Australian Government
Department of Industry, Science, Energy and Resources

Office of the Chief Economist

# Resources and Energy Quarterly

## September 2021

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# Contents



## Resources insights

# Foreword

Australia's resource and energy exports are forecast to reach $349 billion in 2021–22, up from $310 billion in 2020–21. This represents an outstanding result in the context of the global COVID-19 pandemic — which has adversely impacted the world economy, and the resource and energy sectors of some other prominent mining nations. In 2022–23, exports are forecast to decline noticeably to just under the $300 billion mark.

The rollout of COVID-19 vaccines in advanced nations is allowing a strong rebound in the world economy. However, a new surge in COVID-19 cases (delta strain) in many nations is inhibiting a full global recovery, including in the automotive manufacturing sector where semi-conductor chip shortages have forced some renewed plant closures. Container shortages and other supply chain blockages are also impacting adversely on global trade and output, adding upward pressure to prices.

The semi-conductor chip shortage will impact on auto manufacturing — and hence metal demand — until 2022–23. Strong dwelling and infrastructure spending in many nations, due to stimulus measures, will see strong global demand for steel and non-ferrous metals for some quarters yet.

Australian iron ore earnings are (still) forecast to decline sharply in the outlook period, after topping the $150 billion mark — the first time ever for an Australian commodity — in 2020–21. The global economic recovery and constrained supply saw prices exceed US$200/tonne in the middle of 2021, but reductions in Chinese steel production have contributed to price declines in the September quarter. The ongoing recovery in Brazilian supply is set to impact adversely on prices in the outlook period.

Both a stronger outlook for base metals and coal, and the noticeable decline in the Australian dollar over the past three months, have more than offset the impact on export earnings of the modest downward adjustment we have made to our iron ore price forecasts. Lithium exports — of spodumene concentrate and refined chemicals — are expected to almost match zinc exports in 2022–23, as the race to make the world auto fleet electric gathers pace. Exporters of aluminium, nickel, zinc and copper are also benefiting from the global move to low emission technologies.

Thermal coal prices have surged in China, as critical shortages emerge. Seaborne thermal coal prices have risen to their highest level in more than a decade. High demand from major steel producing nations/regions, and problems with Mongolian supply has seen Australian metallurgical coal prices reach multi-year highs, more than regaining all of the reduction in export earnings following China's informal import restrictions.

After a fall of 3.2% in 2020, the IMF forecasts world GDP growth of 6.0% in 2021, 4.9% in 2022 and 3.5% in 2023. The recovery is expected to be dominated by the advanced nations, where the COVID-19 vaccine rollout has been fastest and access higher. Households in advanced nations have built their savings during the pandemic, but this will begin to unwind and increase overall consumption over the outlook period.

Very strong growth in the Chinese economy in the year to the June quarter 2021 seems set to moderate. The IMF has forecast China's GDP growth to be 8.1% in 2021, 5.7% in 2022 and 5.4% in 2023. This outlook has been helped by stimulatory Chinese government policy actions and high foreign demand for China's exports. Power shortages and environmental concerns are seeing withdrawals of Chinese ferrous and non-ferrous metal refining capacity.

There are downside risks to the record export earnings forecasts. They include a potential for a spike in global inflation and a risk of higher interest rates in response. New, vaccine-resistant strains of the coronavirus, and the risk of delays in the rollout of COVID-19 vaccines to the world's population, would also pose significant risks. Another downside risk is the extent of any further disruptions to Australian resource and energy commodity trade with China, which took almost half of such Australian exports in 2020–21.

# About this edition

The *Resources and Energy Quarterly* (REQ) contains the Office of the Chief Economist's forecasts for the value, volume and price of Australia's major resources and energy commodity exports.

A 'medium term' (five year) outlook is published in the March quarter edition of the *Resources and Energy Quarterly*. Each June, September and December edition of the *Resources and Energy Quarterly* features a 'short term' (two year) outlook for Australia's major resource and energy commodity exports.

Underpinning the forecasts/projections contained in the *Resources and Energy Quarterly* is the Office of the Chief Economist's outlook for global resource and energy commodity prices, demand and supply. The forecasts/projections for Australia's resource and energy commodity exporters are reconciled with this global context.

The global environment in which Australia's producers compete can change rapidly. Each edition of the *Resources and Energy Quarterly* attempts to factor in these changes, and makes appropriate alterations to the forecasts/projections by estimating the impact on Australian producers and the value of their exports.

In this report, commodities are grouped into two broad categories, referred to as 'resources' and 'energy'. 'Energy' commodities comprise metallurgical and thermal coal, oil, gas and uranium. 'Resource' commodities in this report are all other mineral commodities.

Unless otherwise stated, all Australian and US dollar figures in this report are in nominal terms. Inflation and exchange rate assumptions are provided in tables 2.1 and 2.2 in the *Macroeconomic outlook* chapter.

Information in this edition of the *Resources and Energy Quarterly* is current as of 21 September 2021.

## *Resources and Energy Quarterly* publication schedule

| Publication | Expected release date | Outlook period final year |
|---|---|---|
| December 2021 | 20 December 2021 | Australian data: 2022–23<br>World data: 2023 |
| March 2022 | 4 April 2022 | Australian data: 2026–27<br>World data: 2023 |
| June 2022 | 4 July 2022 | Australian data: 2023–24<br>World data: 2024 |
| September 2022 | 4 October 2022 | Australian data: 2023–24<br>World data: 2024 |

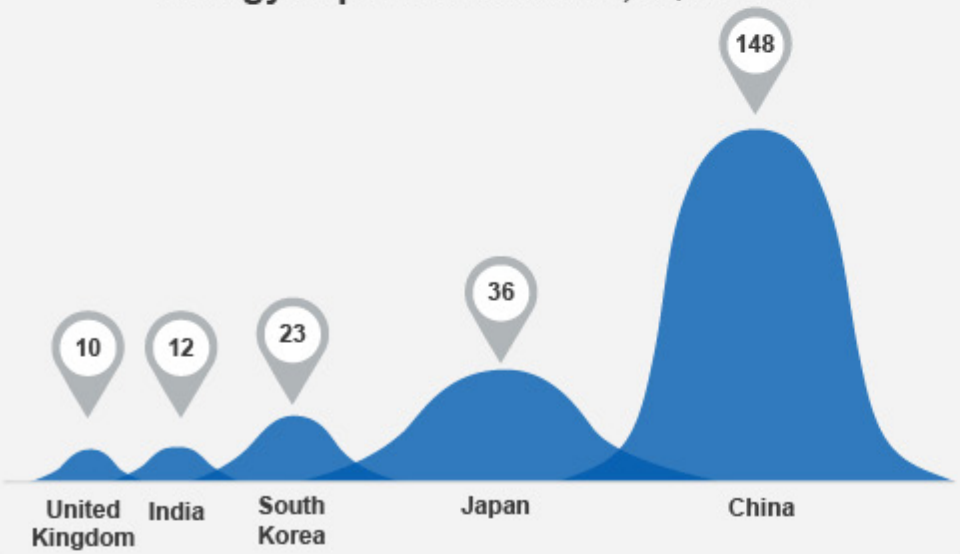
Source: Department of Industry, Science, Energy and Resources (2021)

# Overview

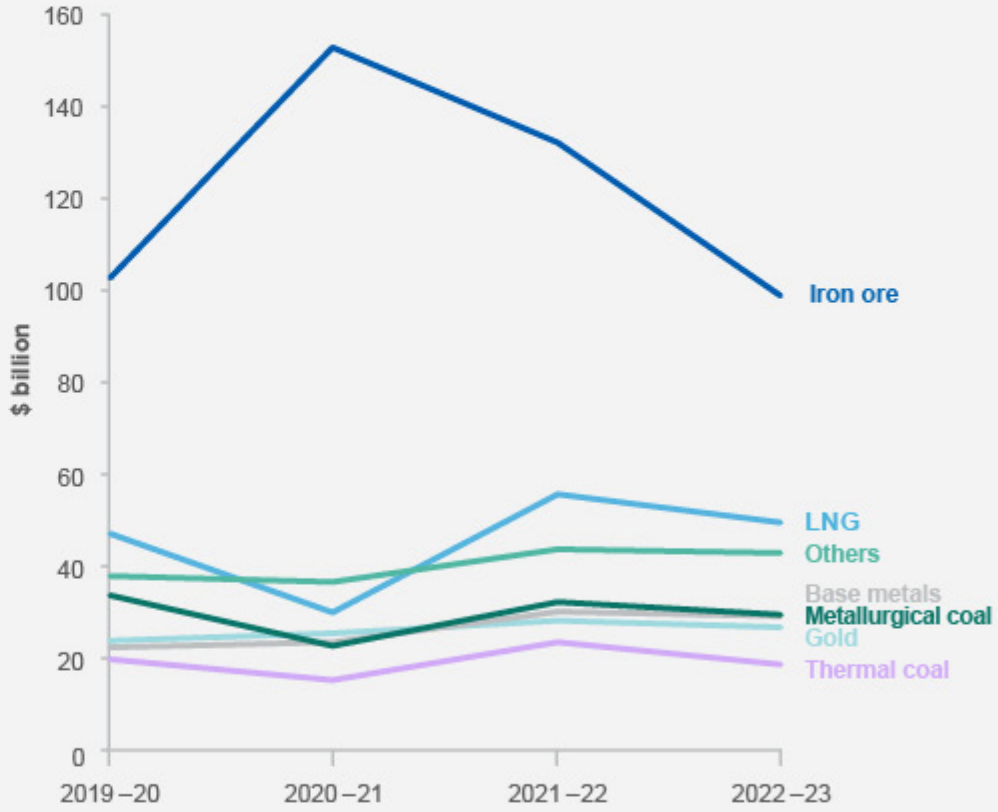
## Australia's mining sector

- **Around 10% of GDP**
- Makes up more than **half of Australia's** total exports
- **Directly employs around** a quarter of a million people

## Major markets for Australia's resources and energy exports in 2020-21, A$billion




## Australia's resources and energy exports



## 1.1 Summary

- The outlook for Australia's mineral exports remains strong, as the world economy rebounds from the impact of the COVID-19 pandemic. High prices, good volume growth and a weaker Australian dollar are driving a surge in export earnings. Some moderation in prices is likely in 2022, as supply rises and demand growth moderates.
- Export earnings are expected to rise by 14% to a record $349 billion in 2021–22, before declining to just under $300 billion in 2022–23.
- Australian iron ore prices look to have peaked, but coal prices have recovered all of their 2020 losses and more, as global shortages emerge.

## 1.2 Export values

### Australia's export values are estimated at about $350 billion in 2021–22

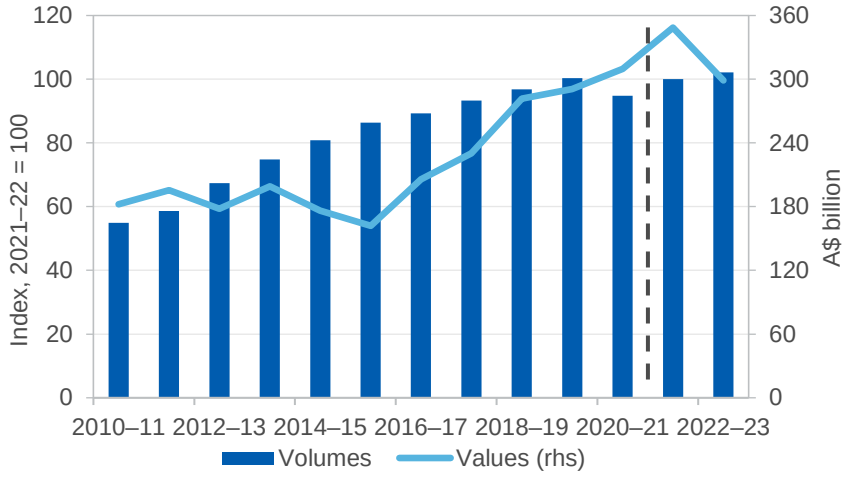
In the September quarter 2021, the Office of the Chief Economist's (OCE) Resources and Energy Export Values Index rose 49% from September quarter 2020; a 3% rise in volumes added to a 47% gain in prices.

Exports are forecast to reach a record $349 billion in 2021–22, up from $310 billion in 2020–21 (Figure 1.1), but fall to $299 billion in 2022–23. With volumes growing modestly, price movements are expected to determine much of the change in earnings (Figure 1.2). Commodity prices are set to decline once demand growth slows and global supply picks up.

### Weaker Australian dollar to help boost earnings

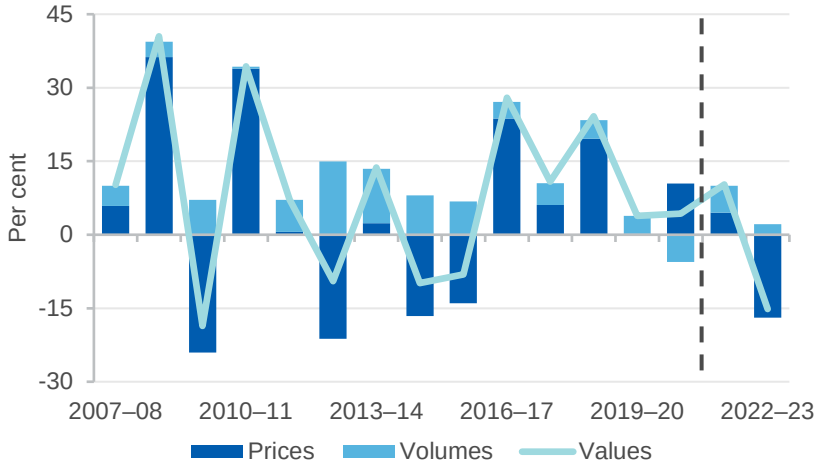
In Australian dollar terms, the OCE's Resources and Energy Commodity Price Index rose by 3% (preliminary estimate) in the September quarter 2021, and was up 47% on a year ago. In US dollar terms, the index fell by 3% in the quarter, but was 50% higher than a year ago. The index of prices for resource commodity exports (Australian dollar terms) rose by an estimated 32% in the year to the September quarter 2021. Energy commodity prices rose by 81% (Figure 1.3) from the COVID-19 crisis lows of September quarter 2020.

**Figure 1.1: Australia's resource and energy export values/volumes**



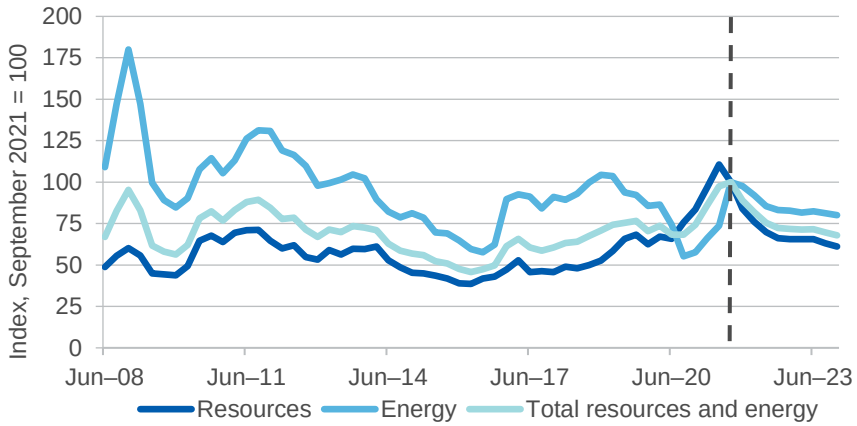

Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

**Figure 1.2: Annual growth in Australia's resources and energy export values, contributions from prices and volumes**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

**Figure 1.3: Resource and energy export prices, AUD terms**




Notes: The export price index is based on Australian dollar export unit values (EUVs, export values divided by volumes); the export price index is a Fisher price Index, which weights each commodity's EUV by its share of total export values.

Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## 1.3 Macroeconomic, policy, trade and other factors

World economic activity continues to recover, as the COVID-19 vaccine rollout gathers pace. However, with the more contagious delta strain circulating, COVID-19 infections are rising again in many nations. The vaccine rollout is highly uneven between developed and developing nations, and vaccination rates vary significantly. Fortunately, as the proportion of the population who are fully vaccinated rises, we will see further improvements in the impacts on health systems and economic activity more broadly.

Container shortages and other supply chain blockages are impacting adversely on global trade and output, and contributing to upward price pressure. Low vaccination rates and rising infection rates in south-east Asia have seen the closure of some plants assembling semi-conductor chips. The shortage of semi-conductor chips needed to complete new vehicle builds has recently seen major auto makers (re)shutting some plants. The temporary closure of a significant portion of the global automotive industry will shift ferrous/non-ferrous metal usage from 2021–22 to 2022–23.

The Chinese economy continues to expand at a relatively strong pace. The government and the central bank continue to vary different policy instruments to try and moderate significant fluctuations in growth.

The US Congress is considering a trillion dollar infrastructure spending package in tandem with a US$3.5 trillion budget reconciliation measure. Both packages can have a stimulatory effect on the US economy in 2022 if signed into law. The US Federal Reserve has signalled that it is likely to make monetary conditions less stimulatory as the economy gathers steam. This will boost the US dollar and thus put downward pressure on commodity prices (usually denominated in US dollars).

Variants of COVID-19 and delays in reaching vaccination goals threaten the fullest possible global economic recovery. Nevertheless, the outlook is for robust growth in the world economy over the 2021–22 and 2022–23 outlook period, as vaccination rates peak. The most recent IMF forecasts put world GDP growth at 6.0% in 2021, after a contraction of 3.3% in 2020. The IMF forecasts world growth to moderate towards more typical levels in 2022 and 2023. The recovery in developed nations — where household savings have risen sharply — is likely going to continue to outpace that of developing nations, where the vaccination rollout is generally lagging. Commodity demand should thus show significant growth over the outlook period. Australian coal exporters are enjoying decade price highs, on the back of shortages in Asia. However, as global supply lifts and demand moderates, prices are likely to decline noticeably from current levels.

Our projections suggest that resource and energy export earnings will peak at nearly $350 billion in 2021–22, but then fall back to just under $300 billion in 2022–23. The extent of any further disruption to Australian resource and energy commodity trade with China poses a downside risk to these forecasts. Higher interest rates — in response to a potential spike in inflation — also pose a downside risk to economic activity and hence the resource and energy export earnings forecasts.

## 1.4 Prices

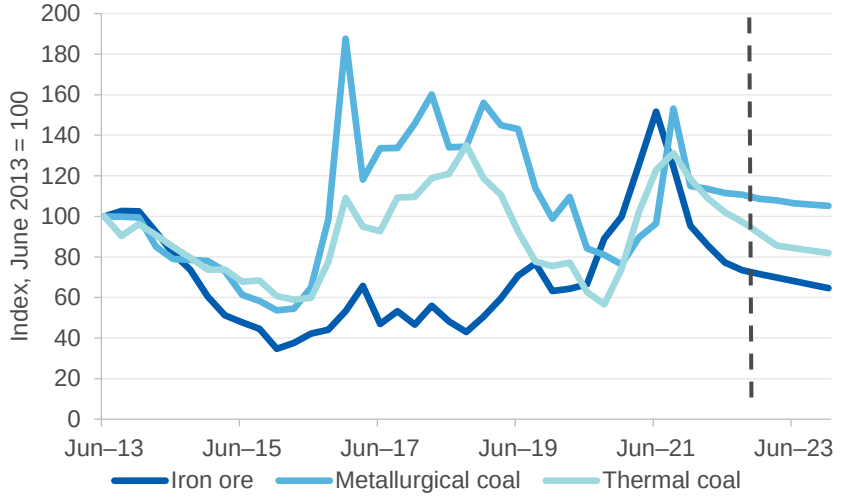
Since the June 2021 *Resources and Energy Quarterly*, the iron ore price hit a decade high (at over US$230 a tonne) and then retreated sharply. Strong demand in some of the advanced industrialised nations has been unable to offset the impact of weaker Chinese demand (Figure 1.4). Prices are expected to ease further over the outlook period, as Brazilian supply recovers and growth in world demand slows down.

Surging demand from steel producers in the major producing nations has seen Australian metallurgical coal prices hit multi-year highs. Australia's dominant position in the seaborne market has meant that our exporters have been able to sell coal to replace the (mainly North American and Russian) cargoes bought by China that have usually been sold elsewhere. Prices are expected to ease over the outlook period, as supply rises. Thermal coal prices have also risen sharply, with premium Australian coal hitting its highest level in more than ten years. With economic activity rebounding and the Northern Hemisphere winter approaching, power utilities are scrambling to rebuild stocks. Prices are likely to ease back in the outlook period, as supply gains match rising demand (Figure 1.4).

Oil prices have more than regained the sharp falls of the COVID-19 pandemic. The oil price seems likely to be capped at US$80 a barrel over the forecast period, as a further recovery in usage is matched by rising supply. Contract LNG prices are forecast to be flat, as oil prices settle.

After a dip to US$1,720 an ounce in early August, the gold price has steadied at around US$1,800 an ounce. The market is anticipating the withdrawal of large monetary stimulus by the major central banks over the outlook period. Lower investor demand is likely to offset improved jewellery demand over the outlook period. The price is likely to fall over the outlook period, as real bond yields rise. Base metal prices have more than recovered their COVID-19 losses, largely on the back of the global economic rebound (Figure 1.5). Supply worries have kept pressure on some base metal prices, with copper hitting record highs. Base metal demand should rise, as world industrial activity recovers and the global energy transition accelerates.

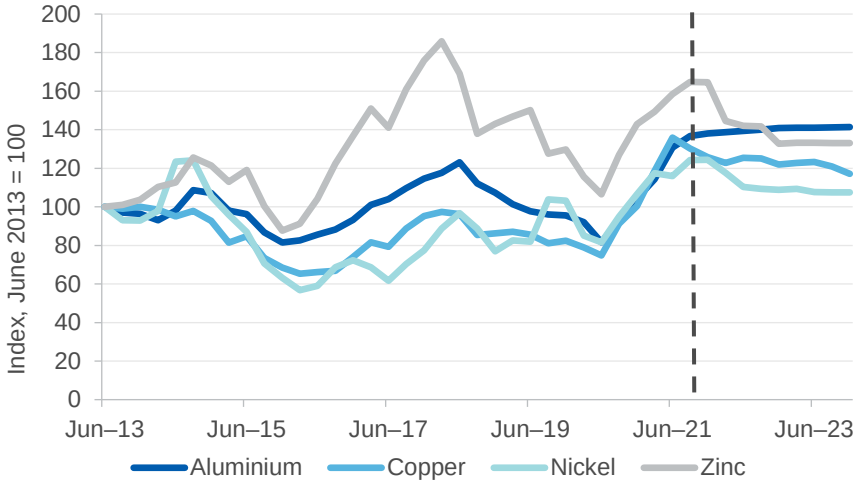
**Figure 1.4: Bulk commodity prices**




Notes: Prices are in US dollars, and are the international benchmark prices

Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 1.5: Base metal prices**




Notes: Prices are in US dollars, and are the international benchmark prices

Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

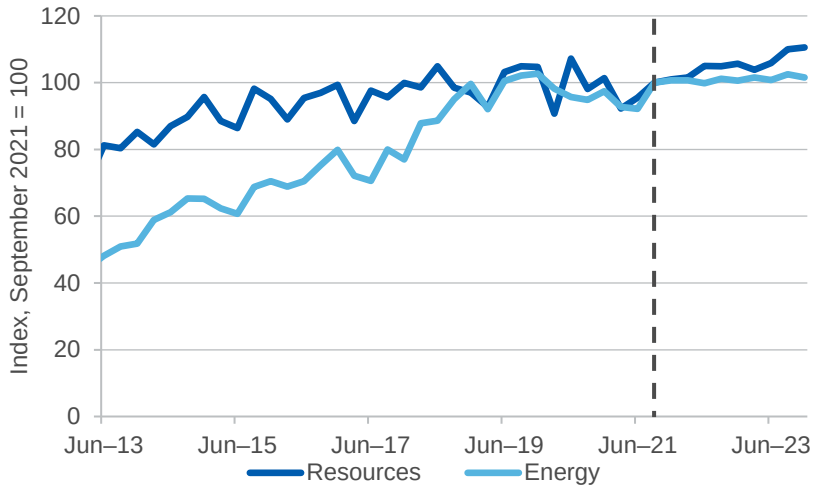
## 1.5 Export volumes

### September quarter export volumes rose, driven by energy exports

The OCE's Resources and Energy Export Volumes Index (preliminary estimate) rose by 6% in the September quarter 2021 from the June quarter, and was 3% higher than a year before (Figure 1.6). Within this total, resource commodity volumes rose 2% in the year to the September quarter 2021, while energy commodity volumes rose by 5%. The improvement in energy exports was driven by the rebound in demand, as the world economy gradually recovered from the impact of COVID-19.

In volume terms, resources exports are likely to show further significant growth over the outlook period. Economic growth and industrial production continues to recover amongst our main trading partners, increasing demand for our ferrous and non-ferrous metals. The production of electric vehicles and new energy technologies will see growing demand for commodities such as copper, aluminium, lithium and nickel. The volume of energy exports is forecasts to show only minor growth during the outlook period. High prices will impact on near term demand adversely.

**Figure 1.6: Resource and energy export volumes**




Source: Department of Industry, Science, Energy and Resources (2021)

## 1.6 Contribution to growth and investment

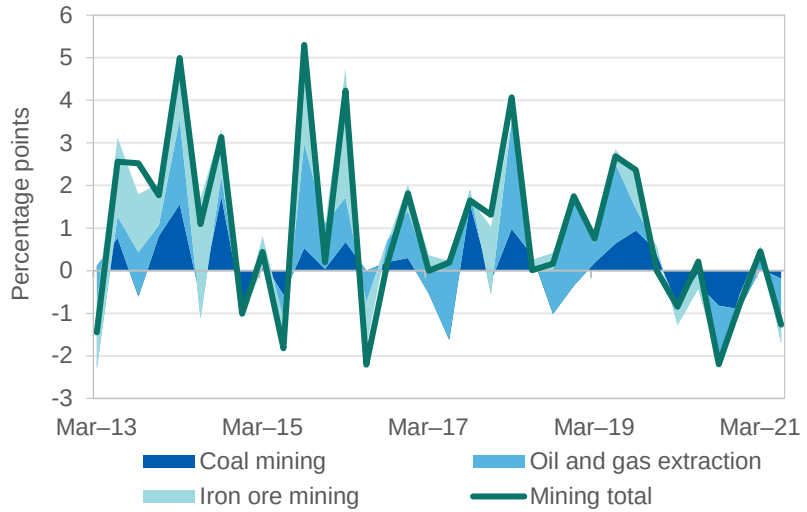
### Mining industry contracted, but by much less than the rest of the economy

Australia's real Gross Domestic Product (GDP) rose by 0.7% in the June quarter 2020, and was up 9.6% through the year since the (pandemic affected) June quarter 2020.

Mining value-added fell by 1.3% in the June quarter, and was down 3.8% over the previous twelve months.

In the coming two years, it is likely that the iron ore sector will make a significant contribution to real GDP growth, as volumes grow on the back of high prices and margins. The coal sector is likely to make a modest contribution to growth in the outlook period. Operational problems had a significant impact on gas production over the past year. Output is likely to make a positive contribution to growth in the outlook period, on the back of stronger LNG demand and high prices.

**Figure 1.7: Contribution to quarterly growth, by sector**

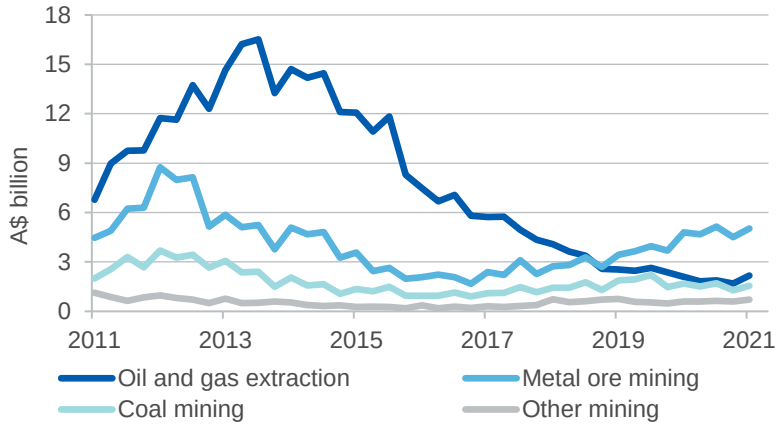



Source: ABS (2021) Australian National Accounts, 5206.0

## Mining investment is picking up

The ABS Private New Capital Expenditure and Expected Expenditure survey for the June quarter 2021 shows that Australia's mining industry invested $9.1 billion in the quarter. This is up by 1.0% in the quarter (seasonally adjusted), and up 2.8% from the June quarter 2020. In recent quarters, strong iron ore prices have supported growth in investment by the metal ore mining sector (Figure 1.8).

