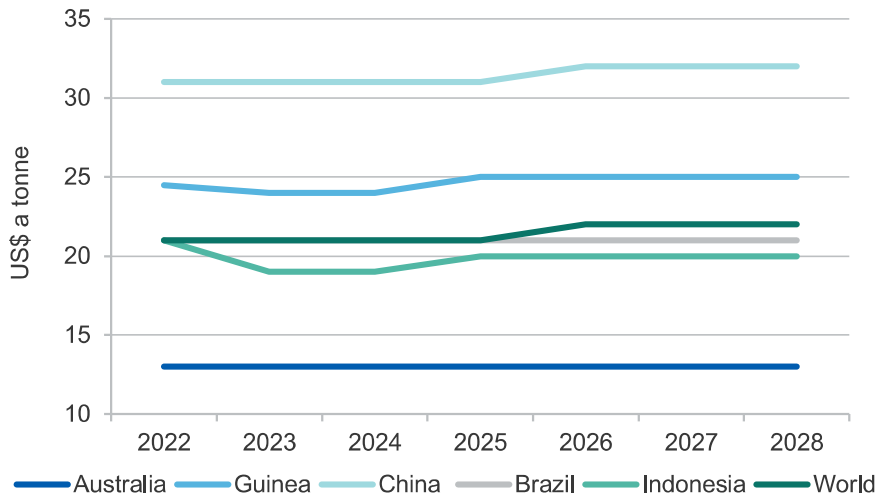
Source: CRU (2023)

Figure 11.18: Alumina refinery total operating cash costs



Source: CRU (2023)

Figure 11.19: Bauxite mine total operating cash costs



Source: Wood Mackenzie (2023)

Table 11.1: Aluminium, alumina and bauxite outlook

World	Unit	2022	2023[f]	2024[f]	2025[z]	2026[z]	2027[z]	2028[z]	CAGR[r]
Primary aluminium									
Production	kt	68,308	70,826	72,643	73,677	75,532	77,001	77,426	2.1
Consumption	kt	68,435	69,954	72,630	73,798	75,258	76,388	77,539	2.1
Prices aluminium[c]									
- nominal	US$/t	2,708	2,462	2,530	2,613	2,522	2,386	2,470	-1.5
- real[d]	US$/t	2,803	2,462	2,475	2,505	2,370	2,197	2,229	-3.7
Prices alumina spot									
- nominal	US$/t	365	360	375	385	369	349	362	-0.1
- real[d]	US$/t	377	360	367	369	347	322	326	-2.4
Australia	**Unit**	**2021–22**	**2022–23[f]**	**2023–24[f]**	**2024–25[z]**	**2025–26[z]**	**2026–27[z]**	**2027–28[z]**	**CAGR[r]**
Production									
Primary aluminium	kt	1,525	1,505	1,564	1,571	1,560	1,561	1,560	0.4
Alumina	kt	20,138	19,938	20,816	20,972	20,858	20,924	21,128	0.8
Bauxite	Mt	102.3	103.8	106.6	109.4	110.7	118.7	118.7	2.5
Consumption									
Primary aluminium	kt	241	187	204	205	204	204	204	-2.7
Exports									
Primary aluminium	kt	1,368	1,369	1,407	1,414	1,404	1,404	1,404	0.4
- nominal value	A$m	5,710	4,938	4,798	4,836	4,879	4,570	4,477	-4.0
- real value[e]	A$m	6,121	4,938	4,588	4,482	4,403	4,025	3,846	-7.5
Alumina	kt	17,739	17,571	18,110	18,246	18,146	18,204	18,381	0.6
- nominal value	A$m	8,977	8,821	9,074	9,198	9,290	9,383	9,477	0.9
- real value[e]	A$m	9,625	8,821	8,676	8,525	8,385	8,263	8,142	-2.8
Bauxite	kt	35,957	37,567	40,306	43,056	44,408	52,408	52,408	6.5
- nominal value	A$m	1,177	1,250	1,414	1,533	1,615	1,944	1,983	9.1
- real value[e]	A$m	1,262	1,250	1,352	1,421	1,458	1,712	1,703	5.1
Total value									
- nominal value	A$m	16,854	16,187	16,582	17,905	18,696	18,966	19,178	2.2
- real value[e]	A$m	18,069	16,187	15,856	16,594	16,874	16,701	16,476	-1.5

Notes: Total nominal and real values of Australian exports include primary aluminium, aluminium waste and scrap, alumina, high purity alumina and bauxite. **c** LME cash prices for primary aluminium; **d** In 2023 calendar year US dollars; **e** In 2022–23 financial year Australian dollars; **f** Forecast; **r** Average annual growth between 2022 and 2028 or 2021–22 and 2027–28; **z** Projection; Source: ABS (2023) International Trade in Goods and Services, 5368.0; Bloomberg (2023); London Metal Exchange (2023); Department of Industry, Science and Resources (2023); World Bureau of Metal Statistics (2023).