### Figure 1.8: Mining industry capital expenditure by commodity




Notes: Other mining includes non-metallic mineral mining and quarrying and exploration and other mining support services; chart data is in nominal, original terms

Source: ABS (2021) Private New Capital Expenditure and Expected Expenditure, 5625.0

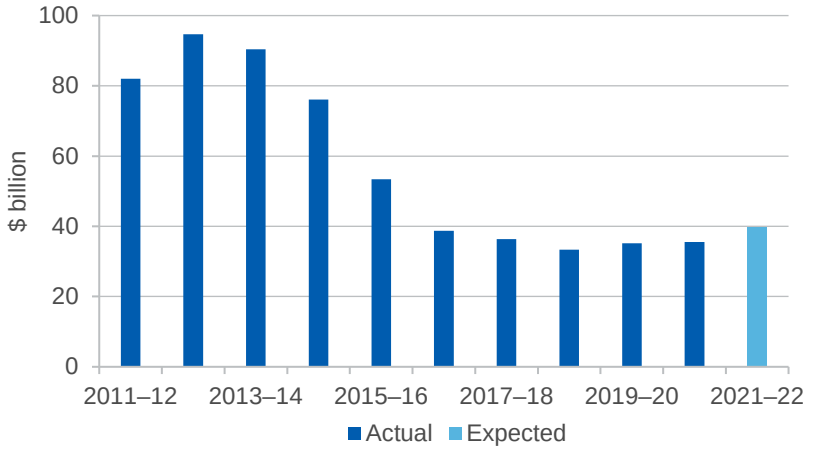
Expenditure was largely steady for buildings and structures and for machinery and equipment in the June quarter 2021 (Figure 1.9). Spending on plant and equipment remains well above its average level of recent years, though the reverse trend has been evident in buildings and structures. Forward expectations suggest that investment in 2021–22 will be slightly higher than in 2020–21 (Figure 1.10). Strong prices for gold, iron ore and other minerals have been leading to new investment plans, including the re-opening of mines. However, investment in new greenfield projects remains well below the levels of the previous decade, when three LNG plants were built.

### Figure 1.9: Mining industry capital expenditure by type, quarterly


Notes: Chart data is in nominal terms, seasonally adjusted.

Source: ABS (2021) Private New Capital Expenditure and Expected Expenditure, 5625.0

### Figure 1.10: Mining industry capital expenditure, fiscal year

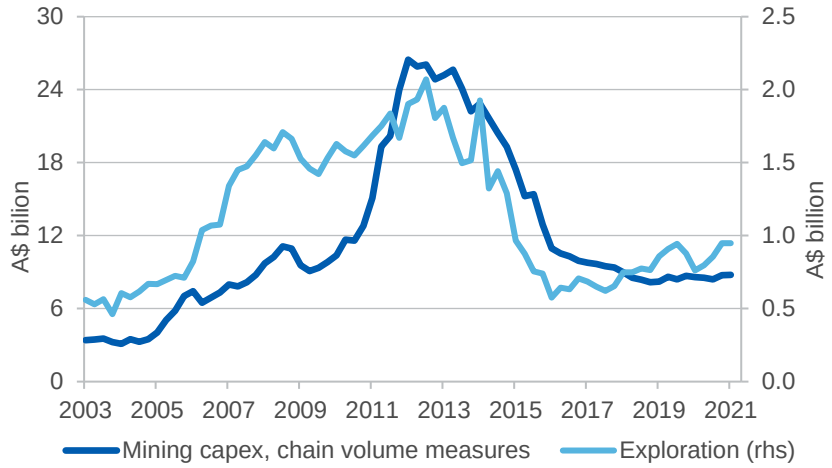



Notes: Chart data is in nominal terms

Source: ABS (2021) Private New Capital Expenditure and Expected Expenditure, 5625.0

Data on exploration spending (adjusted for inflation) suggests that mining capital expenditure is recovering at a marginal pace following falls in early 2020 (Figure 1.11). Exploration spending edged down in the June quarter, but remains higher through the year, with spending for all commodities reaching $949 million.

**Figure 1.11: Mining capital expenditure vs exploration, quarterly**



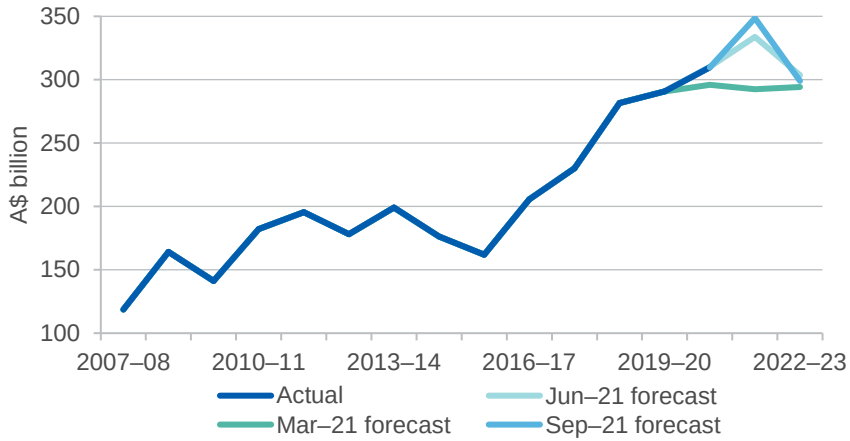

Source: ABS (2021) Private Capital Expenditure Survey, Chain Volume measure, 5625.0

## 1.7 Revisions to the outlook

At $349 billion, the forecast for Australia's resources and energy exports in 2021–22 are $15 billion higher (in nominal terms) than those contained in the June quarter 2021 *Resources and Energy Quarterly* (REQ). A weaker AUD/USD and stronger base/precious metal and energy exports have driven the revisions in 2021–22.

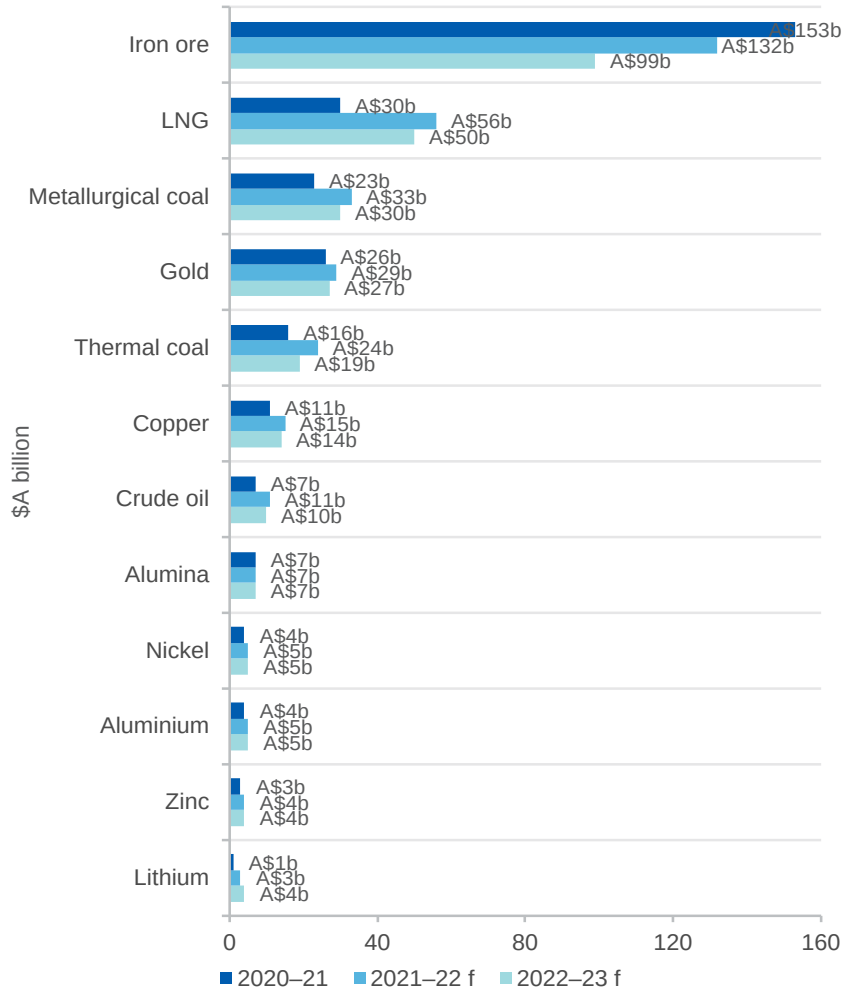
The forecast for $299 billion in export earnings in 2022–23 is down $4bn from the June quarter 2021 REQ. Downward revisions to iron ore prices (and hence earnings) have more than offset the impact of improved energy earnings in 2022–23.

**Figure 1.12: Resource and energy exports, by forecast release**




Source: Department of Industry, Science, Energy and Resources (2021)

## Figure 1.13: Australia's major resources and energy commodity exports, nominal




### Annual per cent change

| | 2021–22 f | | | 2022–23 f | | |
|---|---|---|---|---|---|---|
| | volume | EUV | value | volume | EUV | value |
| Iron ore | 4 | -17 | -13 | 4 | -23 | -19 |
| LNG | 5 | 73 | 83 | 3 | 24 | 28 |
| Metallurgical coal | 7 | 32 | 40 | 4 | 9 | 13 |
| Gold | 34 | -18 | 10 | 16 | -12 | 2 |
| Thermal coal | 8 | 39 | 50 | 5 | 5 | 10 |
| Copper | -2 | 30 | 27 | 0 | 12 | 12 |
| Crude oil | 7 | 41 | 51 | 1 | 14 | 16 |
| Alumina | -2 | 4 | 3 | -1 | 3 | 2 |
| Nickel | 39 | -4 | 34 | 20 | -8 | 10 |
| Aluminium | 2 | 25 | 27 | 1 | 11 | 13 |
| Zinc | 10 | 12 | 24 | 11 | -2 | 9 |
| Lithium | 41 | 124 | 215 | 31 | 44 | 88 |

Notes: f forecast. EUV is export unit value. Per cent change is from 2020–21.
Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## Table 1.1: Outlook for Australia's resources and energy exports in nominal and real terms

| | | | | | Annual percent change | | | |
|---|---|---|---|---|---|---|---|---|
| **Exports (A$m)** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** |
| Resources and energy | 290,758 | 309,748 | 348,582 | 299,030 | 3.3 | 6.5 | 12.5 | –14.2 |
| – real[b] | 301,057 | 315,603 | 348,582 | 293,925 | 1.9 | 4.8 | 10.4 | –15.7 |
| Energy | 115,532 | 81,296 | 128,565 | 113,904 | –12.9 | –29.6 | 58.1 | –11.4 |
| – real[b] | 119,624 | 82,833 | 128,565 | 111,959 | –14.1 | –30.8 | 55.2 | –12.9 |
| Resources | 175,226 | 228,452 | 220,017 | 185,126 | 17.7 | 30.4 | –3.7 | –15.9 |
| – real[b] | 181,433 | 232,771 | 220,017 | 181,965 | 16.2 | 28.3 | –5.5 | –17.3 |

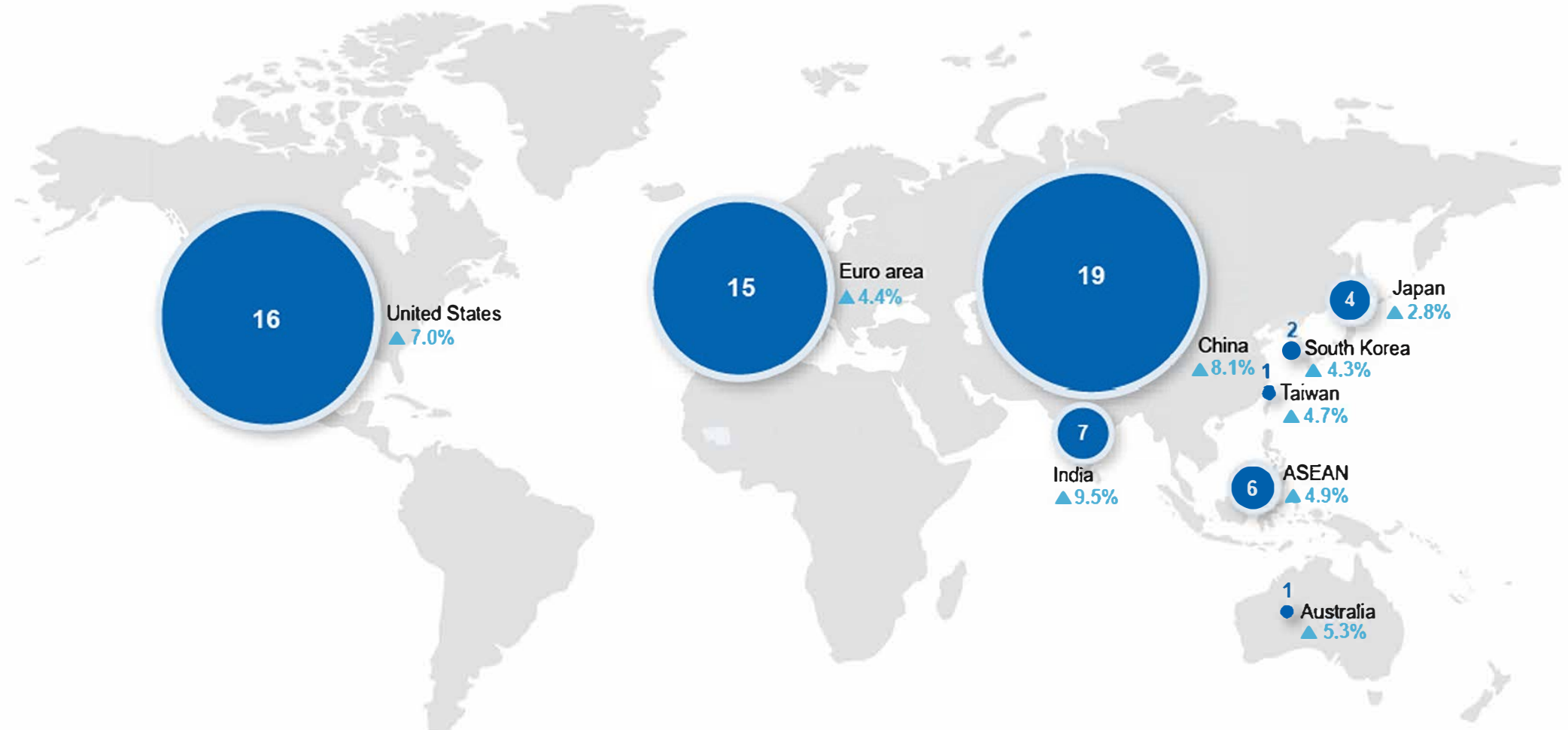
Notes: **b** In 2020–21 Australian dollars; **f** forecast; **r** Compound annual growth rate; **z** projection.
Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## Table 1.2: Australia's resource and energy exports, selected commodities

| | | Prices | | | | Export volumes | | | Export values, A$b | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Unit** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **Unit** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21** | **2021–22[f]** | **2022–23[f]** |
| Iron ore | US$/t | 140 | 115 | 85 | Mt | 868 | 906 | 939 | 153 | 132 | 99 |
| LNG | A$/GJ | 7.4 | 12.9 | 11.5 | Mt | 78 | 82 | 83 | 30 | 56 | 50 |
| Metallurgical coal | US$/t | 123 | 176 | 155 | Mt | 171 | 183 | 186 | 23 | 33 | 30 |
| Gold | US$/oz | 1,850 | 1,740 | 1,668 | t | 283 | 379 | 384 | 26 | 29 | 27 |
| Thermal coal | US$/t | 76 | 98 | 76 | Mt | 192 | 208 | 212 | 16 | 24 | 19 |
| Copper | US$/t | 7,971 | 9,008 | 8,809 | Kt | 902 | 885 | 909 | 11 | 15 | 14 |
| Crude oil | US$/bbl | 54 | 70 | 67 | Kb/d | 276 | 295 | 282 | 7.4 | 11.2 | 9.9 |
| Alumina | US$/t | 284 | 282 | 310 | Kt | 18,600 | 18,299 | 18,336 | 6.9 | 7.1 | 7.2 |
| Nickel | US$/t | 16,267 | 17,836 | 16,280 | Kt | 181 | 252 | 260 | 3.8 | 5.1 | 4.6 |
| Aluminium | US$/t | 2,029 | 2,536 | 2,582 | Kt | 1,357 | 1,387 | 1,387 | 3.7 | 4.8 | 4.7 |
| Zinc | US$/t | 2,657 | 2,834 | 2,488 | Kt | 1,390 | 1,532 | 1,712 | 3.3 | 4.1 | 3.9 |
| Lithium | US$/t | 545 | 1,190 | 1,032 | Kt | 1,466 | 2,063 | 2,526 | 1.1 | 3.4 | 3.8 |
| Uranium | US$/lb | 30 | 34 | 39 | t | 5,649 | 5,800 | 5,800 | 0.6 | 0.5 | 0.6 |

Notes: **a** Export data covers both crude oil and condensate; **f** forecast. **Price information:** Iron ore fob (free-on-board) at 62 per cent iron content estimated netback from Western Australia to Qingdao China; Metallurgical coal premium hard coking coal fob East Coast Australia; Thermal coal fob Newcastle 6000 kc (calorific content); LNG fob Australia's export unit values; Gold LBMA PM; Alumina fob Australia; Copper LME cash; Crude oil Brent; Aluminum LME cash; Zinc LME cash; Nickel LME cash; Lithium spodumene ore.
Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; LME; London Bullion Market Association; The Ux Consulting Company; US Department of Energy; Metal Bulletin; Japan Ministry of Economy, Trade and Industry; Department of Industry, Science, Energy and Resources (2021)

# Macroeconomic Outlook




In 2020, world economic growth contracted by 3.3% due to COVID-19. Increasing containment of COVID-19 and economic stimulus are expected to support growth of 6.0% in 2021.

Risks include slow or limited vaccine rollouts, as well as additional COVID-19 strains. Over the medium term rising inflationary pressures pose a risk.

● = Share of global GDP

▲ = Economic growth in 2021

▼ = Economic contraction in 2021

## 2.1 Summary

- The world economy is forecast to grow by 6.0% in 2021. However, renewed outbreaks of COVID-19 variants, continued supply chain issues and rising (and persistent) inflation, all present risks to the global recovery in the second half of 2021 and in 2022.
- A strengthening recovery in advanced economies is offsetting weaker growth across developing and emerging economies. World economic growth is forecast to moderate to 4.9% in 2022 and 3.5% in 2023, as levels of pent up demand and government support normalise.
- The growing divergence in the recoveries of different economies reflects relative progress in the rollout of COVID-19 vaccinations, and of the level of fiscal and monetary support being provided by governments in response to the pandemic.

## 2.2 World economic outlook

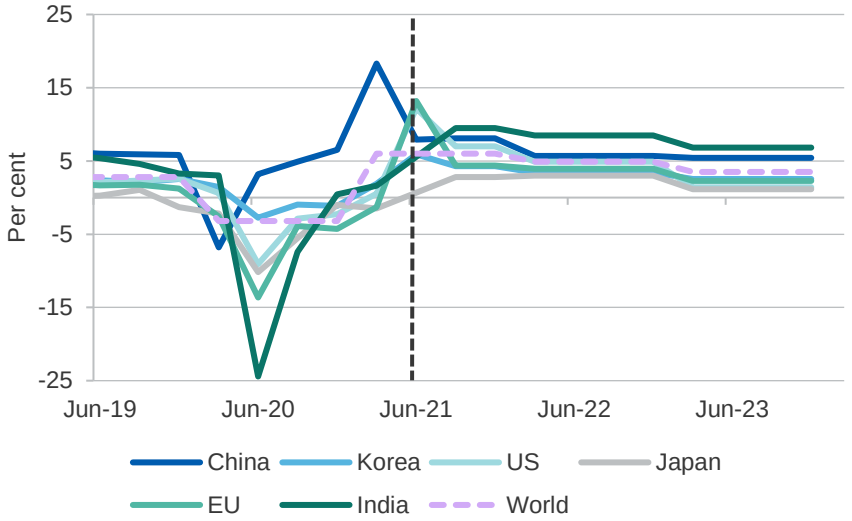
### Global growth now reflecting a stronger recovery in advanced economies

In its July 2021 Outlook, the International Monetary Fund (IMF) projected the world economy to grow by 6.0% in 2021 (Figure 2.1). This forecast is unchanged from its April 2021 update. However, it now reflects a stronger-than-expected recovery in advanced economies that is projected to offset weaker growth projected for developing and emerging economies.

The IMF has highlighted differing levels of progress in the rollout of vaccines as a major driver of the growing divergence in the recovery of different countries and regions. With advanced economies averaging close to 40% of the population vaccinated by the end of July, economic activity has continued to see a return to normal into the second half of 2021. High frequency indicators such as retail activity are now close to pre-pandemic levels, while public transport use and road traffic levels are rising. Projected growth for advanced economies in 2021 has been upwardly revised by 0.5 percentage points to 5.6%.

In comparison, emerging and developing economies had an average vaccination rate less than half of that of advanced economies by the end

**Figure 2.1: GDP growth forecasts**




Source: Bloomberg (2021); IMF (2021)

of July, with forecast economic growth in 2021 reduced by 0.4 percentage points to 6.3%.

The considerable levels of fiscal and monetary support being provided in many advanced economies continues to counter the short-term economic impacts of the COVID-19 pandemic. Significant fiscal packages in economies such as the US, EU and the United Kingdom, are expected to boost economic growth forecasts through to 2022. To assist low and middle-income countries in their recoveries, the IMF is also introducing a new US$650bn allocation of its special drawing rights (SDR), to cover essential health and social spending needs.

Beyond 2021, economic growth is expected to moderate. The IMF forecasts the world economy to grow by 4.9% in 2022, a 0.5 percentage point increase from the April 2021 outlook. This increase is primarily due to the substantial infrastructure package currently being considered by US legislators, with a vote in the House of Representatives scheduled for late

September. World growth is expected to further ease in 2023 as pent up demand in the global economy recedes and government support removed.

However, new strains of the pandemic present growing risks to the recovery. Recent outbreaks in Asia-Pacific and Africa are likely to further constrain global supply chains and risk further increases in producer and consumer prices. These outbreaks, along with further restrictions on movement, could act as a drag on economic activity in advanced and developing economies over the outlook period.

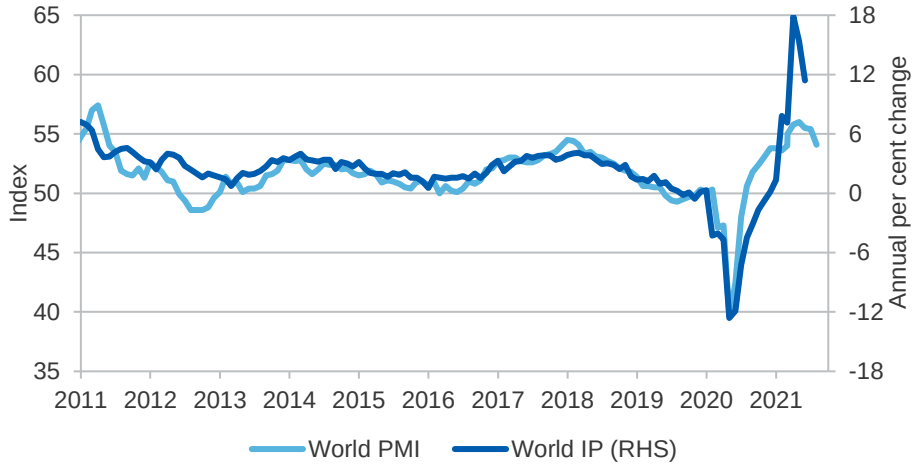
### Robust growth in industrial production and trade projected for 2021

The outlook for Australia's major trading partners remains positive, with growth forecast to reach 7.0% in 2021 and 5.0% in 2022[1]. The World Trade Organisation's *Goods Trade Barometer* — a leading indicator for world trade — reached its highest ever rating in June. And as of July, global merchandise trade volumes exceeded pre-pandemic levels, and are expected to grow by around 8% in 2021.

Trade has now expanded beyond a concentration on pandemic-related purchases, to include goods such as sporting equipment, IT products and iron and steel. However, services trade continues to be slower in its recovery from COVID-19 lows, sitting well below pre-pandemic levels through the first half of 2021. A deterioration in forward-looking indicators, such as export orders, suggests growth is likely to slow from the September quarter.

Global industrial production (IP) has continued to see an impressive rebound in 2021, 12% higher year-on-year at the end of June. However, the rate of recovery appears to be slowing, with world IP in the June quarter falling by 0.2% quarter-on-quarter as COVID-19 containment measures were re-introduced in some nations. The world manufacturing sector, marked 14 consecutive months of expansion in August, with a Purchasing Managers Index (PMI) reading of 54.1. However, the pace of

**Figure 2.2: Industrial production (IP) and world PMI**




Notes: PMI data is to August 2021; IP data only available to June 2021
Source: CPB Netherlands Bureau for Economic Policy Analysis (2021)

this expansion appears to be slowing, with the August reading falling to a six month low (Figure 2.2).

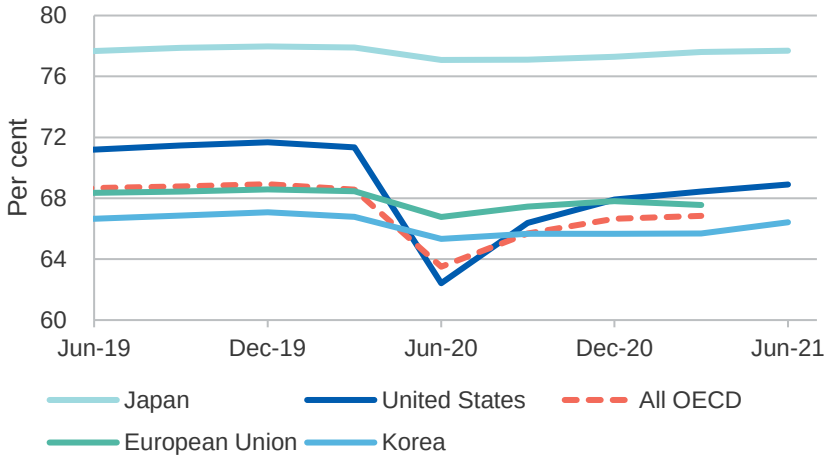
The services sector has shown an improvement in recent months, with four of the five fastest growing industries in the global composite PMI in July including tourism & recreation, telecommunications, industrial services and health care. However, with the rate of expansion slowing to a seven month low in August (with a reading of 52.6), this suggests that economic growth may have already peaked and has entered a post-recovery slowdown in the second half of 2021.

### Employment recovering, but still below pre-pandemic levels.

In spite of the strong global recovery, employment has been slower to rebound, and continues to track below pre-pandemic levels in most major economies. The combined employment rate for all OECD countries

[1] From RBA Statement on Monetary Policy August 2021

**Figure 2.3: Employment rates in OECD economies**




Source: Bloomberg (2021)

reached 66.8% in the first quarter of 2021, up from 63.5% year-on-year, but below its 2019 average of 68.7% (Figure 2.3).

While high frequency indicators such as jobs ads and the number of firms looking to hire, show a strong improvement in labour demand, the supply of labour continues to lag in many major economies. This reflects ongoing barriers such as the impact of school closures on caring responsibilities, health concerns, and travel restrictions maintaining geographical and industry mismatches between supply and demand.

### Supply chain disruptions and inflationary pressures persisting

The strong growth in world trade and industrial production in 2021 is continuing to put pressure on global supply chains, as the surge in demand continues to outpace the recovery in supply. Recent outbreaks of the delta variant of the COVID-19 pandemic are also further impacting supply, particularly from Asia. In July, suppliers' delivery times (measured through the JPMorgan Global manufacturing PMI) were the longest on record, and input prices were at 10 year highs. Supply delays have also started contributing to slowing growth in global production as of July.

Port congestion and a world-wide shortage of shipping containers continues to drive transport costs higher. For example, shipping container rates on the Shanghai to Los Angeles route in early August were more than 500% higher than 12 months previous, and the highest in 30 years. The Baltic Dry Index — a global measure of shipping prices for raw materials such as coal and iron ore — has risen more than 200% in the 12 months to late-August 2021. There are concerns these elevated rates may persist through to 2022.

Shortages of semi-conductors have also continued to impact the global manufacturing sector. This includes a number of consumer discretionary sectors such as automotive and technology, with many major companies warning of ongoing slowdowns in production in recent updates. Toyota announced a 40% cut in global output for September, and this follows production cuts introduced by other major US and European automakers from the June 2021 quarter. The shortages are expected to be overcome, and manufacturing activity is expected to return to normal, albeit at a more gradual rate than first anticipated.

Inflationary pressures in 2021 — particularly due to high food prices — have led emerging economies such as Brazil, Russia and Mexico to (start to) normalise monetary policy and raise interest rates. This may start to impact the pace of the economic recovery in these countries over the outlook period.

## 2.3 Major trading partners' economic outlook

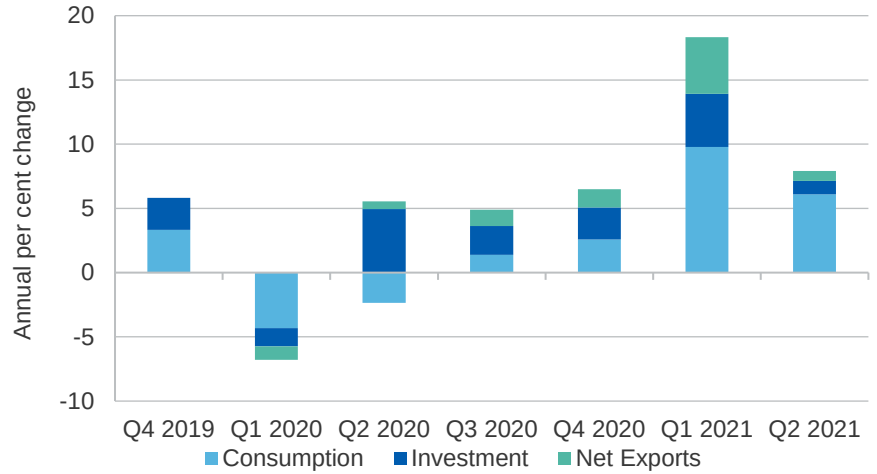
### Consumption starting to play a bigger role in China's recovery in 2021

China's economy has continued to rebound strongly in 2021, with year-on-year growth of 7.9% in the June quarter. China's recovery has broadened from a reliance on exports and infrastructure investment (in 2020), with domestic consumption accounting for more than three-quarters of real GDP growth year-on-year in the June quarter of 2021 (Figure 2.4). This included significant growth in expenditure for the Information Technology (20%), Hospitality (17%), and Transportation (13%) sectors.

Industrial production grew by 5.3% year-on-year in the month of August, down from a 2021 high of 14% in March. China's historic growth surge in the first half of 2021 — as the country emerged from the pandemic — now appears to be easing. China's manufacturing PMI continued to trend lower in August, reaching 50.1. While this reflects seasonal impacts such as adverse weather and planned maintenance, producers have also identified shortages of input goods — such as semiconductor chips, coal and gas — and slowing demand growth, as reasons for the slackening in activity. The Caixin-Markit Manufacturing PMI, a broader-based survey of over 500 companies, also fell into contractionary territory for the first time since April 2020, with a reading of 49.2 in August.

While the IMF's July 2021 Outlook forecasts China's economy to grow by 8.5% in 2021, renewed outbreaks of the delta variant have emerged as a key risk to the ongoing recovery in the second half of 2021. Lockdowns and travel restrictions have been re-introduced across some provinces and major cities, with cases hitting a seven month high in August.

### Figure 2.4: Contributions to China's quarterly real GDP growth




Notes: Consumption is made up of both household and government sectors.
Source: Bloomberg (2021)

This has come in the midst of ongoing efforts by the Chinese government to reduce the accommodative fiscal support that was maintained throughout the early stages of the pandemic, and to reinitiate debt deleveraging. Total infrastructure investment contracted in June (three month moving average, year-on-year) for the first time in over 12 months, marking a considerable slowdown from 30% growth seen at the end of March 2021. China has also continued to advance its so-called 'Three Red Lines policy' in 2021, aimed at tightening borrowing criteria and reducing debt levels in the country's property sector.

With the growing potential for a significant slowdown in economic growth in the second half of 2021, there is growing market commentary that the Chinese government may seek to increase fiscal support in the near term. Local government special bond issuance — the primary means for government funding infrastructure — ran below quota in the first half of the year, and now provides the Chinese government with additional capacity to respond to any weakening in domestic conditions.

### Japan's economy grows in June quarter in the midst of the pandemic

Despite severe impacts from the COVID-19 pandemic in the first half of 2021, Japan's economy has continued to pick up momentum, with positive GDP growth of 1.3% year-on-year in the June quarter.

This has been led by a steady increase in industrial production, which grew 12% year-on-year in the month of July and exports, which grew 37% year-on-year in the same period. While Japan's manufacturing sector has continued its expansion into the second half of 2021, the rate of growth appears to be slowing. Japan's Jibun Bank Manufacturing PMI fell to 52.7 in August (from 53.0 in July). Manufacturers have flagged the growing impact on output and demand from renewed outbreaks of COVID-19 both domestically and in South East Asia, with export orders in August falling for the first time in seven months.

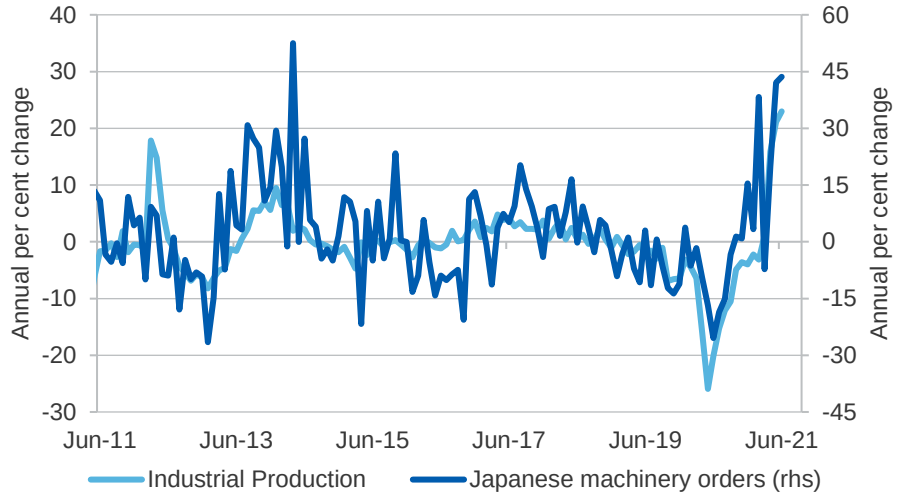
Firms have also continued to identify continued supply chain issues and the ongoing presence of the pandemic is weighing on the sector. Toyota — Japan's biggest company by revenue in 2020 — announced a 40% cut

to global production in September, and other major automakers (such as Honda and Nissan) are flagging similar adjustments. In spite of these disruptions, expectations remain for a continued expansion of Japan's manufacturing sector over the next 12 months.

Japan's Jibun Bank Japan Services PMI also saw a sharp fall in August (to 42.9), signalling ongoing weakness in demand for services in 2021 as the economy recovers from the resurgence of COVID-19 cases. Business activity, and new orders had their fastest declines in over 12 months, while average cost burdens rose for the ninth consecutive month. This includes inputs prices for raw materials, staff and fuel costs.

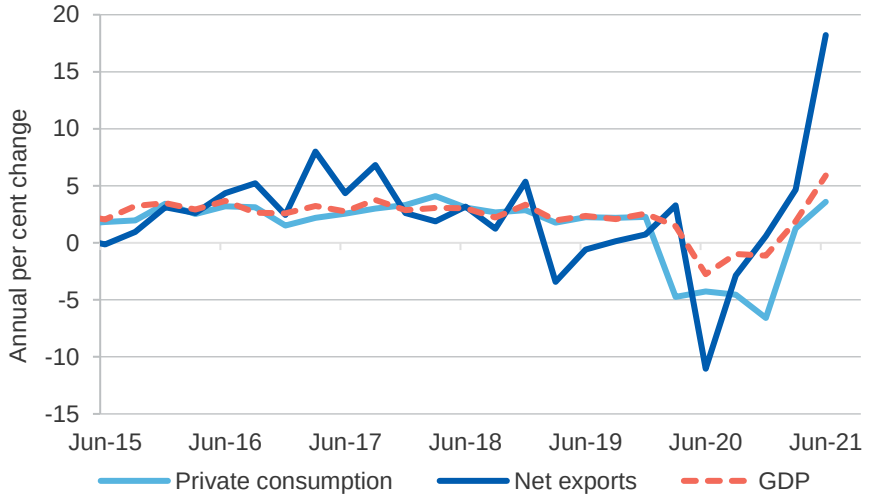
The IMF is now projecting Japan's economy to grow by 2.8% in 2021. This is a fall of 0.5 percentage points from the April 2021 Outlook, reflecting the impacts of the COVID-19 pandemic through the first half of 2021. However, Japan is expected to see a stronger rebound in the second half of 2021, as vaccinations are rolled out and the economy returns to normal, with growth expected to reach 3.0% in 2022.

### Figure 2.5: Japan's industrial production and machinery orders




Source: Bloomberg (2021)

### Figure 2.6: South Korean real GDP, consumption and trade




Source: Bloomberg (2021)

#### Rebound in global trade driving South Korea's recovery

South Korea's GDP grew by 5.9% year-on-year in the June quarter 2021, with the economy having now recovered to above pre-pandemic levels. Strong exports and recovering household consumption have continued to help drive the recovery of the economy (Figure 2.6). Total net exports (in real value terms) in the first half of 2021 were around 47% higher year-on-year and close to 50% higher than the same period in 2019.

South Korea's manufacturing PMI continues to be in expansionary territory, with a reading of 51.2 in August. However, the reading represents a second straight month of falls (from 53.9 in June and 53.0 in July), suggesting the impressive rate of recovery for the sector is perhaps starting to slow going into the second half of 2021. Firms have highlighted a resurgence in COVID-19 cases in Asia and ongoing supply chain issues, as having led to a weakening in domestic and global demand for goods.

The IMF forecasts South Korea's economy to grow by 4.3% in 2021, and 3.4% in 2022, sustained by the ongoing recovery of global economic

activity and trade. However, renewed outbreaks of the pandemic — and its impact on global demand for goods amongst South Korea's major trade partners — will continue to be a key risk for the economy into the second half of 2021.

### First signs of recovery in India after severe second wave of the pandemic

Following widespread COVID-19 outbreaks and subsequent partial containment measures in the first half of 2021, India ended its 2020–21 financial year — running from April 2020 to March 2021 — with a smaller-than-expected contraction of 7.3% year-on-year. This included positive year-on-year growth of 0.4% in the December 2020 quarter, and 1.6% in the March 2021 quarter. The Indian economy has further recovered in the June 2021 quarter, with economic growth of 20.1% year-on-year (noting India's GDP fell by 24.4% for this period in 2020).

India's agricultural industry — which contributes around 15% of the country's GDP — was one of the few sectors to show a positive outcome in the 12 months to March 2021, with growth of 3.6% over the period. This contrasts with substantial contractions over the same period in Manufacturing (-7.2%), Construction (-8.2%) and Hospitality and Communications Services (-18.2%).

The June 2021 quarter has shown continuing signs of a rebound in these industries, with manufacturing and construction growing 49.6% and 68.3% year-on-year respectively. After slipping into contraction for the first time in 11 months in June, manufacturing PMI readings for July and August have remained in expansionary territory. However, the lower reading in August (falling to 52.3 from 55.3 in July) suggests slowing momentum in growth.

India's Services PMI has also rebounded into expansionary territory in August for the first time in four months, with a reading of 56.7. This includes new orders rising at their fastest rate since January 2013. The India Services Business Activity Index (seasonally adjusted) was also in expansionary territory in August, with reports of the increased reopening of venues and renewed business confidence.

The IMF now forecasts India's economy to grow by 9.5% in 2021, a 3.0 percentage point reduction from what was being forecast in its April 2021 Outlook. This reflects expectations of a slower recovery in confidence and growth. India's economy is subsequently forecast to grow by 8.5% in 2022 and by 6.8% in 2023.

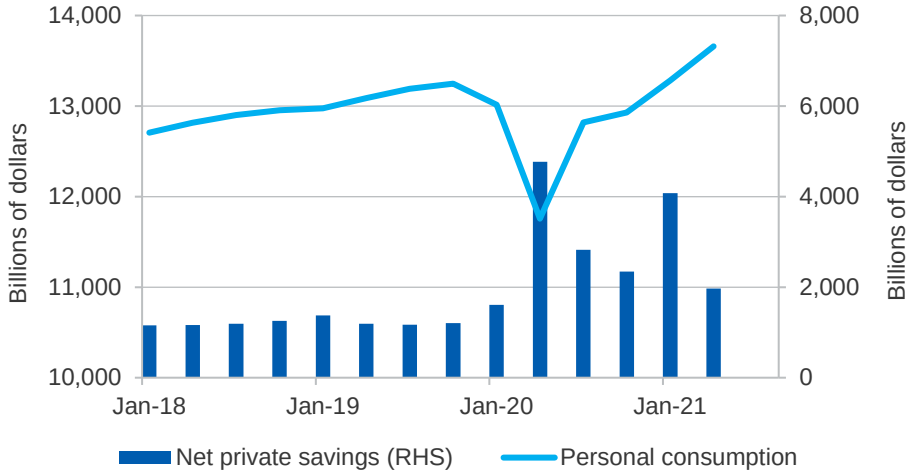
### Substantial fiscal support and household spending driving US recovery

The US economy has continued to make a strong recovery in 2021, growing at an annualised rate of 6.5% in the June quarter. This has followed the successful rollout of vaccines and removal of lockdowns, as well as substantial fiscal support in response to the COVID-19 pandemic equivalent to about 25% of the country's GDP.

Household spending has been a major driver of the recovery of US economic activity to pre-pandemic levels, growing at close to a 12% annualised rate in the June 2021 quarter. While initially supported by a number of rounds of fiscal stimulus spending, record levels of private savings are also contributing to the bounce back in consumption. With around US$2 trillion in estimated net private savings in the June quarter 2021 (Figure 2.7), this release of pent up demand and savings is expected to carry on well into the second half of 2021.

Following its highest ever reading in July, the US Manufacturing PMI index remained in strongly expansionary territory with a reading of 61.4 in August. This includes sharp upturns in output and new orders. However, booming demand has also seen a substantial rise in supply chain shortages and delays, with prices for both raw materials and finished goods jumping substantially. The US Composite PMI Output Index — a combination of both manufacturing and services activity in the US — posted a reading of 55.4 in August. This marks three consecutive months of falls from a high in May. This suggests that the pace of US economic growth may be cooling coming in the second half of 2021, following peaking demand in the June quarter as the economy opened up.

## Figure 2.7: US personal consumption and net private savings




Source: U.S. Bureau of Economic Analysis (2021)

After contracting 3.5% in 2020, the US economy is forecast to grow by 7.0% in 2021. This is an increase of 0.5 percentage points compared with the IMF forecast in its April 2021 Outlook, reflecting the strong bounce back in the June quarter. Growth is then forecast to be 4.9% in 2022 and 1.4% in 2023, supported by the substantial infrastructure package currently being considered by the US Congress.

### EU recovery expanding from manufacturing to services sector

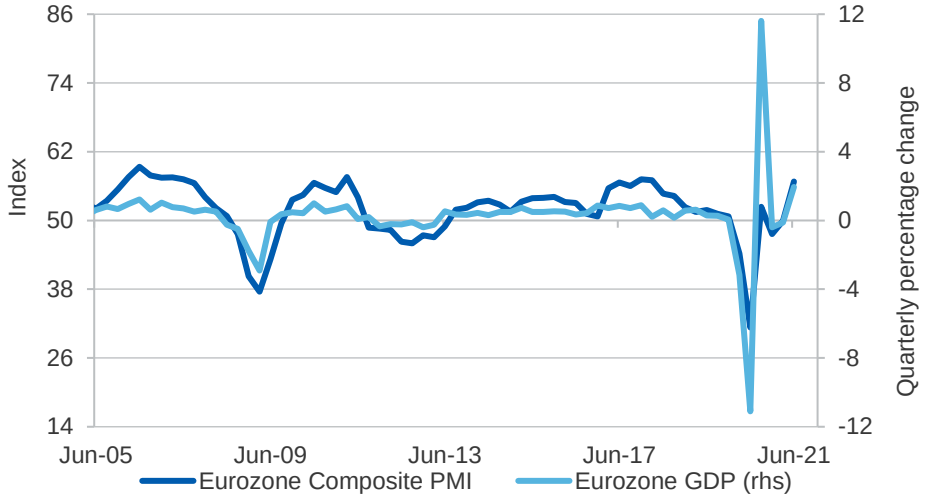
The EU has seen its first signs of economic recovery in the June 2021 quarter, with the economy growing by 1.9% quarter-on-quarter (Figure 2.8). This represented a 13.2% expansion of the economy year-on-year. This followed the easing of lockdowns and social distancing restrictions in numerous member countries over April and May 2021.

The falling numbers of new COVID-19 infections and progress in the roll out of vaccines, has permitted EU members to now begin the process of reopening their economies, and this is benefitting the services sector. The Eurozone PMI Services Business Activity Index reading was 59.0 in August, one of its fastest rates of expansion in 15 years. This reflects the sharp increase in activity seen particularly in the tourism, travel and hospitality sector.

However, the strong (and earlier) rate of recovery in manufacturing in the Eurozone may be starting to slow — with industrial production falling by 0.3% month-on-month in June. This saw industrial output on an annualised basis also fall from 10.4% to 9.7% over the same period. The Eurozone Manufacturing PMI marked a six month low with a reading of 61.4 in August, with output and order growth rates slowing from highs reached in March 2021. Producers have highlighted continued price pressures, with a record increase in prices for input and finished goods, with concerns about the impact of the delta variant on supply chains.

The IMF now forecasts the Euro Area economy to grow by 7.0% in 2021, a 0.2 percentage point increase from its April 2021 Outlook. This reflects the improving health situation and easing of containment measures from the June quarter. Beyond 2021, the speed of the recovery is forecast to normalise, with growth of 4.9% projected in 2022.

## Figure 2.8: Eurozone GDP and Composite PMI (quarterly)




Source: Bloomberg (2021)

## Table 2.1: Key IMF GDP assumptions

| | 2020 | 2021[a] | 2022[a] | 2023[a] |
|---|---|---|---|---|
| Economic growth[b] | | | | |
| Advanced economies | -4.6 | 5.6 | 4.4 | 1.8 |
| – Australia | -2.4 | 5.3 | 3.0 | 2.3 |
| – Eurozone | -6.1 | 4.4 | 3.9 | 2.3 |
| – France | -8.0 | 5.8 | 4.2 | 1.7 |
| – Germany | -4.8 | 3.6 | 4.1 | 1.6 |
| – Japan | -4.7 | 2.8 | 3.0 | 1.1 |
| – New Zealand | -3.0 | 4.0 | 3.2 | 2.6 |
| – South Korea | -0.9 | 4.3 | 3.4 | 2.6 |
| – United Kingdom | -9.8 | 7.0 | 4.8 | 2.0 |
| – United States | -3.5 | 7.0 | 4.9 | 1.4 |
| Emerging economies | -2.1 | 6.3 | 5.2 | 4.7 |
| – ASEAN-5[d] | -3.4 | 4.9 | 6.1 | 5.7 |
| – China[e] | 2.3 | 8.1 | 5.7 | 5.4 |
| – India | -7.3 | 9.5 | 8.5 | 6.8 |
| – Latin America | -7.0 | 5.8 | 3.2 | 2.7 |
| – Middle East | 3.2 | 2.8 | 2.8 | 2.8 |
| World[c] | -3.2 | 6.0 | 4.9 | 3.5 |

Notes: a Assumption; b Year-on-year change; **c** Calculated by the IMF using purchasing power parity (PPP) weights for nominal country gross domestic product; **d** Indonesia, Malaysia, the Philippines, Thailand and Vietnam. **e** Excludes Hong Kong.
Sources: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021); IMF (2021)

## Table 2.2: Exchange rate and inflation assumptions

| | 2020[a] | 2021[a] | 2022[a] | 2023[a] |
|---|---|---|---|---|
| AUD/USD exchange rate | 0.69 | 0.75 | 0.76 | 0.75 |
| Inflation rate[b] | | | | |
| United States | 1.2 | 3.4 | 2.4 | 2.5 |
| | **2019–20** | **2020–21[a]** | **2021–22[a]** | **2022–23[a]** |
| Australia[e] | 1.6 | 1.9 | 1.7 | 2.0 |

Notes: a Assumption; b Change from previous period; **c** Calculated by the IMF using purchasing power parity (PPP) weights for nominal country gross domestic product; **e** Average of daily rates.
Sources: ABS (2021) Consumer Price Index, 6401.0; Bloomberg (2021); Department of Industry, Science, Energy and Resources; RBA (2021) Reserve Bank of Australia Bulletin; IMF (2021).

# Steel

26 Fe 55.845

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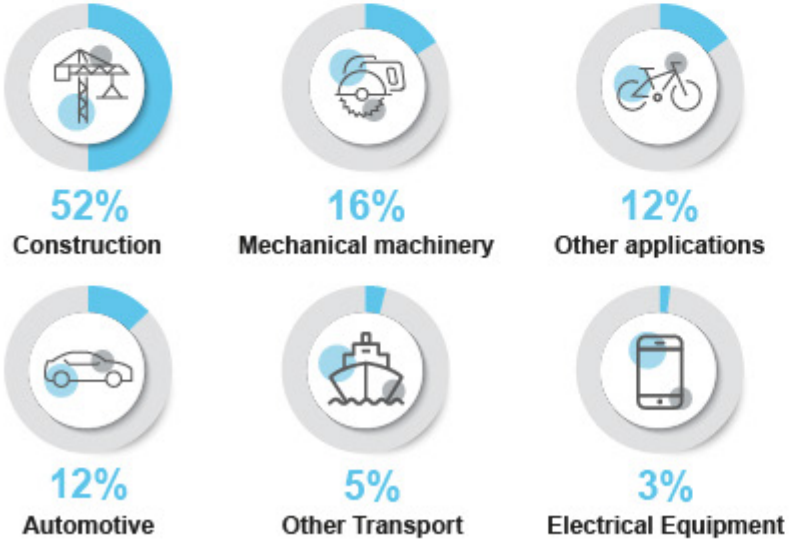
## Australian steel refineries


## Steel facts

- Made in specialised blast furnaces mostly out of **iron and carbon**
- 1,000 kg of steel requires 1,400 kg of iron and 800kg of coal to make
- Pure steel is **1,000 times stronger** than iron
- Steel is the **world's 2nd largest industry**

## World consumption




## Australia's steel

**5.3m tonnes produced** each year

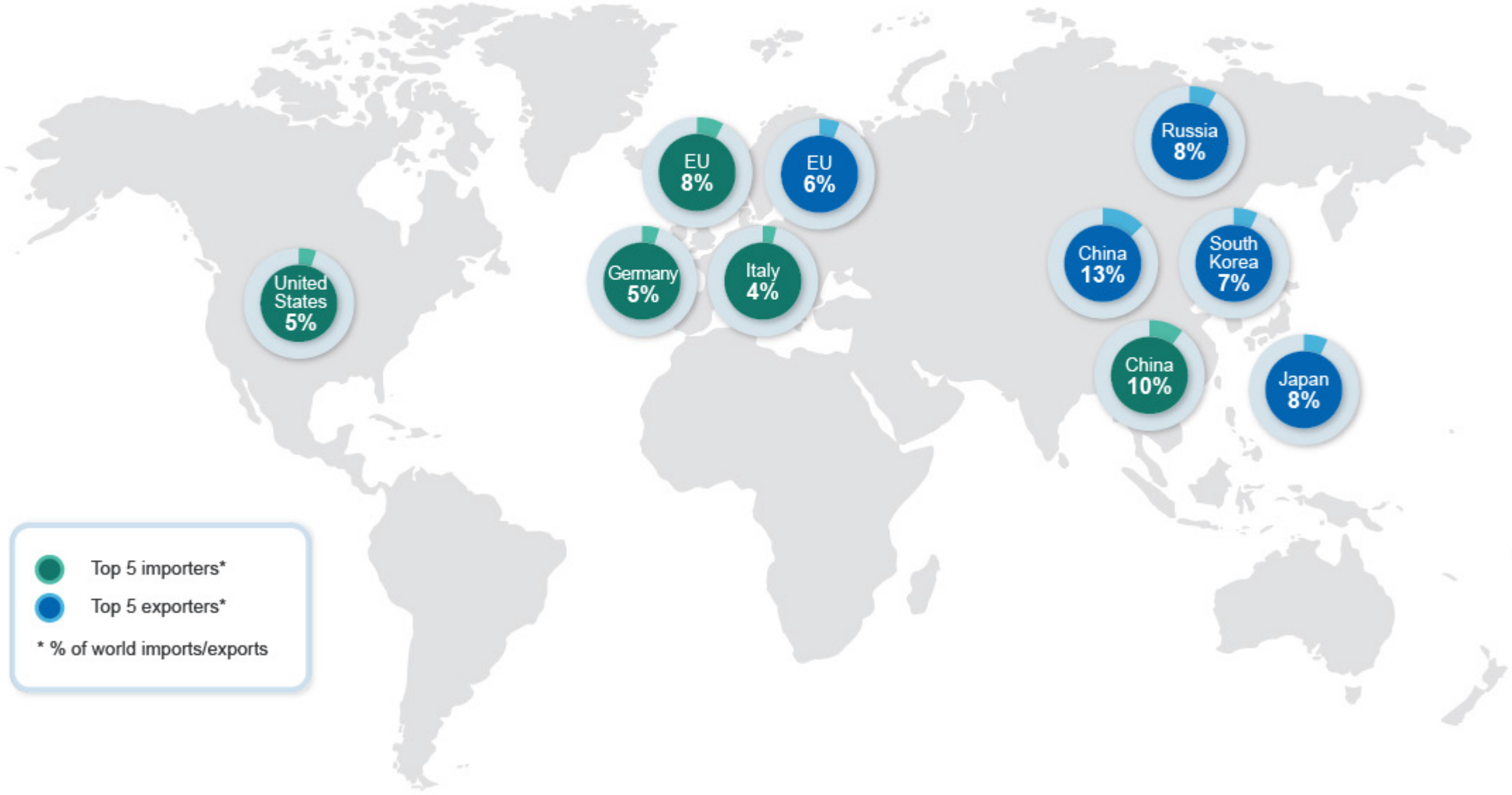
**100,000+ employed** in steelmaking

**Significant export markets**

- China
- Japan
- South Korea
- Singapore
- US

# Steel

## Trade map | September 2021



## 3.1 Summary

- World demand for steel is forecast to grow by 5.8% in 2021, reflecting the ongoing recovery now underway in most major economies following COVID-19 lows. More moderate growth is likely in 2022 and 2023.
- The slowdown in the recovery after 2021, and renewed outbreaks (and variants) of the pandemic, present key risks to global economic growth and steel consumption in the second half of 2021 and beyond.
- Strong demand for steel in the midst of still-recovering supply chains continues to see elevated prices for most steel products across the US, EU and Asia in the September quarter. Prices are still expected to ease from the second half of 2021, as this demand impulse recedes and supply chains normalise. However, the persistence of price pressures across global supply chains remains a key risk.

## 3.2 World consumption and production

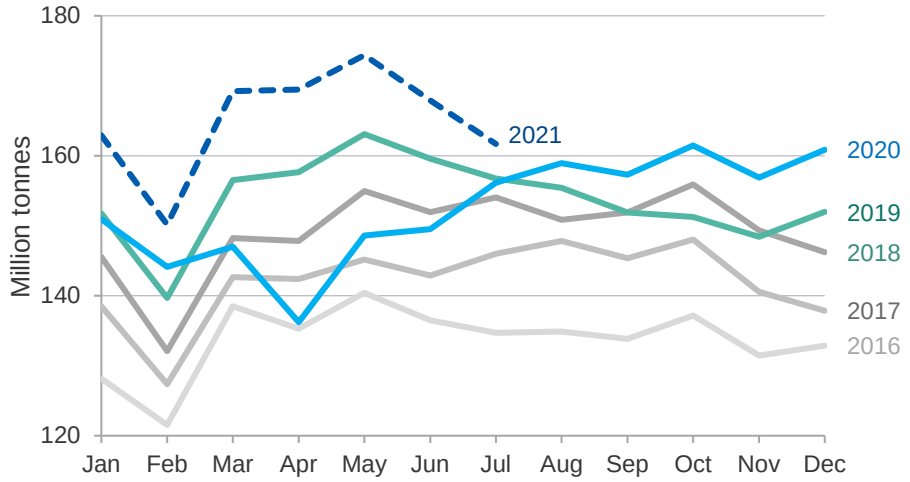
### Global steel output tracking significantly above pre-COVID levels

In spite of renewed outbreaks of the pandemic, steel output has remained resilient across major steel-producing economies so far in 2021. World steel output was close to 1 billion tonnes in the first half of the year. This is 12% higher compared with the same period in 2020, and is tracking significantly above average levels in the years prior to the COVID-19 pandemic (Figure 3.1).

The surge in world steel production reflects strengthening global economic activity, as economies gradually emerge from the COVID-19 pandemic. Global GDP growth remains forecast at 6.0% in 2021. And the world's two biggest economies — the US and China — are at the forefront of this resurgence, with forecast growth of GDP in 2021 of 7.0% and 8.1%, respectively. The pace of the global economic recovery is then expected to ease slightly in 2022, with GDP forecast to grow by 4.9%.

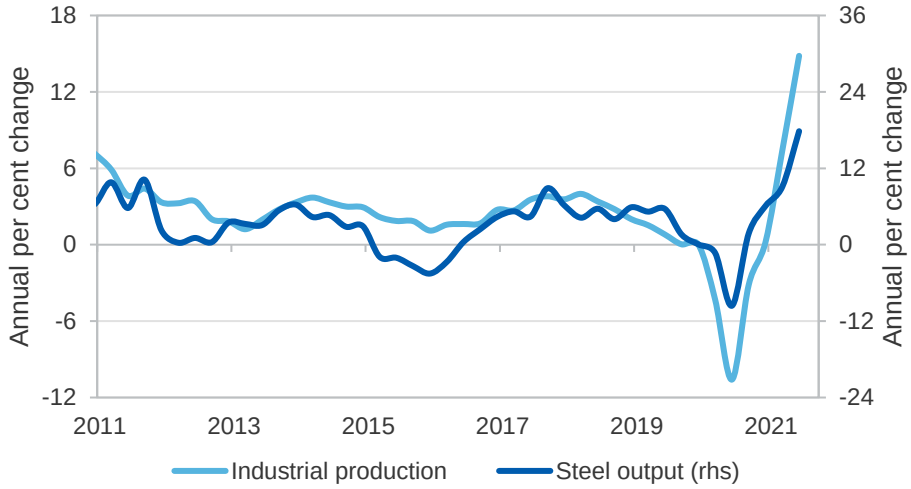
As well as the recovery in industrial production (Figure 3.2), global steel consumption continues to be propelled by the considerable levels of fiscal stimulus across major economies, with a strong focus on infrastructure

**Figure 3.1: Global monthly steel production**




Source: Bloomberg (2021); World Steel Association (2021)

**Figure 3.2: Global quarterly industrial and steel production**




Source: World Steel Association (2021); Bloomberg (2021); CDB (2021); Department of Industry, Science, Energy and Resources (2021)

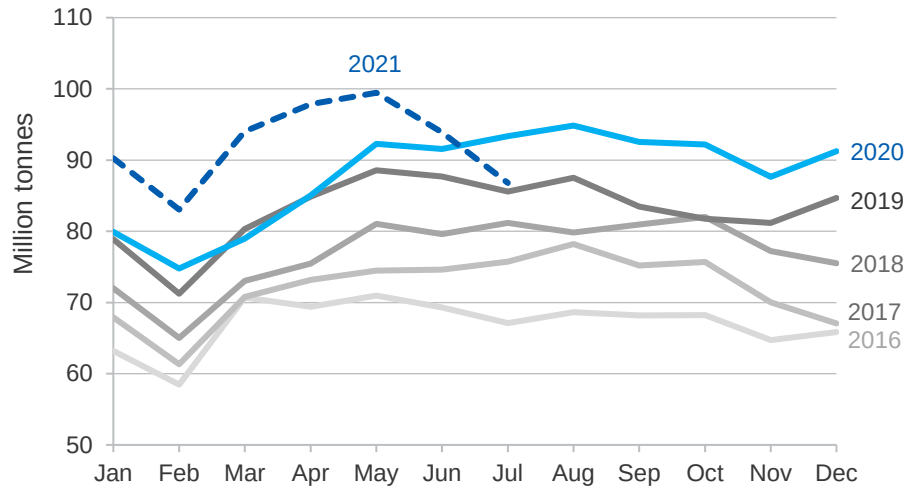
spending and government and business support for the transition to low emissions. This includes a fiscal package worth nearly US$1 trillion implemented in China, as well as similar packages in the EU, US and India.

However, initial signs are emerging of a slowdown in the impressive rates of growth seen for economic activity and industrial output in the first half of 2021. With renewed outbreaks (and variants) of the pandemic appearing in many major economies, downside risks to world industrial production in the short term are rising. The speed at which countries can bring these outbreaks under control will determine to what extent these risks impact global growth and steel demand for the rest of 2021.

### China's record steel output in first half of 2021 starting to slow

Steel production in China hit unprecedented levels in the first half of 2021, growing 12% year-on-year to reach about 560 million tonnes. This included new monthly records for output set consecutively in March, April and May, with production in May nearing 100 million tonnes (Figure 3.3).

**Figure 3.3: China monthly steel production**




Source: Bloomberg (2021); World Steel Association (2021)

China's intense demand for steel in the first half of 2021 partly reflects considerable levels of fiscal accommodation provided by the government in response to the pandemic. New investment in infrastructure — used extensively by the government to stimulate the economy from mid-2020 — grew by 30% (3-month-moving-average) year-on-year by the end of March, and by 7.8% year-on-year in July 2021.

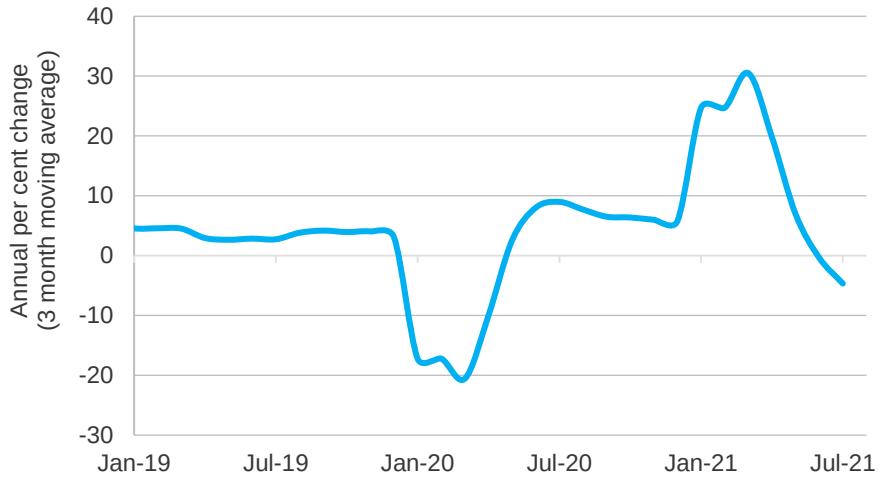
China's exports to global markets — another significant source of demand for steel — grew by 28% year-on-year in the first half of 2021. With production from other major economies facing continued impacts from the pandemic through to 2021, Chinese manufacturers were able to step in to fill the gap, both with steel products directly and many metals-intensive manufactured items.

The sharp fall in China's steel output since May suggests monthly production might have peaked for 2021. The typical seasonal pattern in China tends to see construction activity — which accounts for 50-60% of domestic steel demand — flatten mid-year due to the start of the rainy season. However, the fall in output since May is sharper than recent years. Excavator sales, a reliable lead indicator of construction activity (particularly infrastructure), fell 9.2% year-on-year in the month of July.

Signs are also emerging that accommodative fiscal policies and monetary conditions in place over the last 18 months (due to the pandemic) are being withdrawn. Total infrastructure investment contracted in June (three month moving average, year-on-year) for the first time in over 12 months (Figure 3.4). And growth in total social financing, a broad measure of financial credit in China, fell to its slowest pace since February 2020.

China's recent policy initiatives to cool its property market appear to be taking hold, with new house price growth (month-on-month) in August the slowest in five months. The Central Government's so-called 'Three Red Lines' policy — introduced in September 2020 — mandates tighter borrowing criteria and reduced debt levels for the country's major property developers. This has been bolstered by a cap on new bank lending implemented in early 2021. Weaker volumes for new property

## Figure 3.4: China Fixed Asset Investment in infrastructure




Source: Bloomberg (2021)

starts and land purchases in the first half of 2021 suggest these policies are now starting to take effect.

China's efforts to manage a broad-based de-leveraging and remove fiscal stimulus will face growing challenges moving further into the second half of 2021. Signs have emerged of weaker economic activity in July, with growth in retail sales and industrial output both below consensus forecasts. This suggests that the impressive rate of recovery as the Chinese economy emerged from the pandemic may already be starting to subside. Further to this, renewed outbreaks of the COVID-19 pandemic are a key risk to the ongoing recovery into the second half of 2021. Lockdowns and travel restrictions have been reintroduced across a number of China's provinces and major cities, with cases hitting a seven-month high in August.

With the growing potential of a slowdown in economic growth in the second half of 2021, the Chinese government may once again seek to stimulate the economy by reintroducing greater fiscal support and infrastructure investment. Local government special bond issuance — the primary means for government to fund infrastructure — ran below quota in the first half of the year, and now provides the Chinese government with additional capacity to respond to any weakening in domestic conditions.

### China also targeting direct cuts to steel output in second half of 2021

With strong growth in steel output to June, China's central government would need to strengthen efforts to curb production to meet its stated goal of a reduction in national steel output in 2021. This target was announced in December 2020, as part of its aim of peak steel production by 2025, and would require an 11% fall (year-on-year) in the second half of 2021.

The policy has already led to emissions curbs imposed on a number of steel mills in Tangshan — China's biggest steel-producing city — in February 2021, with an order to achieve a 30-50% reduction in output by the end of 2021. While lower blast furnace utilisation rates for the city suggest the directive has been effective, the announced production curbs appear to have intensified demand and the frontloading of steel purchases in the first half of 2021. With infrastructure and manufacturing-related steel demand reaching its peak during this period, record steel prices and mill margins in China incentivised increased production in other cities and provinces, leading to substantially higher steel output at a national level.

Broader enforcement measures announced in early May have required provinces outside of Hebei (and its city of Tangshan) to start scaling back steel production from June. With slowing construction activity and easing steel-related exports, these production cuts are being implemented amidst slackening demand for steel. Efforts to curb production will likely be aided by weakening prices for steel products in Asian markets that have drastically narrowed profit margins for Chinese steel mills. After reaching a peak of close to $150 per tonne in May 2021, margins for rebar and hot-rolled coil (HRC) fell close to breakeven levels through to July, reducing the incentive for mills to increase output in the near-term.

The Chinese government has also announced new export duties on pig iron, and the removal of export tax rebates for a range of steel products including cold-rolled coil, effective 1 August. This follows the earlier cancellation of export tax rebates for steel products in May 2021, such as

HRC, cold-rolled sheet and rebar. While the changes were announced as part of the effort to reduce the industry's total energy consumption, they are likely to also shore up domestic supplies of steel.

### Growth in steel production peaking in other major economies

In spite of renewed outbreaks of the pandemic and related containment measures, production has remained resilient across other major steel-producing economies in 2021. In the six months to June, world steel output (excluding China) grew by 17% year-on-year to reach 436 million tonnes, marking a recovery in output to 2019 levels.

While steel production (and economic activity) has been slower to rebound in 2021 outside of China, the recovery in many advanced economies is well underway in the second half of the year. World steel demand (ex-China) is expected to grow by 9.2% in 2021, but renewed outbreaks of the pandemic raise significant risks to this outlook.

Steel production in the EU — the second largest steel-producing economy — grew by 17% year-on-year in the first half of 2021. However, this was still 3.7% lower than the same period in 2019 (Figure 3.5).

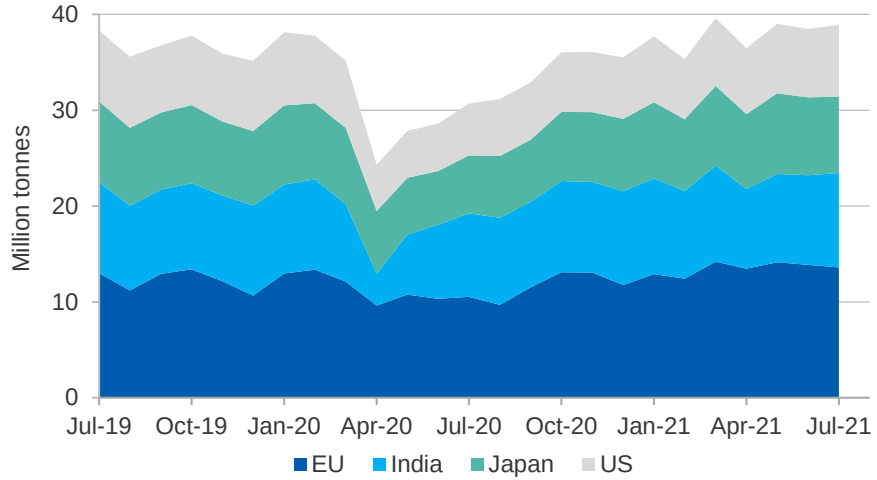
There has been a surge in economic activity across the Eurozone as COVID-19 infection rates have fallen and economies reopened. Business activity rose at its fastest rate in July, with the most impressive growth in services. This reflects the return of industries such as tourism, travel and hospitality with an easing in cross-border restrictions. The strong growth in manufacturing activity in the Euro area in the first half of 2021 has continued in July. Industrial production grew by 1.5% on previous month, and 7.7% year-on-year. However, the Eurozone Manufacturing PMIs for July and August have flagged near-term risks for the Euro manufacturing sector. Along with a further slowing in output and new orders, the impacts of the delta variant on supply chains and economic activity continue to grow.

The EU has announced a number of new initiatives in July as part of its European Green Deal, which aims to reduce net emissions by at least 55% by 2030. This includes the introduction of a carbon border adjustment measure on emissions-intensive goods imported into the EU, such as steel, iron and aluminium. The policy is set to be introduced gradually from 2023, and fully implemented by 2030. The EU is one the world's largest importers of steel, with around 33 million tonnes in 2020 from regions including Asia and Eastern Europe.

US steel production grew by 14% year-on-year in the first half of 2021 (Figure 3.5). This tracks with a strengthening recovery in the US economy, which grew at an annualised rate of 6.5% in the June quarter. The recovery is being led by substantial fiscal support and a rebound in household spending. While household consumption was initially supported by a number of rounds of fiscal stimulus, the drawdown of record levels of private savings (see *Macroeconomic outlook* chapter) is now contributing to the rebound in consumption.

The strong demand has led to delays and supply bottlenecks for many products, including steel and other construction materials. Idle capacity in US mills, existing tariffs on steel imports, and the ongoing scarcity of scrap steel, have all contributed to tight supply. This has created lead times for

**Figure 3.5: Monthly steel production of other major producers**



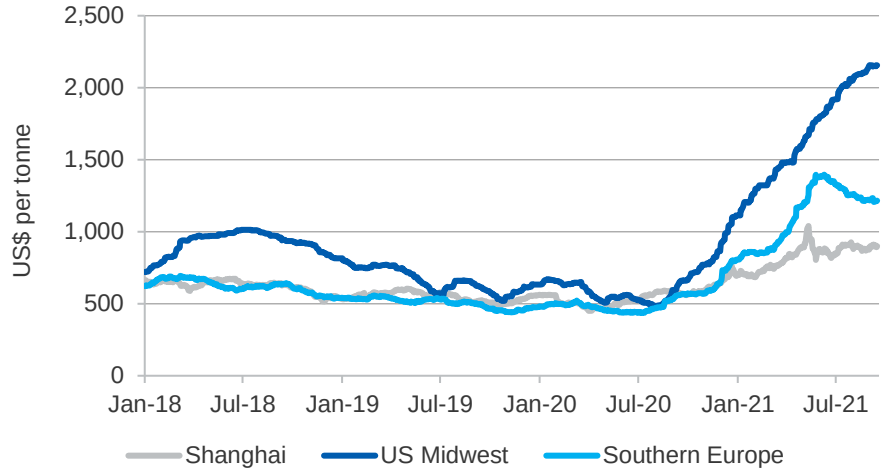

Source: Bloomberg (2021); World Steel Association (2021)

the delivery of finished steel products such as HRC close to double the 10-year average. Prices for US HRC have also risen as much as 300% over the last 12 months, as demand continues to outpace supply (Figure 3.6). Planned mill maintenance through the September and December quarters suggests this market tightness may persist for the rest of 2021.

The US$1 trillion Bipartisan Infrastructure Framework (BIF) was passed by the Senate in early August 2021, with a vote in the House of Representatives scheduled for late September. This package includes US$550 billion in new federal investment on roads and bridges, rail, and water and electrical infrastructure. Estimates suggest the BIF could increase total construction in the US by as much as 4% annually over the next 8 years, and boost steel demand by 2 to 4 million tonnes annually.

An ongoing concern for the US steel market in 2021 is the persistent global semiconductor shortage and its impact on US automakers. With major manufacturers, Ford and General Motors, already cutting output in the June quarter, impacts from the semiconductor shortage are now

### Figure 3.6: Hot-Rolled Coil steel prices




Source: Platts (2021)

expected to persist through the rest of 2021, and this will continue to impact steel demand and scrap supply over the period.

In spite of widespread COVID-19 outbreaks and related containment measures over the period, Indian steel output grew by 27% year-on-year in the first half of 2021 (Figure 3.5). While this was partly a base effect — with steel output falling 23% year-on-year in the first half of 2020 — there are growing signs of a potential rebound in the nation's manufacturing and construction industries, which is also contributing to rising steel demand.

In late July, the Indian Government introduced a new Production-Linked Incentive (PLI) scheme, worth close to US$850 million. This aims to boost domestic production of specialty steel products by as much as 25 million tonnes over the next five years. This includes steel types such as coated, high strength and alloy products, and is expected to have applications across sectors such as defence, aerospace, and power generation.

The Indian Government also announced it would launch a US$1.35 trillion infrastructure plan in early August. This package will aim to boost industrial production and economic growth, and includes a focus on expanding transport infrastructure and the use of cleaner fuels.

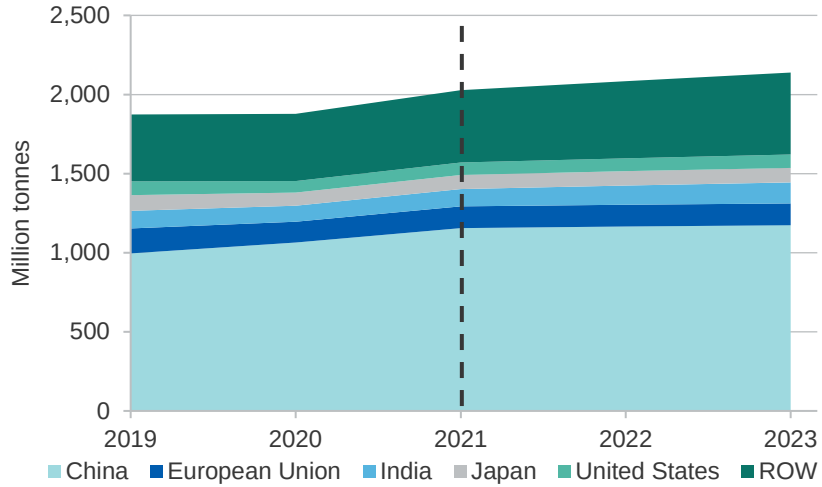
In spite of severe impacts from the COVID-19 pandemic in the first half of 2021, Japan's economy has continued to pick up momentum, with positive GDP growth of 1.3% year-on-year in the June quarter. This has been led by a steady rise in industrial production (up 12% year-on-year in the month of July) and exports (up 37% year-on-year in the same period).

Japan's steel production grew by 27% year-on-year in the first half of 2021 (Figure 3.5). This follows a fall in total output to its lowest levels in over 50 years during the 2020–21 Japanese fiscal year (April 2020 to March 2021).

From the start of August, the Russian Government has introduced a temporary export tax on steel products, aluminium, nickel and copper for

the remainder of 2021. A 15% (or US$ per tonne) tax rate will apply to products such as stainless steel, cold and hot rolled steel, and rebar. This tax was intended to bolster domestic supplies in the midst of a general tightness in global markets for these products. The policy may be taken up in other countries over the remainder of 2021, with China and Vietnam already flagging similar proposals as under consideration.

### Figure 3.7: Global steel production by country




Source: World Steel Association (2021); Department of Industry, Science, Energy and Resources (2021)

### Box 3.1: Decarbonisation of the steel industry and green steel

With the global energy transition gathering momentum, the steel industry is exploring opportunities to play its part in the decarbonisation plan. In the first half of 2021, a number of new initiatives have been announced or implemented by major steel producers. This includes the introduction of Carbon Capture, Utilisation and Storage (CCUS) in existing steelmaking processes, as well as the use of renewable energy and new technologies to drive the steelmaking process.

In July, the world's second biggest steel producer, ArcelorMittal, announced a global carbon-emissions reduction target of 25% by 2030. To achieve this, the company is looking at building a number of new Direct Reduced Iron – Electric Arc Furnace (DRI-EAF) facilities across Europe and North America. DRI allows for inputs other than coking coal to be used in preparing iron ore for its conversion to steel. While this process has largely utilised natural gas until now, ArcelorMittal is aiming to establish the world's first full-scale zero carbon-emissions steel plant in Sestao Spain by 2025. This will utilise green hydrogen-powered DRI, and an EAF using renewable energy power.

South Korean steelmaker POSCO — another of the world's largest steel producers — has announced new research and development into opportunities such as green hydrogen manufacturing technology, hydrogen-based production of hot briquetted iron (HBI), and carbon capture, utilization and storage (CCUS). This includes a number of partnerships with Australian iron ore producers to explore technologies to reduce carbon emissions across the steel supply chain.

And in August, Swedish steel producer SSAB delivered the world's first shipment of steel made without the use of fossil fuels. The Hydrogen Breakthrough Ironmaking Technology (HYBRIT) — a joint venture between SSAB, state-owned utility Vattenfall, and the government-owned mining company LKAB — produced the world's first hydrogen-reduced (in place of coking coal) sponge iron in June, then used to produce steel. They aim to produce fossil-free steel at industrial scale by 2026.

Source: Companies' reports and presentations

## Table 3.1: World steel consumption and production

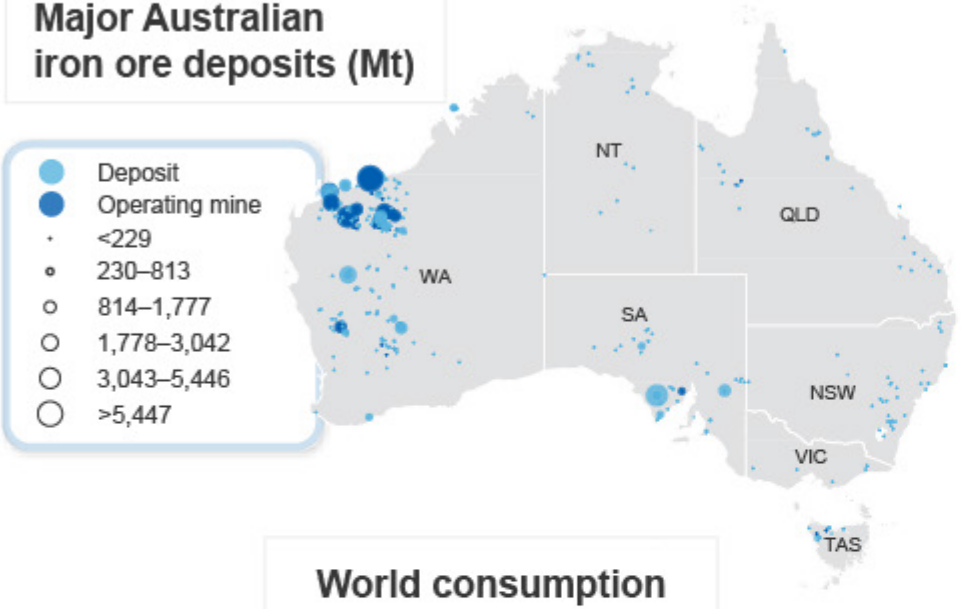
| | Million tonnes | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|
| **Crude steel consumption** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| China | 974 | 1,034 | 1,056 | 1,066 | 6.2 | 2.1 | 1.0 |
| European Union | 155 | 164 | 165 | 167 | 5.8 | 0.9 | 1.3 |
| United States | 108 | 115 | 119 | 121 | 6.7 | 2.7 | 1.9 |
| India | 106 | 109 | 115 | 125 | 3.0 | 5.5 | 9.5 |
| Japan | 64 | 65 | 66 | 68 | 2.7 | 1.2 | 2.5 |
| South Korea | 52 | 53 | 55 | 56 | 2.0 | 2.7 | 2.5 |
| Russia | 45 | 47 | 48 | 48 | 4.7 | 1.6 | 1.5 |
| Brazil | 22 | 24 | 26 | 29 | 5.8 | 11.2 | 10.1 |
| World steel consumption | 1,883 | 1,992 | 2,046 | 2,097 | 5.8 | 2.7 | 2.5 |
| **Crude steel production** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| China | 1,065 | 1,093 | 1,107 | 1,114 | 2.6 | 1.3 | 0.6 |
| European Union | 131 | 137 | 137 | 137 | 4.5 | -0.1 | -0.3 |
| India | 100 | 113 | 124 | 135 | 12.5 | 9.9 | 9.1 |
| Japan | 83 | 93 | 97 | 100 | 11.7 | 3.9 | 3.6 |
| United States | 73 | 83 | 84 | 85 | 14.1 | 1.6 | 1.4 |
| Russia | 72 | 77 | 79 | 82 | 7.3 | 2.8 | 3.2 |
| South Korea | 67 | 71 | 73 | 75 | 6.0 | 2.8 | 2.6 |
| Brazil | 31 | 35 | 39 | 43 | 14.2 | 11.3 | 10.2 |
| World steel production | 1,878 | 1,962 | 2,017 | 2,069 | 4.5 | 2.8 | 2.6 |

Notes: **f** Forecast.

Source: World Steel Association (2021); Department of Industry, Science, Energy and Resources (2021)

# 26 Fe 55.845 Iron Ore

## Major Australian iron ore deposits (Mt)




## Iron ore

- Iron is the most abundent element on earth, forming much of the **planet's core**
- Iron ore deposits were originally **formed by algae**
- Humans have been working with iron for at least **5,000 years**
- Iron was central to the **industrial revolution**

## World consumption

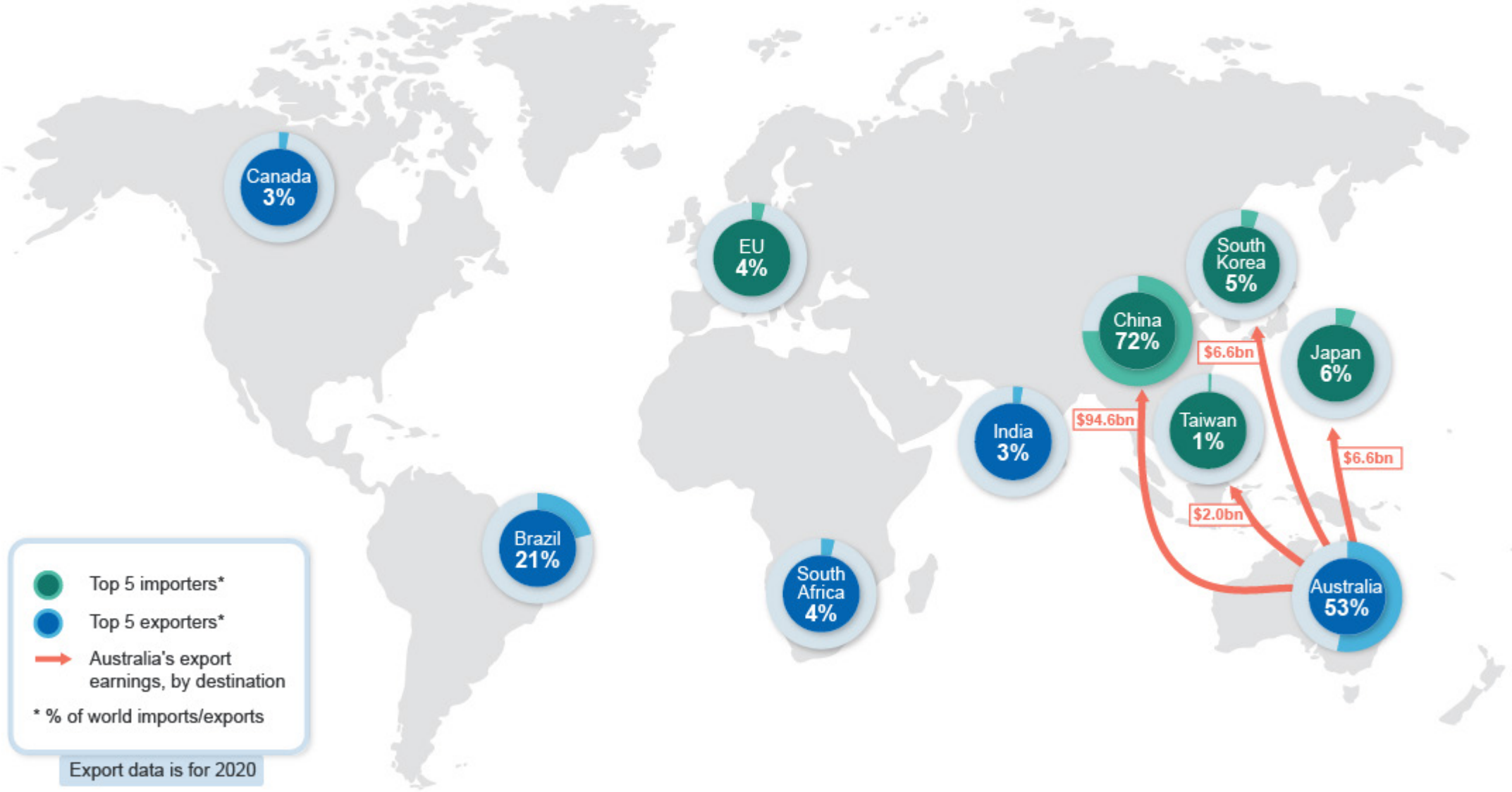
- 56% China
- 9% India
- 5% EU
- 5% Japan
- 3% South Korea
- 22% Rest of the world

## Australia's iron ore

- **World's no.1** for iron ore **resources**
- **Largest iron ore producer** in the world
- **Exports** earned **$153 billion** in 2020-2021

# 26 Fe Iron Ore

## Trade map | September 2021



## 4.1 Summary

- Iron ore prices have now retracted significantly from the highs of over US$200 a tonne seen from May to July. Falling domestic demand for steel in China — due to a softening in construction activity and implementation of a number of key government policies — has seen prices fall more than 50% from their peak by mid-September.
- Australian export volumes are expected to grow steadily, from 868 million tonnes in 2020–21 to 939 million tonnes by 2022–23. This reflects the commencement of several new mines in Western Australia.
- Australia's total iron ore export earnings reached a record $153 billion in 2020–21. The fall in prices from the second half of 2021 is forecast to lead to lower export earnings, of $132 billion in 2021–22 and $99 billion by 2022–23.

## 4.2 Prices

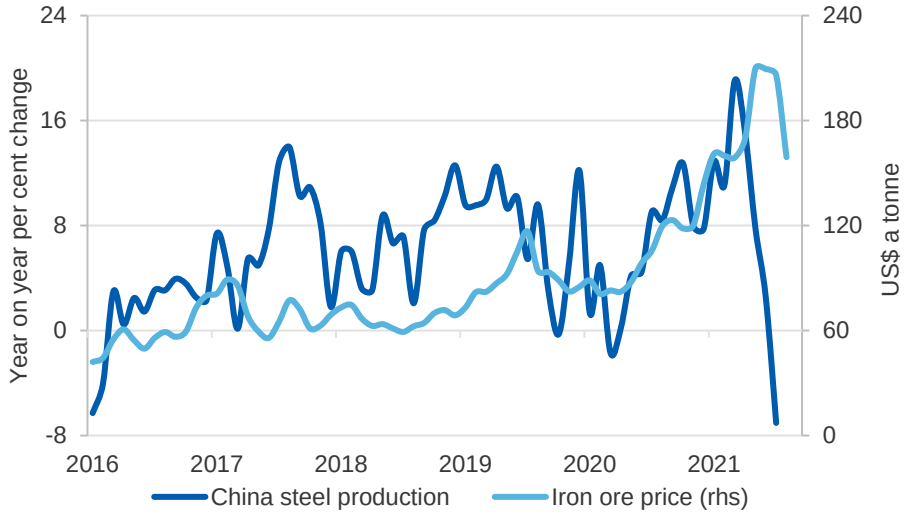
### China's softening demand for steel triggers major falls in price of iron ore

Following record highs during the second quarter of 2021, the price of iron ore has fallen significantly, reaching around US$100 a tonne by mid-September. The average spot price for 62% Fe iron ore fines at Chinese ports for the month of August was around 30% lower than the peak reached in May, but still 4% higher than at the start of 2021.

The fall in prices reflects China's lower steel output from June (Figure 4.1), with expectations of more modest levels of production for the rest of 2021. The typical seasonal pattern in China tends to see strong growth in steel demand in first few months each year as spring construction gets underway. Steel output then tends to flatten from the month of May or June with the beginning of the rainy season. However, the seasonal fall in production in 2021 appears sharper than recent years (see *steel chapter*).

Key government policies in China are also having a significant impact on steel demand so far in the September 2021 quarter. A major driver of China's boom in demand for steel in the first half of 2021 was the considerable levels of fiscal accommodation provided by the government in response to the pandemic. This included growth in total infrastructure investment of 30% year-on-year (3 month average) at the end of March 2021. However, this stimulative spending now appears to be fading, with total infrastructure investment contracting in June for the first time in over 12 months.

**Figure 4.1: Iron ore price and monthly China steel production**




Notes: China import Iron ore fines 62% Fe spot (CFR Tianjin port)
Source: Bloomberg (2021) China import prices; World Steel Association (2021)

As part of its efforts to deleverage the significant levels of debt in its economy, China has also sought to cool its overheating property market. This includes tighter borrowing criteria and reduced debt levels for the country's major property developers, with weaker volumes for land sales and new property starts year-to-date suggesting these policies are starting to take effect.

The combined impact of these policies is weakening demand for steel from the construction sector in recent months, with this industry typically accounting for 50-60% of domestic steel consumption. Renewed outbreaks of the COVID-19 pandemic and flooding in central China from July, also appear to be impacting China's recovery. Growth of retail sales

and industrial output were both below consensus forecasts in July, further contributing to the softening in demand for iron ore from Chinese steel mills so far in the September quarter 2021.

### China's aim to curb steel output in 2021 also impacting iron ore demand

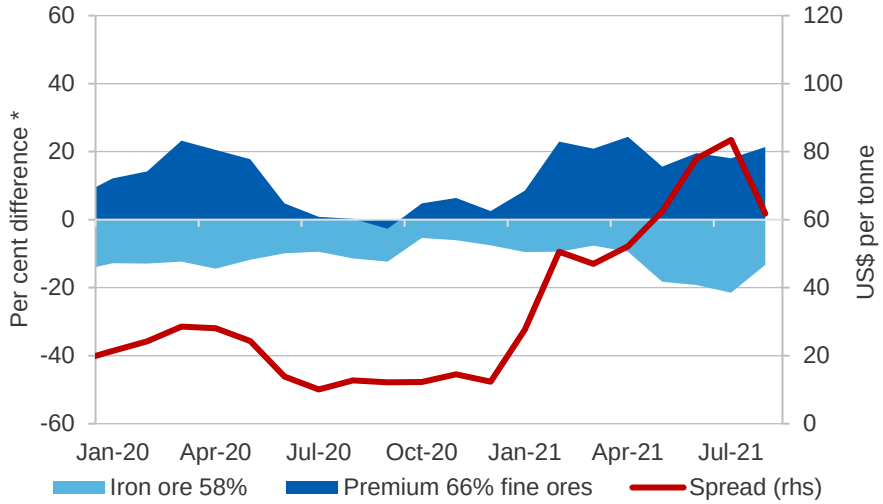
China's central government has reiterated its commitment to curbing steel production from the September quarter, as part of its goal of lower national steel output in 2021. China's steel output grew 12% year-on-year in the six months to June, meaning production will need to fall by around 11% year-on-year in the second half of 2021 in order to meet this ambition.

The policy has been followed by emissions curbs of 30 to 50% being imposed on a number of steel mills in Tangshan — China's biggest steel-producing city — in February this year. However, the introduction of these curbs — at a time when China's demand for steel was at its peak — likely led to intensified demand and frontloading of purchases in the first half of 2021. This contributed to the significant run up in prices for steel and iron ore in the June quarter.

With domestic demand for steel easing in recent months, output curbs now appear to be taking greater effect at a national level. China's central government has mandated nationwide steel production cuts from June, and local enforcement of this measure is expected to be tightened in the second half of the year. This has led to further weakening in the demand for iron ore so far in the September quarter.

Falls in prices for steel products in the Shanghai Futures Exchange from May 2021 have also prompted a significant decline in Chinese steel mill profit margins in recent months, with margins back to near breakeven levels by the end of the June quarter. Along with government-mandated cuts, this has discouraged mills from raising steel production levels in recent months, with many undertaking or scheduling plant maintenance through the September quarter while steel demand is weak.

**Figure 4.2: Iron ore price spread between grades**



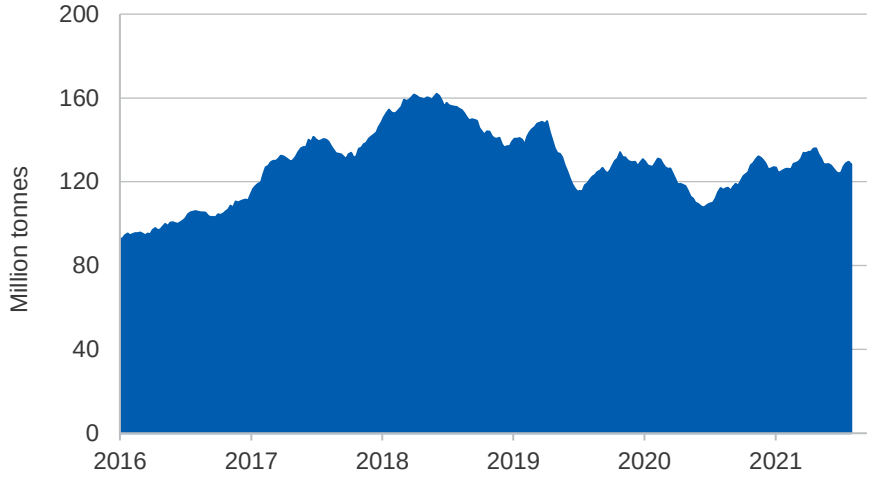

Notes: *Difference to benchmark of 62% iron fines CFR

Source: Bloomberg (2021); China import prices

This is also reflected in the price spreads between higher and lower grades of iron ore imported in China through 2021. The premium paid for 65% Fe fines (relative to 58% Fe fines) reached a record US$80 per tonne in July (Figure 4.2). This premium tends to widen when mills are incentivised to boost production, with the higher grades (62% Fe and above) permitting higher production efficiency and greater output of steel. The narrowing of this premium from August suggests this incentive is now diminishing, and mills are increasingly demanding lower grades of iron ore in order to reduce costs.

Chinese portside stocks of iron ore were around 130 million tonnes at the end of August, tracking reasonably closely to the five year average (Figure 4.3). While many Chinese steel mills drew down iron ore inventories through the June quarter 2021, portside stockpiles remained stable over the period. This will provide a boost in available supplies of iron ore for mills coming into the second half of the year, as mills look to restock.

## Figure 4.3: China's weekly iron ore port stocks



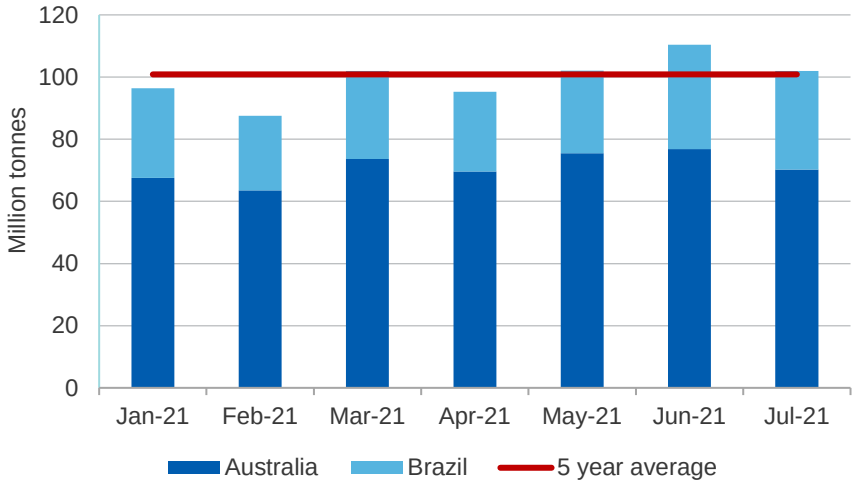

Notes: Benchmark used is 62% iron fines CFR
Source: Bloomberg (2021)

The lower export volumes seen earlier in 2021 from the world's two biggest producers — Australia and Brazil — also appear to have rebounded in recent months. Combined export volumes were above the five year average in May through to July (Figure 4.4). While pandemic-related labour shortages, port maintenance, and safety-related mine closures remain ongoing concerns for major producers, the acute weather disruptions in both countries in the March quarter 2021 have now receded. Vale reported a 11% quarter-on-quarter gain in total output in the June quarter 2021, while total volumes of iron ore exported from Australia in the June quarter increased 8.3% quarter-on-quarter.

### Demand for iron ore to be more subdued in the second half of 2021

While record volumes of Chinese steel production from March to May this year pushed iron ore prices to a high of US$238 a tonne, output is forecast to remain at lower levels for the remainder of 2021. With a growing supply of iron ore from Australia and Brazil also projected for the second half of 2021, this is likely to limit the size of any rebound in iron ore prices in the short term.

## Figure 4.4: Total iron ore exports – Australia and Brazil




Source: ABS (2021); Brazilian customs data

In recent months, China has stepped up efforts to address surging property prices, and this has softened the recent boom in residential construction activity. And while there is the growing prospect of increased infrastructure investment in the second half of 2021, it is unlikely construction activity will return to levels seen in the first half of the year. Along with a weakening pace of growth in manufacturing and exports-related production in July, the major drivers of the robust demand for steel in China in the first half of 2021 have therefore cooled.

Efforts by the Chinese government to curb China's total steel output also appear to be taking greater hold, and are expected to persist for the rest of 2021. Steelmakers outside the city of Tangshan were ordered to scale back production from June, and provinces such as Jiangsu, Shandong and Anhui have all signalled an intention to cut output in the second half of the year. The Chinese government has signalled it is also keen to ensure reduced air pollution (and blue skies) for the Beijing Winter Olympics in

February 2022, and have raised a potential extension of output curbs in northern provinces through to the end of the March quarter 2022. These policies are expected to have an ongoing dampening effect on levels of demand and prices for iron ore through to 2022.

However, China faces a balance between these policies and the ongoing economic recovery as it emerges from the pandemic. There were early signs in July of a weakening in economic activity, along with renewed outbreaks of the COVID-19 pandemic. A continuation of this trend could see an expansion of accommodative fiscal policies again. This could lead to a boost in steel production into the second half of the year, and in turn raise the demand for iron ore.

The Chinese government has taken precautionary steps to bolster domestic supplies of steel, and so prevent any significant ramp up in steel production into the second half of the year. In August, the Chinese government announced new export duties on pig iron, and the removal of export tax rebates for steel products such as cold-rolled coil from 1 August. This follows the cancellation of export tax rebates for steel products such as hot rolled coil, cold-rolled sheet and rebar in May. This appears to have the support of China's major steel producers, with the China Iron and Steel Association condoning limits to steel exports in early August to ensure supply to the domestic market is prioritised.

### Iron ore supply to improve in the second half of 2021

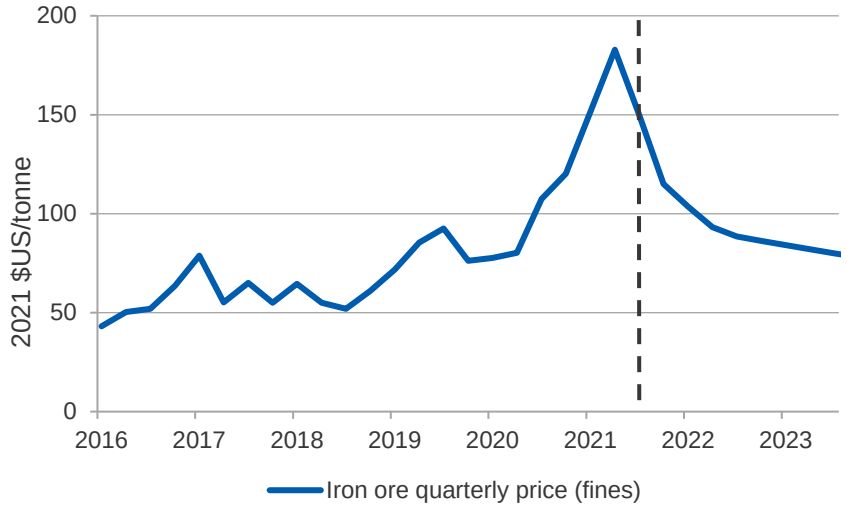
The sources of tight global supply of iron ore present in the first half of 2021 are expected to continue easing through the September quarter. Since May, total volumes shipped from Australia and Brazil have been above the 5-year average, and this upward trend is expected to continue.

Vale's Brazilian operations are slowly returning to output levels last seen prior to the January 2019 Brumadinho tailings dam collapse (see *World Trade section*). The company now expects total production capacity to hit 346 million tonnes by the end of 2021. In Australia, export volumes are expected to rise in the second half of 2021, following a stronger June quarter. The drivers will be major ports returning to full operation, improved weather conditions and new mines coming online (see *Australia section*).

However, the seaborne iron ore market is expected to remain relatively tight over the outlook period, and remains susceptible to supply disruptions. Major producers in Australia have flagged pandemic-related labour shortages in the second half of 2021 as an ongoing concern, as well as the potential of further constraints in production, due to ongoing work on tie-in replacement capacity. Growing congestion at Chinese ports also presents a critical supply risk for the second half of 2021. Slowed port operations and a build-up of vessel queues at ports such as Ningbo — due to stricter COVID-19 protocols — have seen significant queues of ships developing in recent months, and slowing deliveries. These presents a risk of upward pressure on the price of iron ore.

Prices are forecast to average around US$150 a tonne in 2021, before falling to below US$100 a tonne in 2022 (Figure 4.4).

**Figure 4.5: Iron ore price outlook, quarterly**




Notes: China import iron ore fines 62% Fe spot (FOB)

Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

## 4.3 World trade

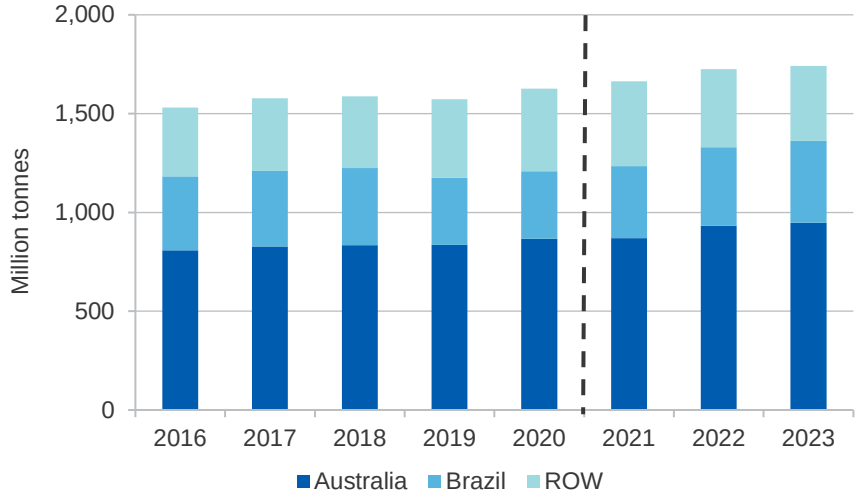
### Brazilian supply continues to recover in 2021

Total shipments of iron ore from Brazil — the world's second largest exporter behind Australia — grew by 5% to reach almost 86 million tonnes in the June quarter 2021. This was 13% higher compared with the same period in 2020.

Brazil's largest producer, Vale, had total production of around 76 million tonnes in the same period, an increase of 11% compared with the March 2021 quarter (and a 12% increase year-on-year). This followed an improvement in seasonal weather conditions, as well the continued recovery in operations from its 2019 Brumandinho tailings dam collapse.

Despite the progress, Vale has revised down its expectations on the recovery in capacity, from 350Mt per annum to 343Mt by the end of 2021. This follows forced shutdowns at its Timbopeba complex in June, after concerns about failure of another of its tailings dams.

**Figure 4.6: Outlook for global iron ore exports**




Source: World Steel Association (2021); Department of Industry, Science, Energy and Resources (2021)

While Vale remains confident of meeting its full year 2021 guidance of total production between 315 and 335 million tonnes, challenges remain in the second half of 2021. In the seven months to July 2021, shipments from Ponta da Madeira — one of Vale's major export terminals in Northern Brazil — were 21% lower than expected. This was also the lowest volume for the period in 4 years, following a fire at one of the loaders in January. Freight rates on the Brazil to China iron ore route also hit a decade high in August, following limited availability of ships in the Atlantic basin.

Vale has also downgraded its target for production capacity in 2022 from 400 million tonnes to 370 million tonnes per annum. The planned growth in capacity in 2022 is contingent on recommissioning and expansion of its Southeastern and Northern systems, with output capacity from its Serra Sul mine, increasing from 83 million tonnes in 2020 to 100 million tonnes from the second half of 2022. However, delays in permitting for projects in the Serra Norte and Serra Sul operations have prompted the recent reduction by Vale.Growing congestion at Chinese ports from August in the midst of renewed outbreaks of the delta variant are continuing to delay shipments of iron ore from both Brazil and Australia. This has led to Brazilian shipments falling 7% year-on-year in the month of July, and total Australian shipments falling 2.8% over the same period. As many as 200 vessels remained queued outside Chinese ports in late August, with stricter quarantine measures slowing port operations and delaying unloading schedules.

Iron ore shipments from Australia continue to be subject to COVID-19 disruptions, tie-in and ramp up of brownfield replacement mines, and the management of sites of cultural heritage. Maintenance at BHP's Nelson Point No.1 car dumper at its port facilities at Port Hedland, Western Australia will continue in the September quarter, weighing on shipments.

In May 2021, the Chinese government announced an aim to diversify its current iron ore supply. Australia currently accounts for more than 60% of the country's iron ore imports. China's new plan includes a target of 45% self-sufficiency in steelmaking raw materials by 2025. This plan includes a combination of: greater use of electric arc furnace (EAF) steelmaking

(which uses more scrap steel and less iron ore as inputs); increased domestic exploration and production of iron ore; and securing greater overseas reserves.

In early July, China's National Development and Reform Commission (NDRC) announced a target of scrap steel use of 320 million tonnes by 2025. This compares with 250 million tonnes of scrap steel consumed by Chinese steelmakers in 2020. This would likely require a substantial shift in China's current production mix, with (EAF) steelmaking providing about 11% of the country's output in 2019. Alternatively, China may explore options to increase scrap usage in its Blast Furnace-Basic Oxygen Furnace steelmaking operations (which is typically more iron ore-intensive), given its comparatively younger blast furnace fleet.

To aid this process, China lifted its ban on scrap steel imports at the start of 2021. However, in the short term, the current global shortage of scrap steel will act as a constraint on its rising adoption under either option.

China has also said it intends to develop domestic iron ore capacity and secure increased access to overseas iron ore resources. In 2019, China produced around 241 million tonnes of iron ore domestically, equivalent to around 19% of its domestic consumption. China has recently identified a significant number of greenfield and expanding domestic projects, potentially capable of increasing the country's iron ore concentrates production by as much as 105 million tonnes per year. However, with comparatively lower grades of iron ore and higher marginal costs relative to other major producers such as Australia and Brazil, efforts are likely to concentrate on foreign prospects. Recent falls in the price of iron ore may also reduce the profitability of many of the Chinese projects.

China is investigating a number of possible iron ore mines in Africa, including large deposits in Gabon and Madagascar. The most notable prospect in Africa is the proposed Simandou iron ore mine, located in Guinea. The project is becoming increasingly emphasised as a key element in China's future supply chains, although production remains a number of years away. With potential full production capacity of 200 million tonnes per year, this is around 15-20% of output currently produced in the Pilbara region of Western Australia. However, the project requires long term and significant investment in mining-related and transport infrastructure to get minerals to market, and remains exposed to current political instability in the country.

Global iron ore markets are expected to remain tight, with slow growth in both supply and demand over the next few years (Figure 4.5). Market structure is not expected to alter significantly, with Australia's market share expected to hold up. A recovery in Brazilian supply is likely in the short-term, but a number of high-cost mines in Brazil and China are also expected to face closure or depletion over the next 10 years.

## 4.4 Australia

### Iron ore export earnings reached a new record in 2020–21

Australia's iron ore export value reached a record of $48 billion in the June quarter 2021. This included a new monthly record of $17.6 billion of iron ore exported in the month of June. The strong result reflected soaring global iron ore prices, with total export values in the June quarter 2021 rising 25% from the March quarter 2021, and nearly 70% higher than the same period in 2020.

Total volumes of iron ore exported from Australia in the June quarter 2021 increased 8.3% quarter-on-quarter, as shipments recovered from seasonal weather disruptions experienced earlier in 2021. However, total volumes in the June quarter were still 8.3% lower than the same period in 2020. This follows ongoing labour shortages amongst Australian producers as a consequence of COVID-19 restrictions, as well as issues at the Port Dampier export terminal.

Iron ore exports to China totalled around A$40.3 billion in the June quarter 2021, representing around 84% of total Australian iron ore export value for the period. Total export value to China rose 29% quarter-on-quarter, and was 70% higher than the same period in 2020 (Figure 4.6). The outcome reflects the significant tailwind elevated iron ore prices have provided for Australian exporters, with export volumes to China in the June quarter 2021 down 3.7% year-on-year.

Despite modest falls in export volumes for a number of Australia's major producers in the March quarter 2021, domestic operations continue to perform strongly. Total export volumes of iron ore were 868 million tonnes in 2020–21, up 1.2% year-on-year.

Rio Tinto shipped 76 million tonnes in the June quarter 2021, a 2% fall quarter-on-quarter and 12% lower than the same period in 2020. Shipments for the first half of 2021 remained 3% below where they were for the same period in 2020. This follows seasonal weather disruptions (typical in the March quarter), cultural heritage concerns, and labour shortages encountered through the first half of 2021. As a result of the shortfall, Rio Tinto has advised that 2021 production will be at the lower end of its guidance range (for 325 to 340 million tonnes of production).

This will be achieved in part through the addition of 90 million tonnes of replacement mine capacity coming online at Robe Valley, West Angelas and Western Turner Syncline Phase 2. The new Gudai-Darri (formerly Koodaideri) mine is also set to ramp up during 2022.

BHP achieved 9% quarter-on-quarter growth in the June quarter 2021. For the full year 2020–21, total iron ore production was 254 million tonnes, meeting guidance for the period and representing a 2% increase year-on-year.

BHP is targeting 249-259 million tonnes in the 2021–22 financial year, and this will include a ramp up of its South Flank project, which began production in May and is expected to reach full production of 80 million tonnes per year over the next few years.

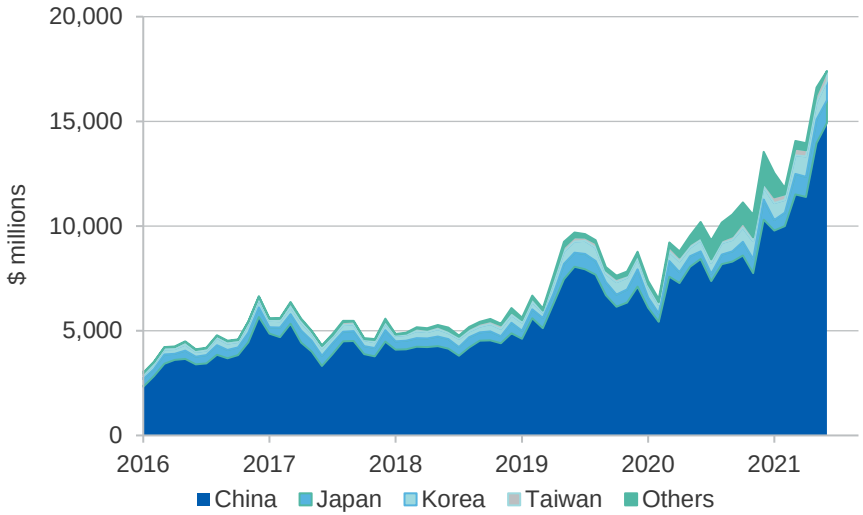
Fortescue's total exports reached a record 49 million tonnes in the June quarter 2021, a 17% increase quarter-on-quarter, and 4% higher compared with the same period in 2020. Total shipments for the 2020–21 financial year were 182 million tonnes, a 2% rise compared with the previous year. This has come as Fortescue's newly developed Eliwana project ramps up in 2021, with output expected to reach almost 30 million tonnes per year.

High iron ore prices so far this year have seen heightened efforts to bring a number of new projects online in 2021. In June, NT Bullion's reopened Frances Creek mine made the first shipment of iron ore from the port of Darwin since 2015.

Shipments of high grade direct shipping ore from the newly commissioned Wiluna West JWD project in Western Australia are also expected to begin during the September quarter. Approvals are for operations of up to 7 million tonnes per annum over an initial mine life of 10 years.

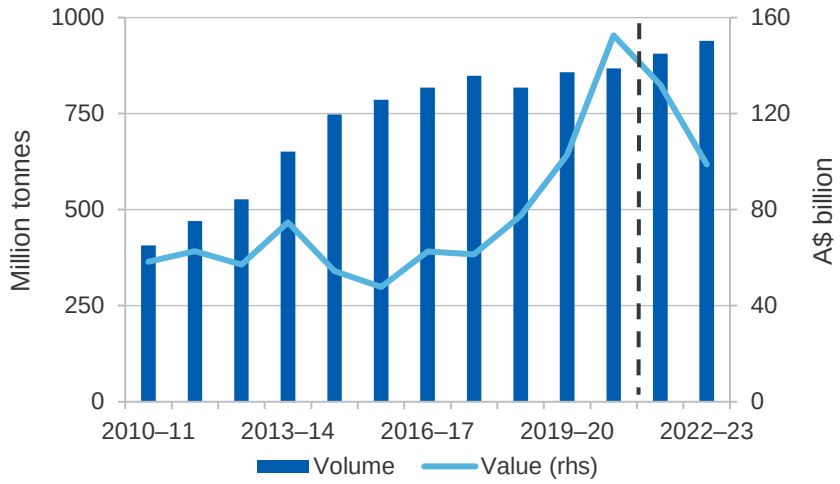
With steady production volumes and record prices, Australia's iron ore export earnings reached a new record of $153 billion in 2020–21. Prices for iron ore are expected to ease from the second half of 2021, leading to some moderation in earnings over the subsequent two years. Total export value for iron ore is forecast to be $132 billion in 2021–22 and $99 billion in 2022–23 (Figure 4.7).

### Figure 4.7: Australia's iron ore export destinations, monthly



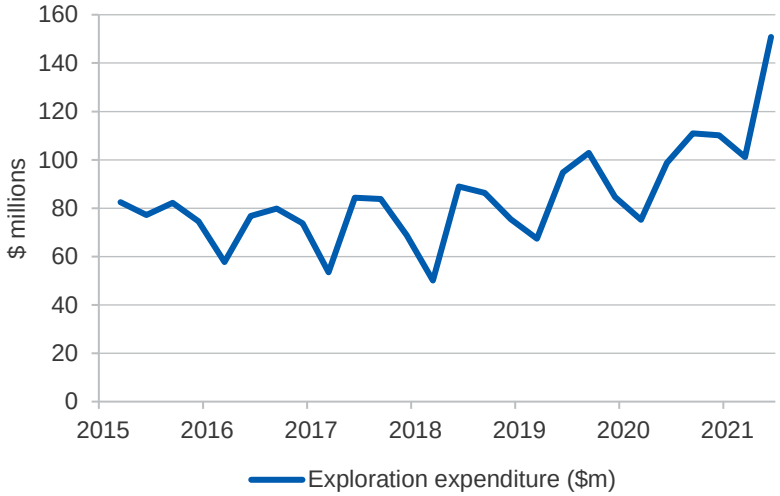

Source: ABS (2021); Department of Industry, Science, Energy and Resources (2021)

## Figure 4.8: Australia's iron ore export volumes and values




Source: ABS (2021) International Trade, Australia, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## Figure 4.9: Australian iron ore exploration




Source: ABS (2021) Mineral and Petroleum Exploration, 8412

### Iron ore exploration expenditure is growing as prices lift

A total of $151 million was spent on iron ore exploration in the June quarter 2021. This is 49% higher than exploration in the March quarter 2021, and 52% higher than in June quarter 2020. Exploration has been elevated in recent quarters as iron ore prices have reached historical highs in the first half of 2021 (Figure 4.8).

### Revisions

Forecast export earnings for 2020–21 have been revised upwards from $149 billion in the June 2021 *Resources and Energy Quarterly* (in nominal terms) to $153 billion in this edition. This reflects record prices during May and June. Forecast Australian export earnings have been revised down by around $4 billion for 2021–22 to $132 billion, and have been revised down by around $14 billion in 2022–23, reflecting easing prices from the second half of 2021.

## Table 4.1: World trade in iron ore

| | Million tonnes | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|
| | 2020 | 2021[f] | 2022[f] | 2023[f] | 2021[f] | 2022[f] | 2023[f] |
| Total world trade | 1,626 | 1,664 | 1,726 | 1,741 | 2.3 | 3.7 | 0.9 |
| **Iron ore imports** | | | | | | | |
| China | 1,170 | 1,218 | 1,273 | 1,267 | 4.1 | 4.5 | -0.5 |
| Japan | 99 | 115 | 119 | 123 | 15.1 | 3.9 | 3.6 |
| South Korea | 70 | 74 | 76 | 78 | 4.7 | 2.8 | 2.6 |
| European Union | 63 | 78 | 78 | 78 | 23.6 | 0.0 | 0.0 |
| **Iron ore exports** | | | | | | | |
| Australia | 867 | 870 | 934 | 948 | 0.4 | 7.3 | 1.5 |
| Brazil | 342 | 364 | 396 | 414 | 6.4 | 8.8 | 4.6 |
| South Africa | 66 | 69 | 72 | 75 | 4.6 | 5.3 | 4.0 |
| Canada | 55 | 57 | 61 | 62 | 3.3 | 6.1 | 2.3 |
| India | 52 | 57 | 56 | 53 | 9.9 | -2.6 | -4.3 |

Notes: **f** forecast.

Source: World Steel Association (2021); International Trade Centre (2021); Department of Industry, Science, Energy and Resources (2021)

## Table 4.2: Iron ore outlook

| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| Prices [bc] | | | | | | | | |
| – nominal | US$/t | 96 | 150 | 93 | 81 | 55.4 | -38.0 | -12.7 |
| – real [d] | US$/t | 100 | 150 | 91 | 77 | 50.3 | -39.5 | -14.9 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Production | | | | | | | | |
| – Steel [h] | Mt | 5.53 | 5.67 | 5.90 | 5.91 | 2.7 | 3.9 | 0.2 |
| – Iron ore | Mt | 911 | 922 | 948 | 991 | 1.2 | 2.8 | 4.5 |
| Exports | | | | | | | | |
| Steel [h] | Mt | 0.88 | 0.78 | 1.01 | 1.01 | -11.6 | 30.5 | 0.2 |
| – nominal value | A$m | 1,011 | 770 | 919 | 882 | -23.8 | 19.3 | -4.0 |
| – real value [i] | A$m | 1,047 | 785 | 918 | 867 | -25.0 | 17.1 | -5.6 |
| Iron ore | Mt | 858 | 868 | 906 | 939 | 1.1 | 4.4 | 3.6 |
| – nominal value | A$m | 102,861 | 152,590 | 132,092 | 98,900 | 48.3 | -13.4 | -25.1 |
| – real value [i] | A$m | 106,505 | 155,475 | 132,092 | 97,211 | 46.0 | -15.0 | -26.4 |

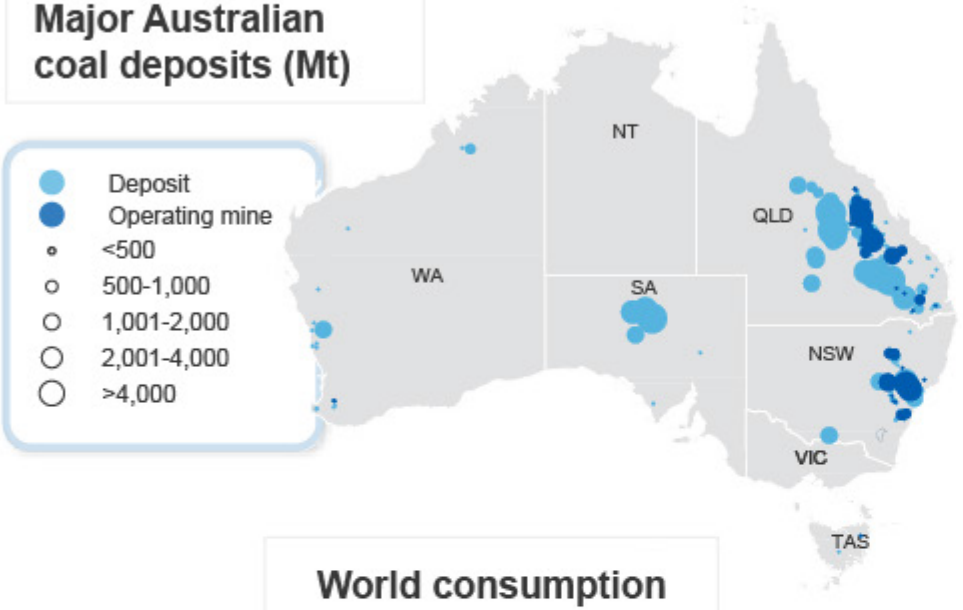
Notes: **b** fob Australian basis; **c** Spot price, 62% iron content basis; **d** In 2021 US dollars; **f** forecast; **h** Crude steel equivalent; Crude steel is defined as the first solid state of production after melting. In ABS Australian Harmonized Export Commodity Classification, crude steel equivalent includes most items from 7206 to 7307, excluding ferrous waste and scrap and ferroalloys; **i** In 2020–21 Australian dollars; **s** estimate.

Source: ABS (2021) International Trade in Goods and Services, Australia, 5368.0; Bloomberg (2021) Metal Bulletin; World Steel Association (2021); AME Group (2021); Company Reports; Department of Industry, Science, Energy and Resources (2021)

# Metallurgical coal

6 C Carbon 12.011

## Major Australian coal deposits (Mt)




## Metallurgical coal

- Metallurgical coal is primarily used **to make steel**
- Contains **more carbon and less ash & moisture** than thermal coal
- 1x tonne of steel made in a blast furnace **uses 780kg of met coal**
- Electric arc furnaces don't use met coal as a **raw material**

## World consumption

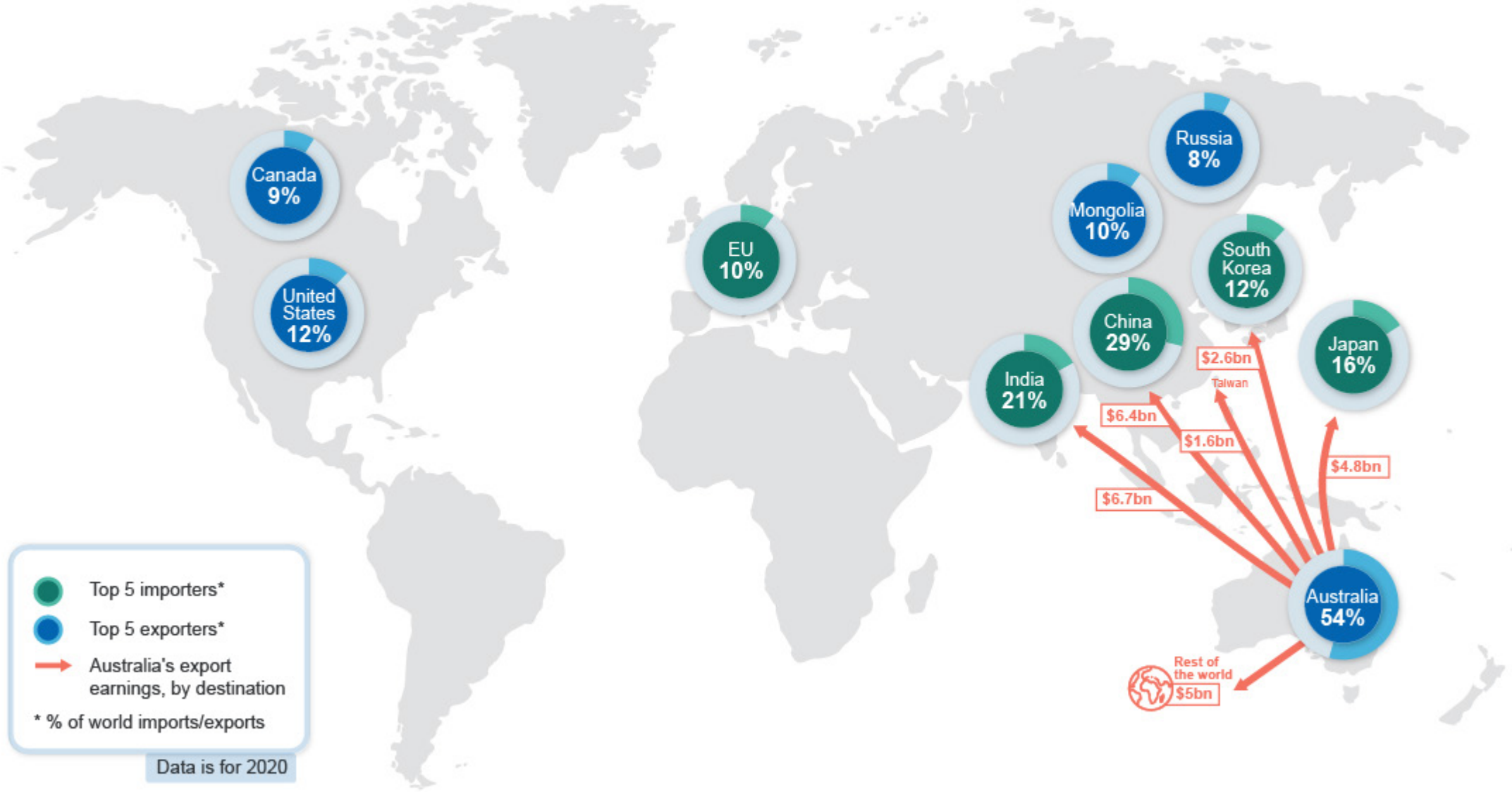
- **59%** China
- **10%** India
- **7%** Russia
- **5%** EU28
- **5%** Japan
- **4%** South Korea

## Australia's metallurgical coal

- **World's no.1** **metallurgical coal** exporter
- **170m tonnes** of **metallurgical coal** exported each year
- **Almost all** of Australia's met coal is **exported**

# Metallurgical coal

## Trade map | September 2021



## 5.1 Summary

- Metallurgical coal prices have hit new peaks in recent months, as supply shortages meet rebounding global industrial production. The Australian premium hard coking coal (HCC) price is forecast to ease from an average US$162 a tonne in 2021 to US$159 a tonne in 2022 and US$152 a tonne by 2023.
- Australia's exports are forecast to rise from 171 million tonnes in 2020–21 to 186 million tonnes by 2022–23. Supply chains disrupted by China's informal import restrictions have largely reorganised (see *Australia section*).
- Australia's metallurgical coal export values are forecast to reverse most of their recent decline, rebounding from $23 billion in 2020–21 to $30 billion by 2022–23.

## 5.2 World trade

A gap has opened in metallurgical coal supply chains in recent months, with recent rapid demand growth yet to be matched on the supply side. Supply remains disrupted by the COVID-19 pandemic and associated containment measures, which have affected mines and transport. The re-organisation of supply chains following the imposition by China of informal import restrictions on Australian supply has added to the complexity, at a time when significant COVID-19 disruptions persist.

Consumer sentiment around the world is picking up — especially in Europe and the United Kingdom — where industrial activity also now appears to be gaining momentum. Purchases and production of cars and other manufactured products is rising, and the large build up of savings across many advanced Western nations over the last 18 months could fuel a potential spending boom as economic normality is restored.

Nonetheless, it is expected that prices will ease back from their recent peaks. Much of the recent surge in demand is 'pent-up': caused by the closure of significant steel/auto making capacity over much of 2020. As the wave of catch-up production is achieved, demand pressure on steel (and thus metallurgical coal) is likely to ease from its current peak.

## 5.3 World imports

### China's imports are levelling off as prices lift

The Chinese Government has announced an intention to curb the nation's steel output, with a goal to constrain volumes in 2021 to 2020 levels. The strength of the global recovery and pent-up demand for cars and other manufactured goods may put pressure on this policy, with steel output having risen in the first half of 2021. Import volumes have trended down in recent months (Figure 5.1), partly due to high prices and partly as a correction from very strong growth in 2020. Import volumes nonetheless remain strong in annual terms (Figure 5.2).

One factor likely to weigh on steelmakers is the recent surge in prices for metallurgical coal. Domestic supply in China has not been able to entirely fill the gap left by the absence of imports from Australia, forcing more imports from Russia, Canada and the US. This has come at a cost to China's steelmakers: prices for high quality metallurgical coal have been above US$215 a tonne during the June and September quarters of 2021.

### India's metallurgical coal imports are set to recover

India is the world's second largest steel producer and second biggest metallurgical coal buyer, and is estimated to have imported 51 million tonnes in 2020. This is down from 58 million tonnes in 2019, reflecting the effects of the COVID-19 pandemic on Indian steelmaking. In recent months, the Indian Government has announced an easing of containment measures, as the spike in COVID-19 cases in the June quarter abated. Investment plans that were previously disrupted have now been restored, with large Indian steelmakers announcing projects worth a total of US$11 billion over the next five years (though final investment decisions are yet to be made in many cases).

Indian steelmaking (and thus the importation of metallurgical coal) is consequently expected to rebound, rising slowly in the final quarter of 2021 and more rapidly from early 2022. Imports are forecast to reach 75 million tonnes by 2023 (Figure 5.2). Australia is well placed to supply much of this extra demand.

### Japanese and South Korean imports are recovering slowly

Japan is the world's third largest metallurgical coal importer, despite a fall in imports during 2020. Some of this loss is expected to be made up as COVID-19 vaccinations roll out and steelmaking rebounds. However, post-COVID restarts will occur against a backdrop of long-term decline in Japanese steelmaking, with two major producers expected to permanently retire some capacity. Japan's metallurgical coal imports are not expected to reach their pre-COVID levels, despite increasing slightly to around 45 million tonnes annually over the outlook period.

South Korea is the world's fourth largest metallurgical coal importer, buying 34 million tonnes in 2020. This is about 10% below the level of 2019. Imports are expected to lift slightly over the outlook period, with steel needs being met partly from domestic steel inventories.

## 5.4 World exports

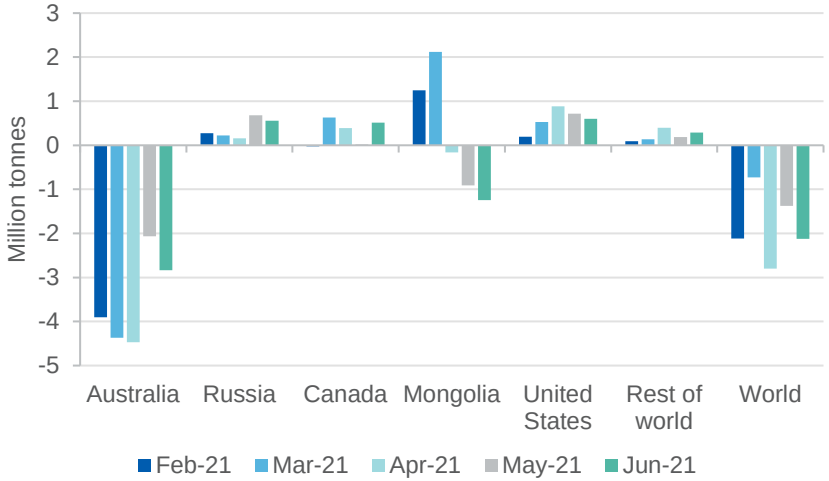
### US export volumes are in a partial recovery

US supply remained largely stagnant through much of the first half of 2021, with some mines affected by labour shortages and disputes. The US has long been the world's second largest exporter of metallurgical coal after Australia, despite relatively high production costs (Figure 5.3). US metallurgical coal exports are expected to grow modestly in 2021, partially reversing the sharp fall of 2020. However, little growth is expected from 2022. As the demand surge from Europe passes, high production costs in the US metallurgical coal industry and high transport costs to Asia will place the US at a structural disadvantage, particularly in Asia where the market is growing fastest (Figure 5.4).

### Russia's exports are recovering, supported by new infrastructure

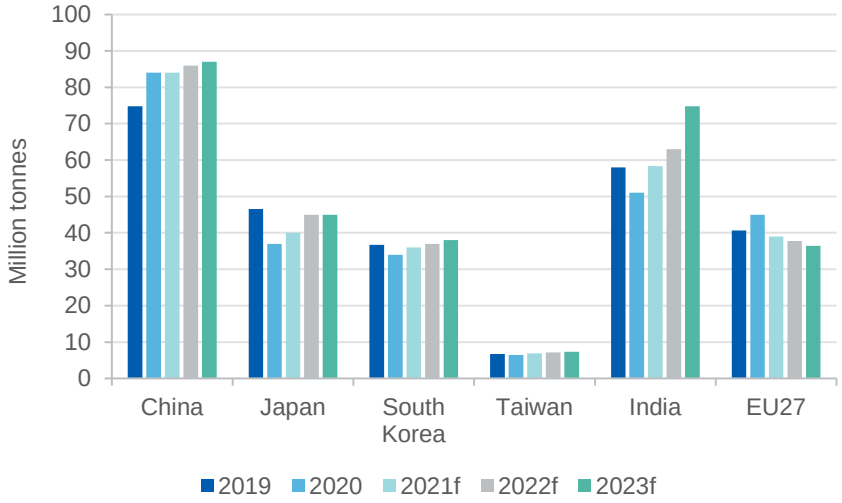
Russian exports are expected to recover from a 2020 low of 30 million tonnes to reach 37 million tonnes by 2023 (Figure 5.4). Russian coal is cheap to produce (Figure 5.3) and has low sulphur, making it suited for emerging Asian markets where pollution laws are becoming more stringent. A large quantity of new transport capacity is also expected to come online between 2022 and 2024 (see *Thermal coal chapter*).

**Figure 5.1: China's metallurgical coal imports, year-on-year change**




Notes: China customs released combined January/February data for 2021.
Source: Bloomberg (2021); China customs (2021)

**Figure 5.2: Metallurgical coal imports**




Notes: **f** Forecast.
Source: IHS (2021); Department of Industry, Science, Energy and Resources (2021)

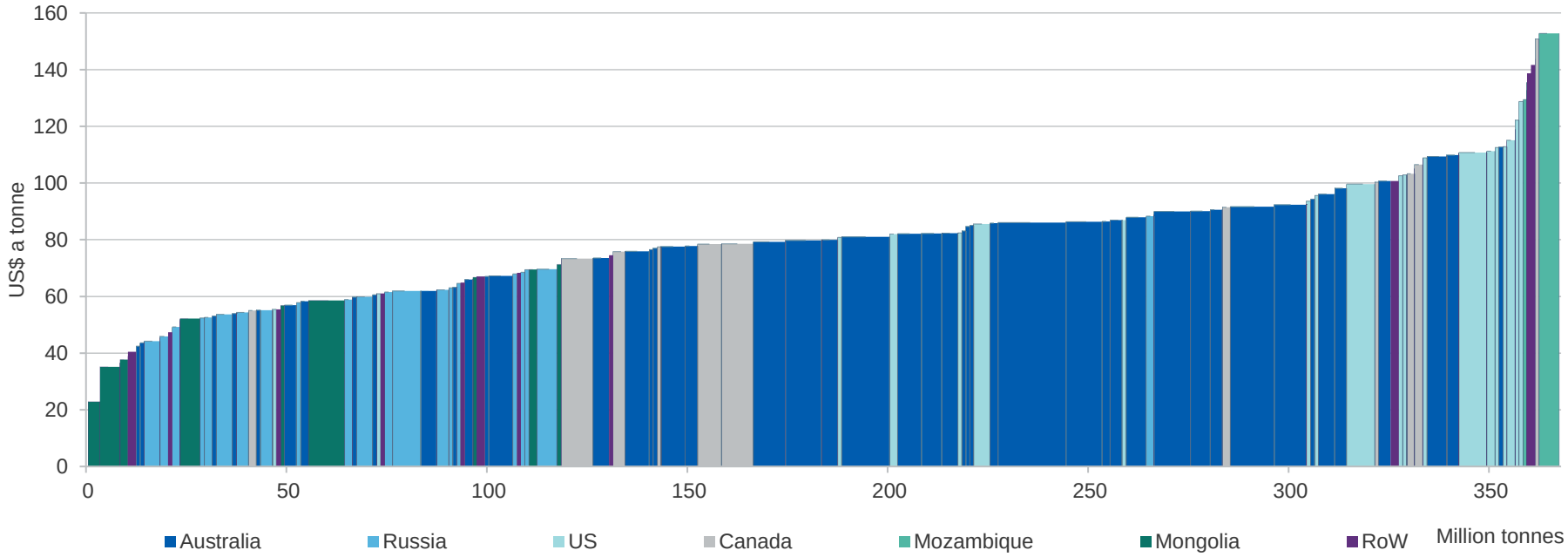
### Mongolia's exports remain subject to conditions in China

Mongolian exports have partially recovered from a sharp fall during 2020, when trade was disrupted by Chinese efforts to contain the COVID-19 pandemic. Exports are expected to increase over the outlook period, from 26 million tonnes in 2020 to 33 million tonnes by 2023. Exports should be supported by recent tariff cuts in China under the Asia-Pacific Trade Agreement, and by the completion of a key railway connecting mines in Mongolia with buyers in northern China.

### Exports from Canada could partly fill China's Australia gap

In response to China's informal restrictions on Australian exports, Canada (among other coal exporting countries) has increased its exports to China. However, exports overall have been recently affected by forest fires, which have disrupted supply routes that feed export terminals in Vancouver. Teck, a major supplier, has already advised that previous export guidance will not be met as a result, with the bulk of the country's fire season still yet to come. Conditions are nonetheless improving for Canadian exporters, with exports forecast to lift to 36 million tonnes by 2023 (Figure 5.4).

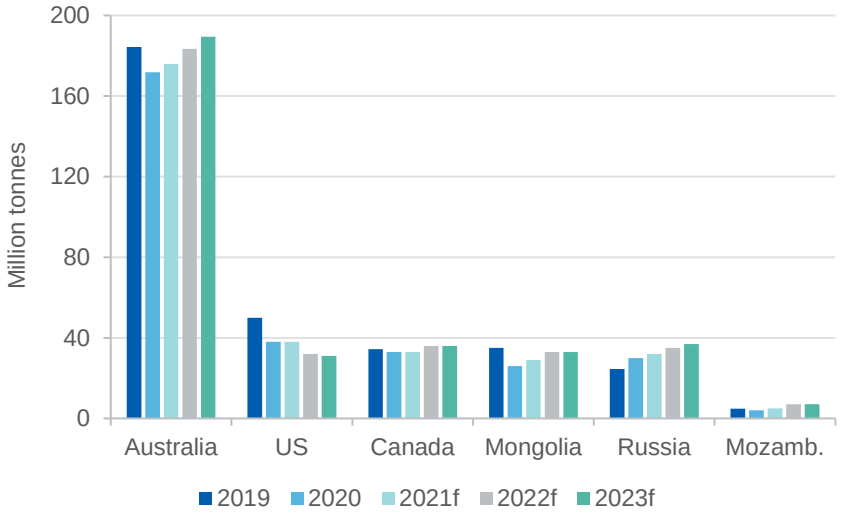
**Figure 5.3: Metallurgical coal (including hard coking, PCI and semi-soft) global cost curve, FOB**




Notes: FOB is Free on Board. RoW is rest of world.

Source: AME Group (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 5.4: Metallurgical coal exports**




Notes: **f** Forecast
Source: IHS (2021); Department of Industry, Science, Energy and Resources (2021)

### Mozambique's exports will take time to recover

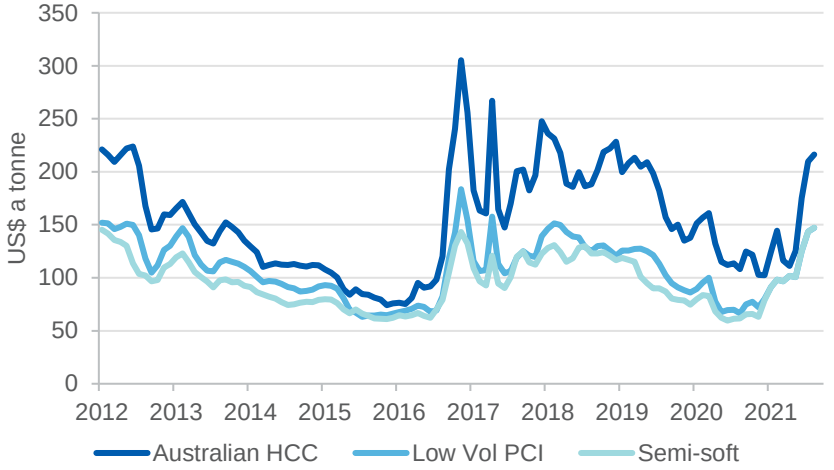
Mozambique's exports fell sharply in 2020, to an estimated 3 million tonnes, as low prices severely affected the country's relatively high cost producers. Exports are forecast to recover to 7 million tonnes by the end of the outlook period, supported by improved global demand, the ramp up of Vale's Moatize mine, and by upgrades to the Nacala logistics corridor rail line and port.

## 5.5 Prices

### Metallurgical coal prices volatile on China uncertainty

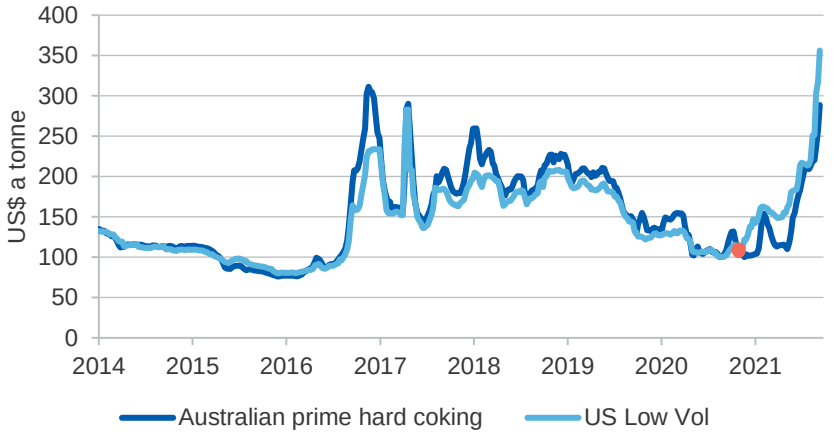
Metallurgical coal prices have continued to surge (Figure 5.5), driven up by tight supply and rising demand. Trade flows are expected to remain in their current alignment over the outlook period, with a price premium set to continue for metallurgical coal produced outside Australia. It is expected this price premium will weaken over time, with buyers across key markets including Korea, Taiwan, Japan and India all seeking to bring coal

**Figure 5.5: Metallurgical coal prices, monthly**




Notes: HCC stands for hard coking coal. PCI stands for pulverized coal for injection.
Source: Platts (2021)

**Figure 5.6: Metallurgical coal prices - Australian Prime Hard vs US Low Vol, FOB**




Source: IHS (2021). Low vol = low volatile coking coal. Orange marker indicates approximate timing of informal import restrictions from China.

deliveries forward to meet increased demand from steelmakers. The diversion of Australian coal from China to other markets is now effectively complete, with the previous surplus of Australian supply now largely redirected.

Metallurgical coal prices are expected to remain volatile over the final quarter of 2021. Potential weather events over autumn remain the most significant upside risk to prices, with the potential to disrupt shipping from Queensland. Some broad upward price pressure is also expected to persist, as global steelmaking continues to scale up. The premium Australian HCC price is forecast to average US$162 a tonne in 2021, easing to US$159 a tonne in 2022, and US$152 a tonne 2023 (Figure 5.7).

On the downside, potential cuts in Chinese steelmaking have become more likely over the last few months. Any such cuts would likely take price pressure off non-Australian metallurgical coal, reducing the price differential (Figure 5.6) and potentially enabling further cost rebalance between China and ex-China markets.

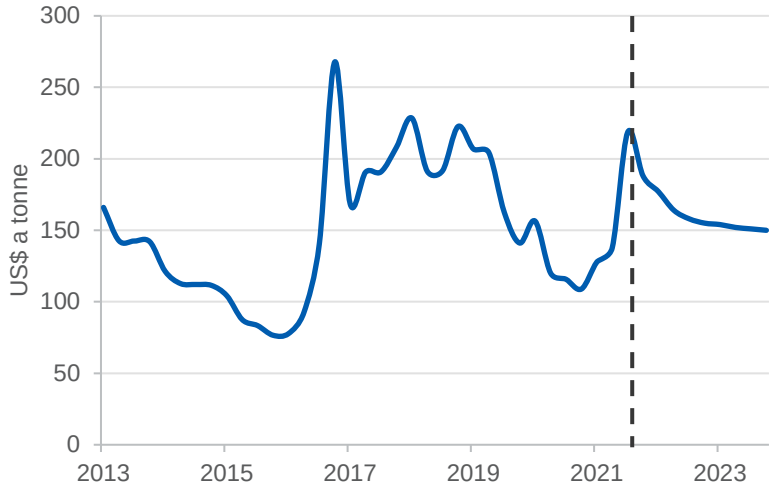
## 5.6 Australia

### Metallurgical coal export earnings are on a strong trend

Australian exports have now integrated into new supply chains, with no impact on volumes evident in the wake of the informal import restrictions imposed by China. Prices have also recovered significantly (Figure 5.7). Australian coal demand has risen significantly in South Korea (up by 56% between January and June 2021) and Japan (up by 65% between January and June 2021). European importers have also sought greater access to Australian supply, seeking to capitalise on its lower price relative to US supply.

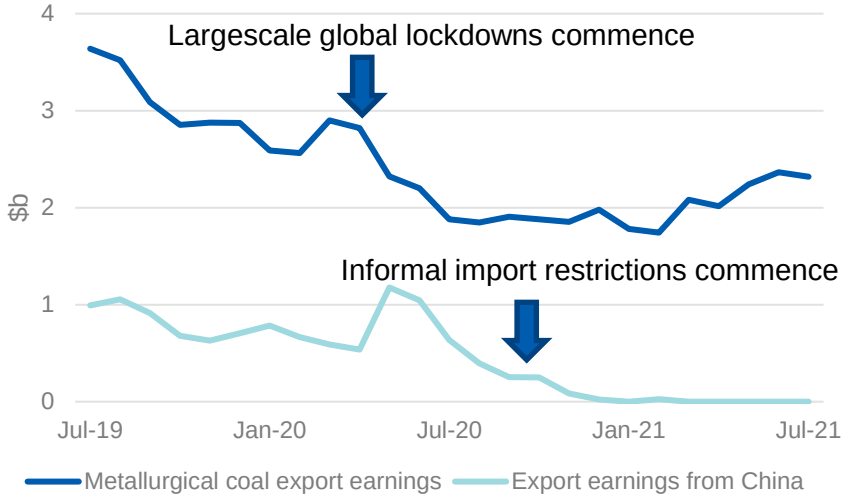
Higher demand from India is expected to add further to pressure on Australian exports over the outlook period, with buyers in Japan, South Korea and Taiwan also expressing interest in greater supply in the December quarter. The build-up of Australian metallurgical coal inventories — which followed the commencement of Chinese import restrictions — has now largely cleared, with trade volumes fully restored.

**Figure 5.7: Australian premium HCC spot price, quarterly**




Source: Platts (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 5.8: Australia's metallurgical coal export values, monthly**




Source: ABS (2021) International Trade, Australia 5454.0

Metallurgical coal supply is expected to be supported shortly by output from Wollongong Coal's Russell Vale Colliary extension, which received final environmental approval in early September.

Metallurgical coal export earnings were $23 billion in 2020–21, with the sector affected by the COVID-19 pandemic, and to a lesser extent by China's informal import restrictions (Figures 5.8 and 5.9). However, a strong recovery is underway, with further gains expected throughout the outlook period, as mines resume operations and newly formed supply chains strengthen amidst a broader global economic recovery. Export volumes are forecast to rise back to 186 million tonnes, with export earnings reaching $30 billion by 2022–23.

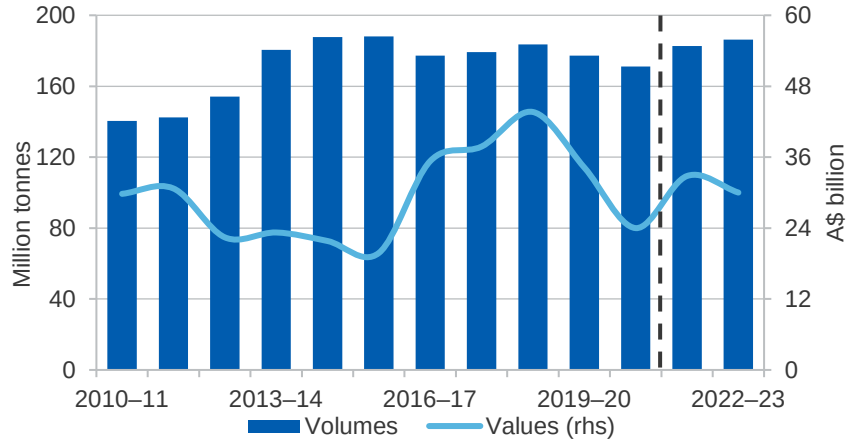
### Coal exploration expenditure has declined

Australia's coal exploration expenditure decreased by 37% year-on-year to $55 million in the June quarter 2021, likely reflecting uncertainty over thermal coal markets. Price increases may improve rates of exploration over coming quarters, most notably for metallurgical coal (Figure 5.10).

### Revisions to the outlook for Australian metallurgical coal exports

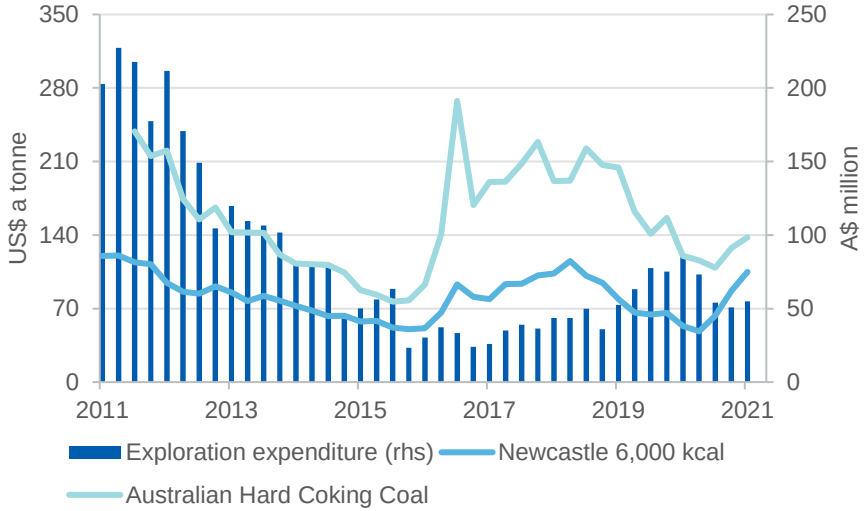
Australia's forecast metallurgical coal export earnings have been revised up by $1 billion in 2020–21, but down by $1.5 billion 2022–23 (in nominal terms) since the June *Resources and Energy Quarterly*. This result largely reflects changes to the price outlook, with prices rising sooner than previously expected.

**Figure 5.9: Australia's metallurgical coal exports**




Source: ABS (2021) International Trade, Australia 5454.0; Department of Industry, Science, Energy and Resources (2021)

**Figure 5.10: Australian coal exploration expenditure and prices**




Source: ABS (2021); IHS (2021); Platts (2021)

## Table 5.1: World trade in metallurgical coal

| | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| World trade | Mt | 309 | 332 | 336 | 343 | 7.5 | 1.3 | 2.1 |
| **Metallurgical coal imports** | | | | | | | | |
| China | Mt | 84 | 84 | 86 | 87 | 0.0 | 2.4 | 1.2 |
| India | Mt | 51 | 58 | 63 | 75 | 14.5 | 7.9 | 18.7 |
| Japan | Mt | 37 | 40 | 45 | 45 | 8.1 | 12.5 | 0.0 |
| European Union 28 | Mt | 45 | 39 | 38 | 36 | -13.3 | -3.2 | -3.5 |
| South Korea | Mt | 34 | 36 | 37 | 38 | 5.9 | 2.8 | 2.7 |
| **Metallurgical coal exports** | | | | | | | | |
| Australia | Mt | 172 | 176 | 183 | 189 | 2.4 | 4.2 | 3.3 |
| United States | Mt | 38 | 38 | 32 | 31 | 0.0 | -15.8 | -3.1 |
| Canada | Mt | 33 | 33 | 36 | 36 | 0.0 | 9.1 | 0.0 |
| Russia | Mt | 30 | 32 | 35 | 37 | 6.7 | 9.4 | 5.7 |
| Mongolia | Mt | 26 | 29 | 33 | 33 | 11.5 | 13.8 | 0.0 |
| Mozambique | Mt | 4 | 5 | 7 | 7 | 25.0 | 40.0 | 0.0 |

Notes: **f** Forecast; **s** Estimate.

Source: IEA (2021) Coal Information; IHS (2021); Department of Industry, Science, Energy and Resources (2021)

## Table 5.2: Metallurgical coal outlook

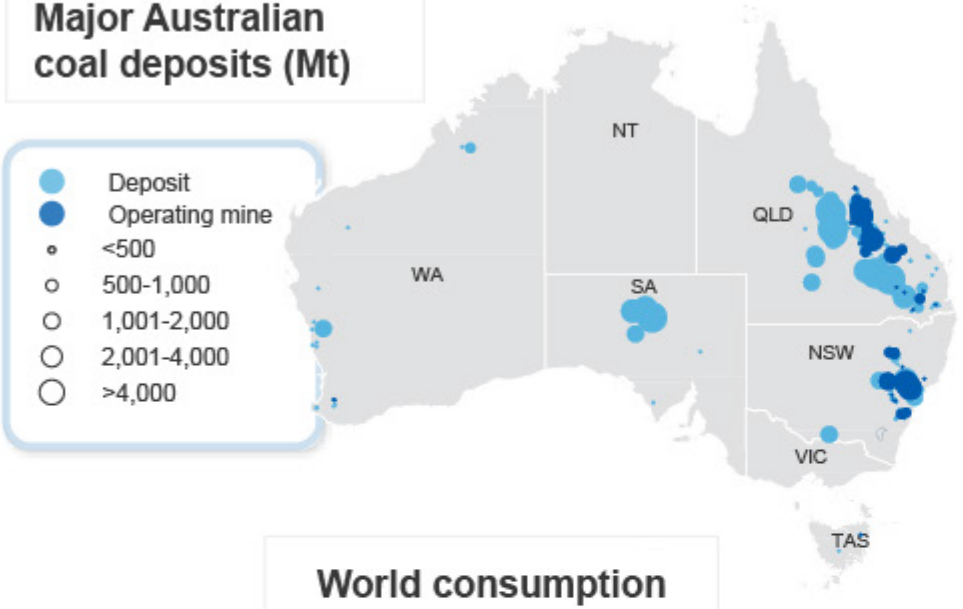
| World | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| Contract prices[e] | | | | | | | | |
| – nominal | US$/t | 125 | 163 | 159 | 152 | 22.8 | 3.8 | -4.4 |
| – real[d] | US$/t | 129 | 163 | 156 | 145 | 18.7 | 1.3 | -6.8 |
| Spot prices[g] | | | | | | | | |
| – nominal | US$/t | 125 | 162 | 159 | 152 | 29.3 | -2.2 | -4.3 |
| – real[d] | US$/t | 130 | 162 | 155 | 145 | 25.0 | -4.4 | -6.6 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Production | Mt | 183 | 170 | 188 | 192 | -7.1 | 10.9 | 1.9 |
| Export volume | Mt | 177 | 171 | 183 | 186 | -3.5 | 6.7 | 1.9 |
| – nominal value | A$m | 34,245 | 23,360 | 32,809 | 30,004 | -31.8 | 40.5 | -8.5 |
| – real value[i] | A$m | 35,458 | 23,801 | 32,809 | 29,492 | -32.9 | 37.8 | -10.1 |

Notes: **d** In 2021 US dollars. **e** Contract price assessment for high-quality hard coking coal. **i** In 2020–21 Australian dollars. **f** Forecast. **g** Hard coking coal fob Australia east coast ports. **s** Estimate.
Source: ABS (2021) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Innovation and Science (2021); Platts (2021)

# Thermal coal

6 C Carbon 12.011

## Major Australian coal deposits (Mt)




## Thermal coal

- Thermal coal is primarily used in **electricity generation**
- Coal accounted for **38%** of power generation globally in 2018
- Mines are open cut or underground depending on the **geology of the deposit**
- **Coal formation** began 290-360 million years ago

## World consumption

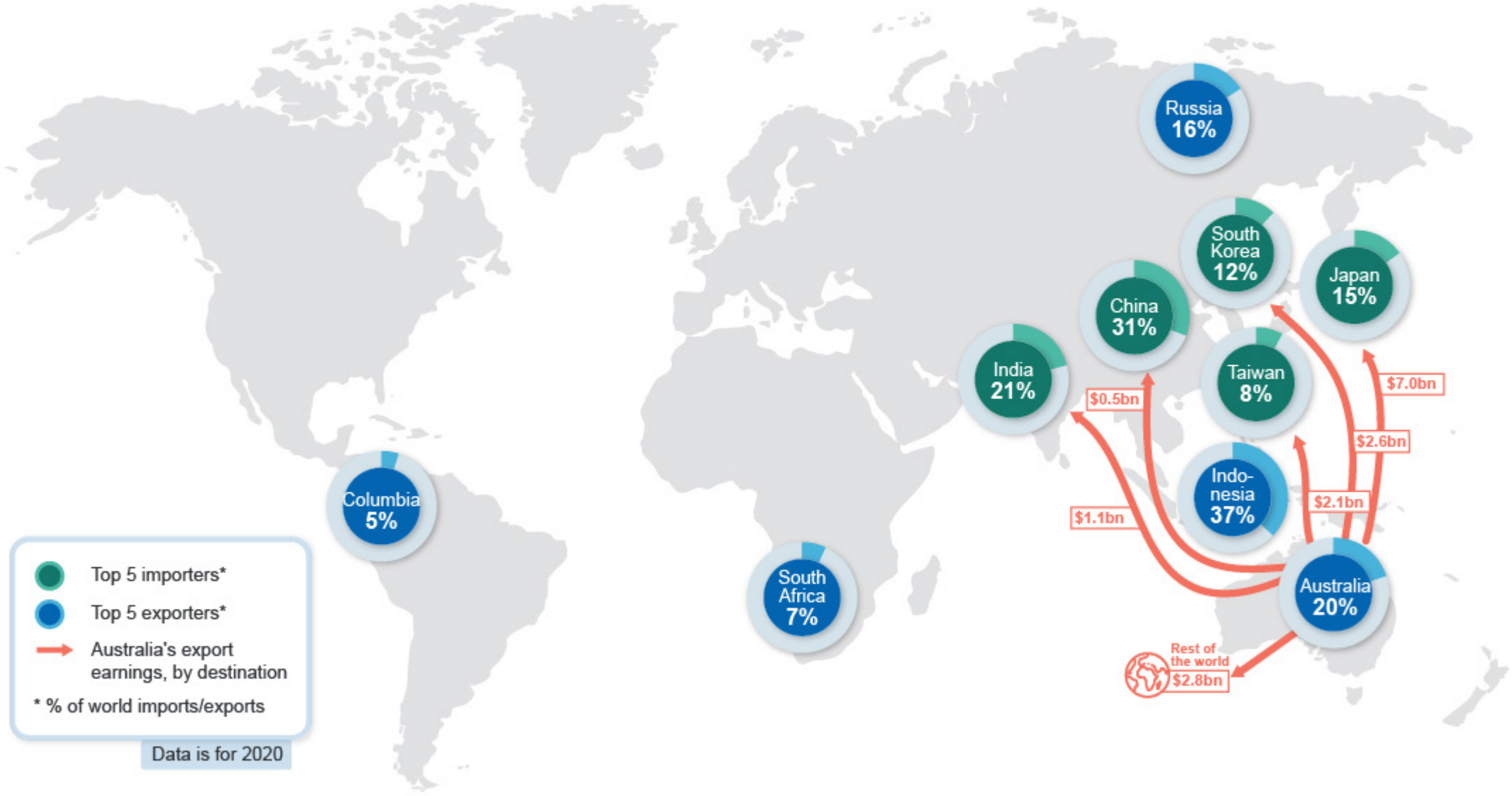
- 55% China
- 14% India
- 8% United States
- 3% South Africa
- 3% Indonesia
- 2% Japan

## Australia's thermal coal

- **World's 2nd** largest **thermal coal** exporter
- **World's 4th** **largest black coal** resources
- **75-80%** of thermal coal **is exported**

# Thermal coal

## Trade map | September 2021



## 6.1 Summary

- Thermal coal spot prices have increased strongly in recent months, as Asian demand grew amidst an unusually hot northern summer. The Newcastle benchmark price is forecast to average US$101 a tonne in 2021, easing slowly to US$71 a tonne by 2023.
- Australian thermal coal exports declined from an all-time high 213 million tonnes in 2019-20 to 192 million tonnes in 2020–21, as a result of COVID-19. Exports are expected to recover to 212 million tonnes by 2022–23, as Asian economies return to normal conditions.
- Export values are forecast to rise from $16 billion in 2020–21 to $24 billion in 2021–22, before easing back to $19 billion in 2022–23.

## 6.2 World trade

Thermal coal trade remains subject to significant competing forces. Trade volumes have partially recovered from the downturn of 2020, and prices are now well above their pre-COVID-19 level. In recent months, prices for some grades of thermal coal have reached their highest level in more than 10 years, supported by economic recovery and user restocking after a cold winter across much of the Northern Hemisphere.

Recent revenue surges are likely to run up against longer-term structural issues in the coal market. Investor and policy pressure has grown in recent years, and the global coal-fired power plant construction pipeline has contracted since 2015. This pressure is extending to existing coal-fired power plants, with the Asian Development Bank recently entering a partnership with Prudential Insurance, BlackRock, Citigroup, HSBC and other financial institutions, to purchase plants around Asia. The purchase proposal, announced early in August, includes a plan to shut any acquired coal-fired power plants within 15 years, well ahead of schedule.

Coal producers are also contending with recent net zero emissions commitments from China (by 2060), the EU (by 2050, with the target now legislated), Japan (by 2050), Taiwan (by 2050), and South Korea (by 2050, and also with a legislated target).

This is expected to impact on prospects for potential new coal mines, where viability and financing calculations will consider long-term demand implications. Potential new mines have also been facing challenges accessing certain capital and insurance. Yet, in an environment where coal-fired power plants remain under construction in China and South Asia, some new coal mines are still likely to be needed. Current trends point to a potential supply risk, and a possibility that new coal supply may actually retreat faster than demand, leading to more upward pressure on coal prices. While these spikes would support new coal investment, coal market volatility could make progress on that front slow and uneven.

Market and policy pressures are also forcing a degree of concentration in the coal market, favouring larger businesses over smaller ones. About 25% of seaborne thermal coal trade in 2021 is expected to come from five companies: Glencore (with significant operations in South Africa, Australia and Columbia), SUEK (a Russian company), PT Bumi Resources and PT Adaro Energy (both Indonesian miners), and Yancoal Australia. Ongoing market pressure may further concentrate coal supply over time, with potential implications for prices.

Coal demand is also expected to concentrate, but on geographic lines, with an increasingly large share of demand linked to Asia (Figure 6.1). However, trajectories for coal use in Asia are increasingly uncertain, with imports to India, Vietnam, Japan and South Korea, all expected to remain below their 2019 levels in 2021. Coal use in China, which holds more than half of the world's remaining coal-fired power plant construction pipeline, is expected to grow slightly during the outlook period, before levelling off.

Global seaborne coal imports fell by around 10% in 2020, but are expected to recover by 5% in 2021 and rise 3% further in 2022, remaining largely steady in 2023. Coal supply is expected to reach 1,079 million tonnes in 2023, falling slightly short of the prior peak reached in 2019.

## 6.3 World imports

### China's import price premium remains high as import restrictions persist

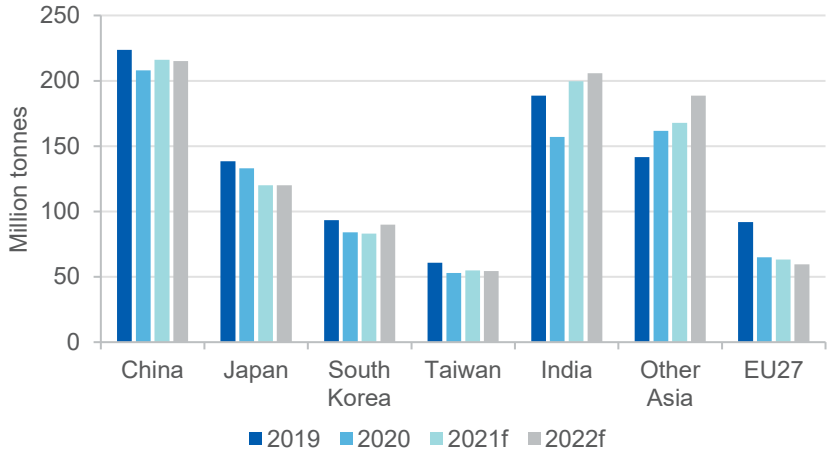
China's thermal coal imports have grown strongly since the COVID-19 pandemic, driven up by an inability of domestic supply to keep pace with strong demand — which has been fuelled by a cold winter and then an unusually hot summer. Indonesia remains the largest source of Chinese thermal coal imports, though disruption from rainfall has recently curbed the capacity of Indonesian suppliers to meet surging Chinese demand, with prices in China spiking higher as a result. Chinese domestic supply was also affected by a weeklong closure of more than 150 coal mines in the run-up to celebrations of the 100th anniversary of the founding of the Chinese Communist Party. Informal restrictions on Australian-sourced coal have magnified the impact of other factors on domestic coal prices, supply, and inventories.

In July, officials in a number of large cities (including Beijing and Xi'an) started timetabling outages and planned disruptions to electricity supply. Guangdong province, which accounts for around 10% of China's economic output, has been subject to forced power rationing since late May. Other provinces, including Yunnan, Zhejiang and Guangxi, have faced periodic usage curbs designed to reduce supply pressures.

China's National Development and Reform Commission recently ordered power firms to build up larger stocks of coal, and is also seeking to draw additional power from the country's nuclear, solar and hydro facilities, though the latter have been affected by unusually severe droughts, leading to low dam levels and poor output. Notices have also been issued extending the operation of 15 coal mines previously marked for closure. With supply pressure likely to persist, it is expected that China's domestic coal prices will remain high for the rest of 2021 and potentially beyond.

Exports from Indonesia, South Africa, and other nations will all continue to be drawn to the Chinese market, which is providing a price premium to those countries' exporters.

**Figure 6.1: Thermal coal imports**




Note: **f** Forecast

Source: IHS (2021); IEA (2021) Coal Market Report; Department of Industry, Science, Energy and Resources (2021)

Chinese imports from Russia, Columbia and the Philippines also continue to rise. The shift in global supply chains brought about by Chinese informal import restrictions against Australia has added to the average length and duration of coal freights, leading to a rise in average freight costs since mid-2021. These higher rates are likely to persist, as the new global supply chains appear to be solidifying in the absence of any change to the conditions that brought them about. At the time of writing, coal use in China appears to be peaking and is beginning to edge down as weather conditions moderate. This decline may reduce some price and demand pressure in the final quarter of 2021, but risks may also run the other way in the event of further disruptions to global coal production and supply.

### India's coal imports are rising unevenly

Indian thermal coal imports rose marginally in the first half of 2021, following a sharp decline in 2020. However, recovery has been affected by renewed waves of the COVID-19 pandemic, with accompanying

restrictions significantly affecting industrial activity across much of the country. An abundance of domestic supply and high prices for seaborne thermal coal, have weighed on growth in imports during much of the last year, though imports from Australia have grown noticeably (Figure 6.2).

Imports may be further affected by the current monsoon season (expected to persist until late September), and by fears of further COVID outbreaks. While electricity demand remains solid, the bulk of recent growth has been met from domestic reserves and supply.

Industrial activity also remains weak during the September quarter, with output and transportation disrupted by COVID containment measures. It is expected that the lifting of these restrictions — already underway in parts of India — will support a rebound in industrial activity, potentially pushing Indian imports up more strongly in the latter part of 2021.

India's recent coal auctions, which included 67 mines and deposits, have faced a loss of interest in recent months, with the Indian Government extending the deadline for bids. It is not expected that these auctions will noticeably affect Indian domestic supply during the outlook period. Import pressure may thus build further, as coal use recovers in 2022 and 2023.

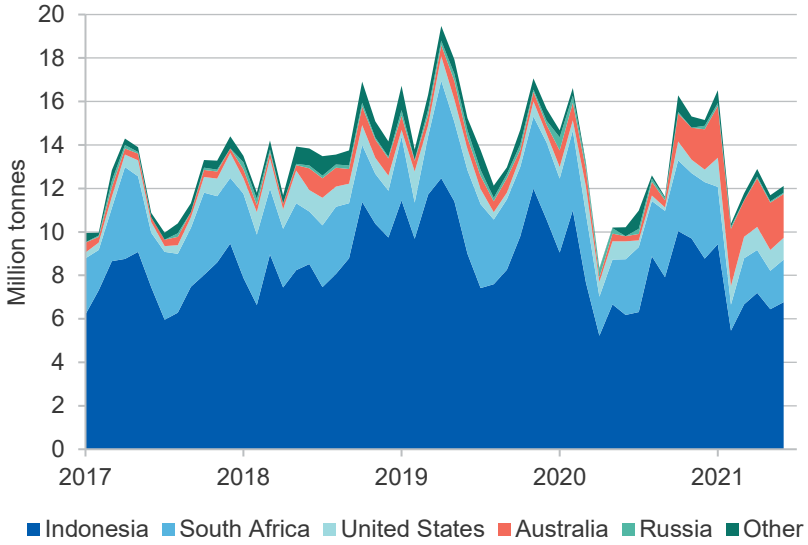
Indian coal imports are expected to grow modestly over the outlook period, increasing just over 5% between 2021 and 2023.

### Japan's imports are expected to grow solidly in 2021

Japanese imports appear on track to recover substantially in 2021, though not to their pre-COVID-19 level. Growth will be fuelled, in part, by higher prices for LNG, which have improved the relative competitiveness of coal for Japanese energy suppliers. A hot summer period is likely driving greater use of thermal coal to support electricity generation. While some coal-fired power plants (including Maramachi and Shinchi 1) were affected by an earthquake early in 2021, most of the affected plants have now been returned to full operation.

Imports to Japan may be pushed up further in coming months, due to the narrowing of coal reserves (a result of energy producers postponing purchases to avoid high prices). However, some offset may come through the return of additional nuclear capacity to the market, with Kansai Electric's Mihama 3 reactor now back online. This follows the return of the Ohi 3 reactor to full operation in July.

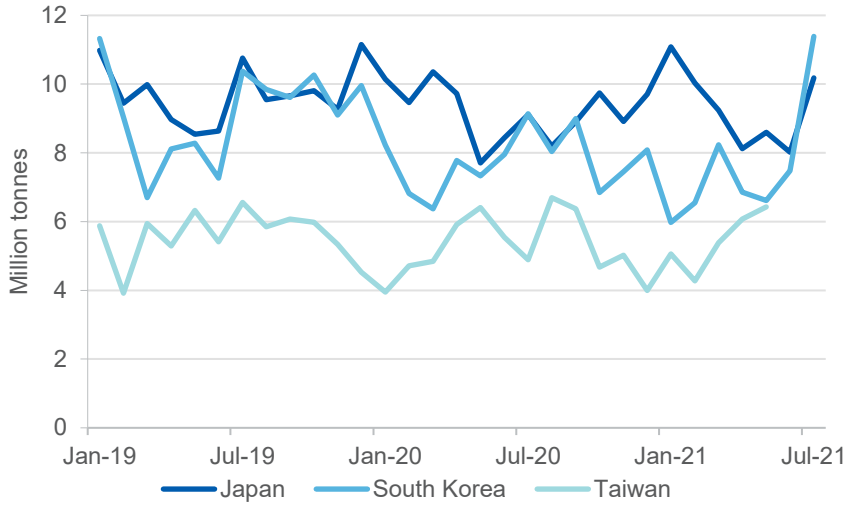
**Figure 6.2: India's thermal coal imports, monthly**




Source: IHS (2021)

In the medium term, rising imports are also likely to be checked by growing pressure on Japan's coal-fired electricity fleet. Japan recently cancelled its Akito coal-fired power plant, which was the last proposed coal-fired power plant project in the country.

**Figure 6.3: Japan, South Korea and Taiwan's thermal coal imports**




Source: IHS (2021)

### South Korean coal imports are recovering

South Korea's thermal coal imports have been significantly affected by its recent air pollution crackdown, which resulted in a rare extension of coal burning restrictions beyond the winter period (Figure 6.3). Imports are nonetheless likely to be pushed up in the short-term, due to upcoming scheduled maintenance at several South Korean nuclear plants. While nuclear generation has grown in recent years, this maintenance is likely to curb output in the short-term. It is expected that South Korean imports will rise in 2021, peak around the end of the outlook period, and subsequently decline as coal-fired power plant output starts to wind back.

### Taiwan's imports remain contained in 2021

Taiwanese coal imports fell only modestly in 2020 (Figure 6.3). Over the outlook period, modest growth in electricity use is expected to be offset by pollution controls and tighter carbon emissions policies — intended to reduce the share of power generation obtained from coal. However, the closure of another nuclear plant is likely to push coal imports up. Taiwan's coal imports are expected to be largely steady over the outlook period, with decreases over the longer term.

### South East and South Asia imports are set to grow, led by Vietnam

Nations in South East and South Asia (excluding India) collectively import about 150 million tonnes of thermal coal. This sum is expected to grow over the outlook period (Figure 6.4). Vietnamese imports are expected to rise, with two large coal-fired power plants preparing for grid connection.

In the Philippines, imports have been relatively low over much of 2021, but are expected to rise over the remainder of the year and beyond, especially following the connection of the new Mariveles coal-fired power plant. Coal imports from Malaysia were relatively solid in 2021, and are expected to grow modestly over the outlook period.

On balance, it is expected that thermal coal imports to South East and South Asia will increase by around 20 million tonnes over the outlook period (Figure 6.4), with the region providing the strongest growth in coal-fired power relative to other regions.

## 6.4 World exports

Global exports have shifted in recent quarters, with Australian coal exports being rapidly redirected to India and other Asian markets following the informal import restrictions imposed by China. Indonesia, Russia and Australia remain dominant in export markets, with the former two nations being increasingly drawn to the Chinese market to fill the gap left by Australian supply (Figure 6.5).

### Indonesia's exports are rising despite temporary disruptions

Indonesian thermal coal exports remain on track to easily exceed their 2020 levels, recovering solidly (but not completely) from the effects of the COVID-19 pandemic. However, repeated bouts of heavy rainfall through

much of 2021 have disrupted supply, contributing to recent rises in global thermal coal prices. Access to labour has also been affected by COVID-19 and recent containment efforts. Issues with heavy equipment (most notably problems with the floating cranes at Taboneo anchorage) have also affected exports, though this is largely resolved at the time of writing.

In an effort to encourage greater production, the Indonesian Government has offered to expand output quotas, providing domestic needs are met. A possible removal of all remaining import restrictions by China may also provide an incentive for Indonesian producers to expand their output over the remainder of 2021 and into 2022. Indonesian exports are expected to grow by at least 80 million tonnes in 2021 as disruptions pass.

### Russia's exports will be supported by improvements in infrastructure

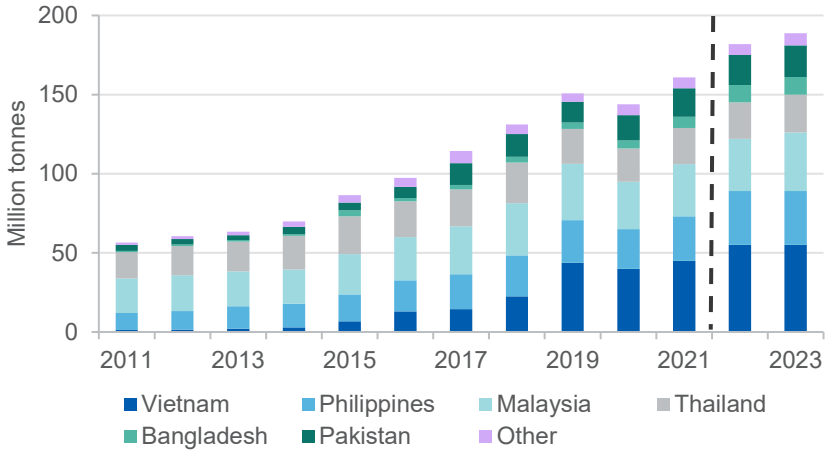
In recent months, Russian exports have been affected by difficulties with its rail network, partly due to seasonal maintenance, but also due to a bridge collapse on the Trans-Siberian railway. However, Russia continues to benefit from Chinese restrictions on Australian supply, gaining a price premium as Russian supply is drawn in as a substitute. Expansion of Russian port capacity (from 36 million tonnes to 50 million tonnes annually) is in progress, and is expected to begin operation in 2022.

Additional rail freight capacity connecting Russia to markets in East Asia is also under development, with R.Z.D. (the Russian state rail operator) foreshadowing growth in eastbound volumes from 53 million tonnes in 2020 to 69 million tonnes by 2024. The completion of this export capacity, and the high inherent quality of Russian coal, are expected to increase Russia's scale and importance as a coal exporter over the coming years.

### Colombia's exports are growing slowly, but face ongoing disruption

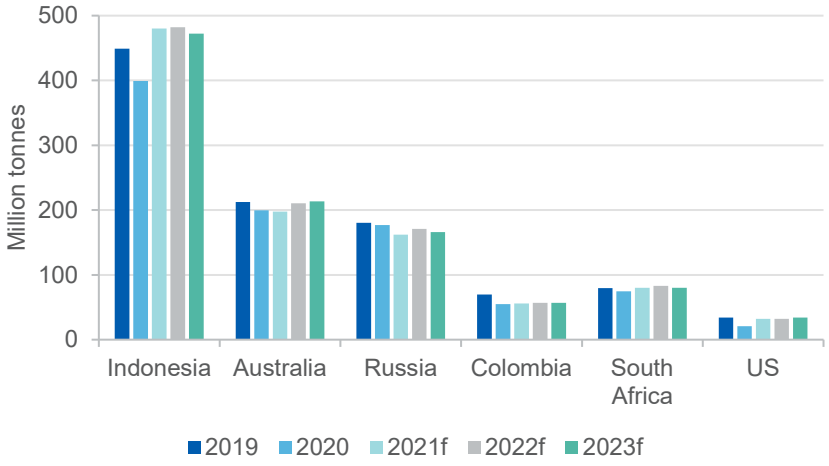
Columbian coal output remains well short of its pre-COVID level, with its suppliers continuing to face disruptions. Prodeco, a large supplier, requested permission to reduce supply for up to four years, but the request was rejected by the Government. This led to the company seeking to hand back its mining contracts, adding to market uncertainty.

**Figure 6.4: South and South East Asia thermal coal imports**




Source: IEA (2021) Coal Information; Department of Industry, Science, Energy and Resources (2021); IHS (2021)

**Figure 6.5: Thermal coal exports**




Notes: **f** Forecast.

Source: IHS (2021); IEA (2021) Coal Information; ABS (2021); Department of Industry, Science, Energy and Resources (2021)

Glencore, which jointly owns the large Cerrejón mining complex, has also faced significant issues: strikes had a big impact in 2020. However, the disruptions appear largely to have passed, with the miner now exporting reliably to Europe, largely in line with its previous volumes.

Columbian exports are expected to increase through the final quarter of 2021. However, with demand in the Atlantic market falling significantly, the longer term outlook for Columbian exports will depend on exporters' capacity to reposition into the Asian market.

### US exports have picked up, but long-term cost challenges remain

US exports are recovering strongly, with domestic and international demand pushing suppliers to maximise their output. Exports have been driven by a temporary surge in European demand, which saw prices in the European market reach their highest level for more than 10 years in July.

Rising demand in the US domestic market and a shift upward in gas prices, have also supported coal production, though this may pass as an unusually hot northern summer draws to a close.

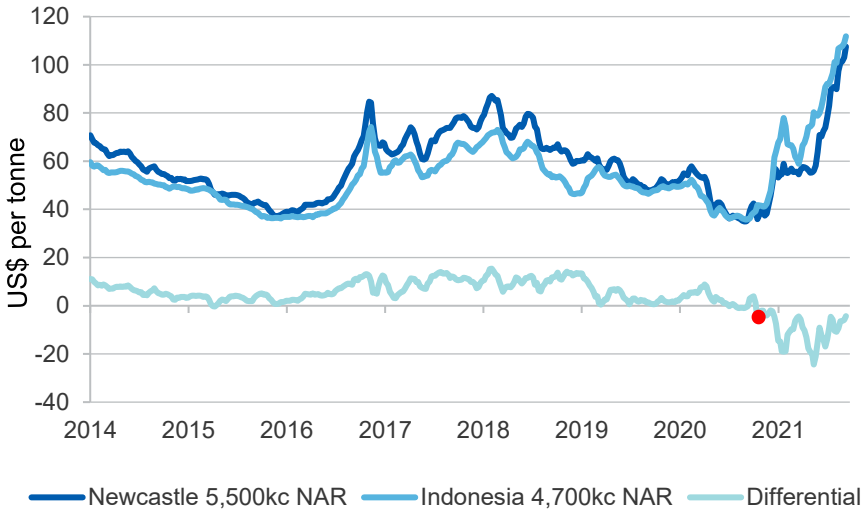
## 6.5 Prices

### Prices have surged during 2021, but may now be peaking

Thermal coal prices have lifted sharply so far in 2021, amidst supply disruptions and growing demand in China, South Korea, Japan and Taiwan. Chinese demand has been supported by a strong domestic recovery, which saw coal use grow faster than domestic supply. This has pushed up China's coal imports, with the effect on prices magnified by the informal import restrictions imposed on Australian supply.

Prices outside China have not reached similar levels, but have still faced some pressure due to an unusually hot northern summer, which has added to electricity use since mid-2021. Price pressure in ex-China Asia has been partially checked by access to more affordable Australian coal, and by a still-incomplete recovery in global demand (it is expected that around half of the fall in global seaborne thermal coal trade recorded in 2020 will be reversed in 2021).

**Figure 6.6: Thermal coal prices — Australian vs Indonesian**




Source: IHS (2021). NAR = Net as received. Red dot indicates timing of Chinese restrictions.

However, price growth outside of China has occurred, in part due to supply disruptions in Indonesia, South Africa and Australia. As these disruptions pass, and the hot northern summer recedes, prices are expected to edge back late in 2021, falling further through the remainder of the outlook period. The market continues to be marked by high price differentials between 5,500 kcal coal and 6,000 kcal coal, which reached record levels in July, as a result of disruptions to South African and Australian high grade coal supply.

On balance, thermal coal prices for Newcastle 6,000kcal product are expected to fall to US$85 a tonne in 2022 and US$71 in 2023, with inflated price differentials gradually reducing, though Chinese domestic prices are expected to remain elevated for the foreseeable future.

## 6.6 Australia

### Australian thermal coal exporters face volatile conditions in 2021

Thermal coal export prices have risen solidly in Australia, supported by strong demand in ex-China Asia. Volatile weather conditions across the northern hemisphere have pushed up demand for Australian coal, and new supply chains created following Chinese import restrictions have now solidified and begun to gain the benefits of experience and scale. Consumers across the Asian region may also be attempting to build stockpiles given the increasing likelihood that supply tightness will persist for at least another year.

Storm-related weather disruptions and flooding in June caused damage to the Morwell River Diversion near the Yallourn coal mine, creating a potential risk to Victoria's energy supply. Temporary repairs have been conducted to safeguard the short-term operation of the Yallourn coal mine, and in late July a process for full repair was agreed between Energy Australia and the Victorian Government.

In August, the Queensland Government passed the Resources and Other Legislation Amendment Bill 2021, which retrospectively validates 86 coal mining leases which previously had an unclear legal standing. The Queensland Department of Resources noted that '(t)he proposed amendments will clarify that any leases approved between 1989 and 2010 and were not issued a hard-copy instrument of lease are – and have always been – considered valid'. The bill could help to provide better investment certainty by placing a substantial proportion of coal production in Queensland on a sounder legal footing.

The NSW Government has recently granted an approval for an additional five years operation of Glencore's large Mangoola coal mine, effectively extending its operation out to 2030. An outage at the NCIG loader temporarily disrupted Australian exports from Newcastle, though this has not prevented a steady rise in NSW exports through the second half of 2021.

A further upside to exports may result from potential further development of the Galilee Basin in Queensland. Projects mooted for the region include GVK Group/Hancock's Alpha and Kevin's Corner projects, Waratah Coal's Alpha North and Galilee projects, and AMCI's South Galilee Coal Project. The total output for these projects could exceed 150 million tonnes per annum in exports, though at the time of writing prospects for the projects remain uncertain. Final approval and commencement of mining at the Carmichael mine offers a precedent for further approvals and a potential to utilise rail infrastructure constructed for the initial project.

Sharp variations in price differentials — which have affected Australian coal exports through much of 2021 — have been offset by a surge in ex-China Asian demand for Australian 5,500 kcal product in recent months. This has led to a price rise for 5,500 kcal coal, narrowing the price differential with 6,000 kcal coal and offsetting much of the impact on premiums which followed the imposition of informal import restrictions by China. It is expected that recovering prices and growing demand, in conjunction with a full return to operation of the NCIG loader, will ensure that export values remain higher, and volumes equal to, their levels of 2020.

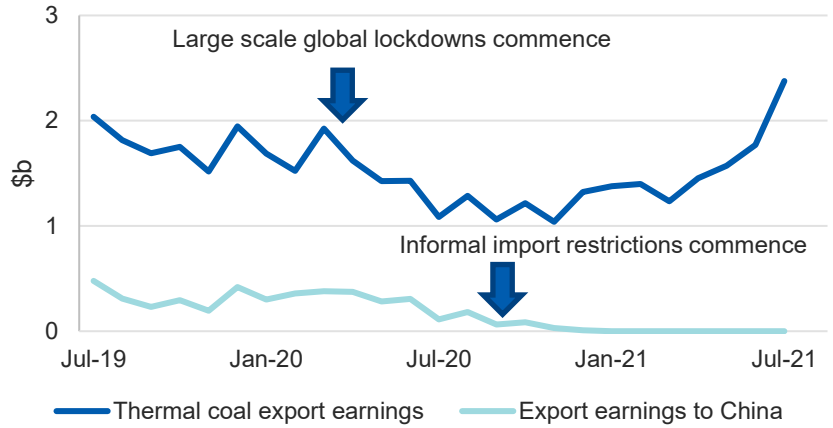
The effect of Chinese informal import restrictions has abated with monthly export earnings exceeding pre-restriction levels (Figure 6.7). However, weather disruptions could present a risk to Australian exports, with recent warnings suggesting a wet spring and possible La Nina are in prospect.

In volume terms, coal exports are expected to lift slightly during the outlook period, rising from around 192 million tonnes in 2020–21 to 212 million tonnes by 2022–23 (Figure 6.8). Export values are forecast to pick up from $16 billion in 2020–21 to $24 billion in 2021–22, before easing back to $19 billion in 2022–23.

## Revisions to the outlook for Australian thermal coal exports

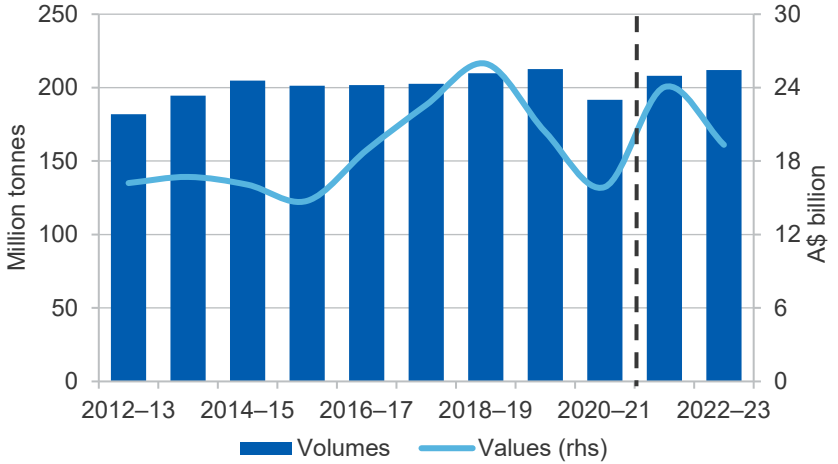
Thermal coal export earnings forecasts have been revised up from estimates in the June quarter *Resources and Energy Quarterly*. Export earnings forecasts have risen by just over $2 billion in 2021–22 and 2022–23. The revision reflects the recent surge in thermal coal prices, and the likelihood that much of this rise will be sustained over the next two years.

**Figure 6.7: Australia's monthly thermal coal export values**




Source: ABS (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 6.8: Australia's thermal coal exports**




Source: ABS (2021); Department of Industry, Science, Energy and Resources (2021)

## Table 6.1: World trade in thermal coal

| | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| World trade | Mt | 987 | 1,048 | 1,077 | 1,079 | 6.2 | 2.8 | 0.2 |
| **Thermal coal imports** | | | | | | | | |
| Asia | Mt | 797 | 842 | 874 | 876 | 5.6 | 3.9 | 0.2 |
| China | Mt | 208 | 216 | 215 | 205 | 3.9 | -0.4 | -4.8 |
| India | Mt | 157 | 200 | 206 | 212 | 27.2 | 3.1 | 2.8 |
| Japan | Mt | 133 | 120 | 120 | 120 | -9.8 | 0.0 | 0.0 |
| South Korea | Mt | 84 | 83 | 90 | 90 | -1.2 | 8.4 | 0.0 |
| Taiwan | Mt | 53 | 55 | 54 | 54 | 3.8 | -1.3 | -1.3 |
| **Thermal coal exports** | | | | | | | | |
| Indonesia | Mt | 399 | 480 | 482 | 472 | 20.3 | 0.4 | -2.1 |
| Australia | Mt | 200 | 198 | 210 | 213 | -0.7 | 6.3 | 1.4 |
| Russia | Mt | 177 | 162 | 171 | 166 | -8.5 | 5.6 | -2.9 |
| Colombia | Mt | 55 | 56 | 57 | 57 | 1.8 | 1.8 | 0.0 |
| South Africa | Mt | 74 | 80 | 83 | 80 | 7.5 | 3.8 | -3.6 |
| United States | Mt | 21 | 32 | 32 | 34 | 52.4 | 0.0 | 6.3 |

Notes: **s** Estimate **f** Forecast

Source: International Energy Agency (2021); IHS Markit (2021); Department of Industry, Science, Energy and Resources (2021)

## Table 6.2: Thermal coal outlook

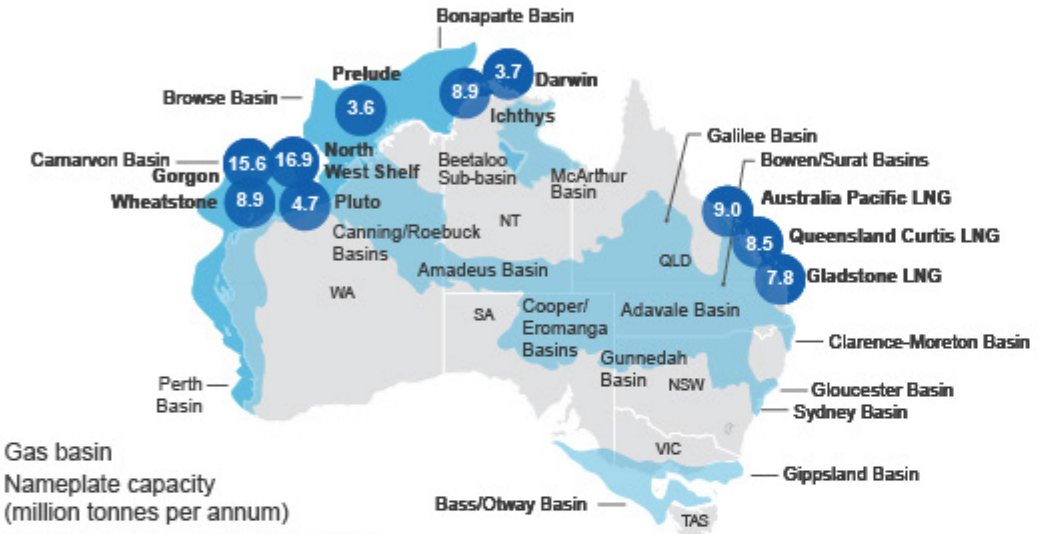
| World | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| Contract prices[b] | | | | | | | | |
| – nominal | US$/t | 69 | 110 | 93 | 77 | 60.0 | -15.8 | -16.4 |
| – real[c] | US$/t | 71 | 110 | 90 | 74 | 54.5 | -17.8 | -18.4 |
| Spot prices[d] | | | | | | | | |
| – nominal | US$/t | 58 | 101 | 85 | 71 | 75.3 | -15.8 | -16.2 |
| – real[e] | US$/t | 60 | 101 | 83 | 68 | 69.5 | -17.7 | -18.2 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Production | Mt | 268 | 237 | 262 | 265 | -11.5 | 10.4 | 1.0 |
| Export volume | Mt | 213 | 192 | 208 | 212 | -9.7 | 8.4 | 1.8 |
| – nominal value | A$m | 20,376 | 15,977 | 24,044 | 19,330 | -21.6 | 50.5 | -19.6 |
| – real value[h] | A$m | 21,097 | 16,279 | 24,044 | 19,000 | -22.8 | 47.7 | -21.0 |

Notes: **b** Japanese Fiscal Year (JFY), starting April 1, fob Australia basis. Australia–Japan average contract price assessment for steaming coal with a calorific value of 6700 kcal/kg gross air dried; **c** In current JFY US dollars; **d** fob Newcastle 6000 kcal net as received; **e** In 2021 US dollars; **f** Forecast; **h** In 2020–21 Australian dollars; **s** estimate

Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; IHS (2021); NSW Coal Services (2021); Queensland Department of Natural Resources and Mines (2021); Company Reports; Department of Industry, Science, Energy and Resources (2021)

# Gas

## Australia's LNG projects and gas basins




## Gas facts

- LNG is produced by **cooling natural gas to -161°C**
- **LNG shrinks** to 1/600th the volume of natural gas
- **LNG accounted for 12%** of global gas demand in 2020
- Natural gas accounted for **23% of the world's primary energy mix** in 2019

## Global gas use by sector

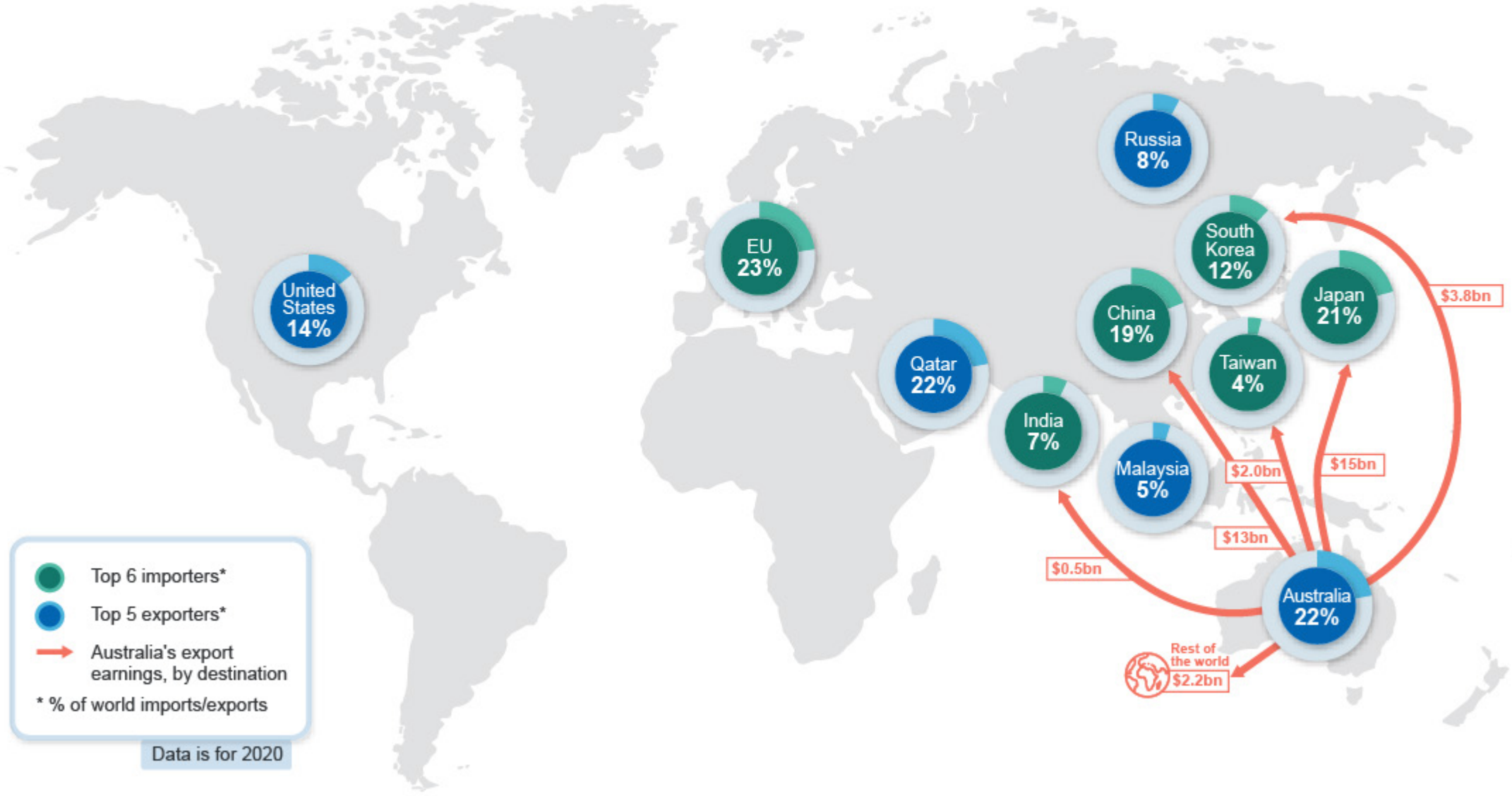
- **20%** Industry
- **19%** Transport
- **22%** Residential
- **40%** Electricity

## Australia's LNG

- **78m tonnes exported** in 2020, valued at **$36bn**
- Total **LNG nameplate capacity** is **88m tonnes** per annum
- Around **3/4** sold on **long-term contracts**

# LNG

## Trade map | September 2021



## 7.1 Summary

- Asian LNG spot prices and oil-linked contract prices are expected to moderate in 2022 and 2023, as the LNG market remains well supplied and oil prices stabilise above US$65 a barrel.
- Australian export volumes are forecast to increase by 5.4% to 82 million tonnes in 2021–22 and 0.9% to 83 million tonnes in 2022–23, as technical issues are resolved at the Prelude and Gorgon LNG plants.
- Australia's LNG exports earnings are forecast to rise from $30 billion in 2020–21 to $56 billion in 2021–22, as oil-linked contract prices surge.

## 7.2 World trade

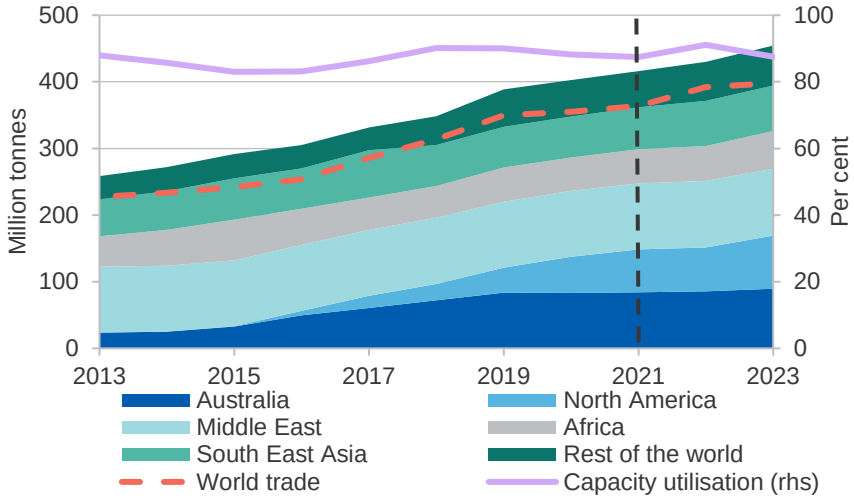
### LNG trade growth driven by Asia-Pacific

In the first half of 2021, global LNG trade grew by almost 5% year-on-year, as the global economy showed a strong recovery from the COVID-19 pandemic. A number of extreme weather events also raised demand, as the Northern Hemisphere built inventories after a bitter winter, followed by a hot Asian summer and sustained droughts in South America that affected hydro generation. The Asia-Pacific region remains the key driver of import growth, with an impressive 12% year-on-year expansion in the first half of 2021. There are downside risks to Asia-Pacific import demand, including high-spot prices and the pace and style of net-zero policies.

Export growth has been dominated by North America, largely due to the 50% rise in liquefaction capacity since the beginning of 2020, with mixed export performance from other regions. Exports from the Asia-Pacific have largely been flat, and the Middle East has seen only moderate growth.

Global LNG trade is expected to increase by 2% in 2021, driven by continued import growth in the Asia-Pacific region, and export growth in North America. Trade is then expected to increase by 7.8% in 2022 and 1.5% in 2023 (Figure 7.1). Growth is expected to moderate beyond the outlook period as the increase in demand from emerging Asia is partially off-set by decreasing demand elsewhere. Given the large scale expansion of global LNG capacity in recent years, import demand is expected to remain below export capacity throughout the outlook period.

**Figure 7.1: LNG demand and world supply capacity**




Source: Nexant (2021) World Gas Model; Department of Industry, Science, Energy and Resources (2021)

## 7.3 World imports

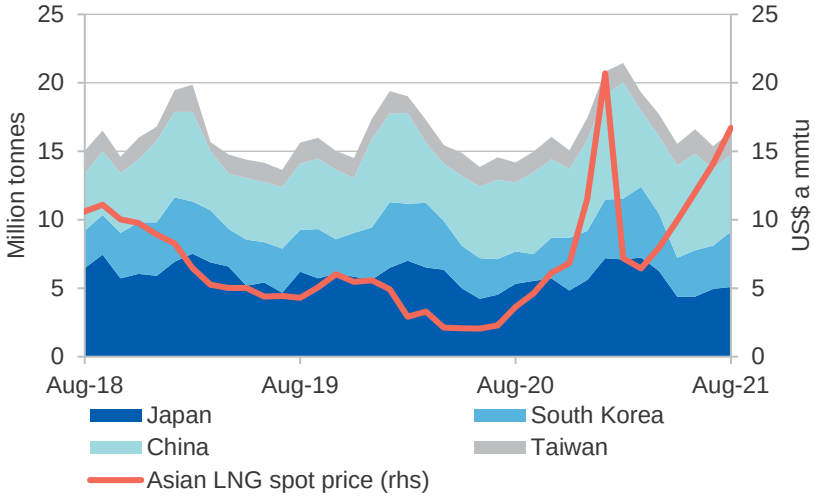
### Japanese LNG demand to slow in pursuit of net-zero

Japan imported 38.6 million tonnes of LNG in the first half of 2021 — marginally higher year-on-year — as the economy recovers from the COVID-19 pandemic. However, Japanese LNG demand generally remains on a downward trend, and Japan is predicted to lose its position as the top global LNG importer to China during 2021 (Figure 7.2).

Following the announcement of a net zero by 2050 target in October 2020, Japan released a draft 6th Strategic Energy Plan in July 2021, which details provisional power generation mix targets for 2030. The draft plan incorporates a large swing towards nuclear and renewables generation, with the share of gas proposed to decline from 37% to 20%. While increasing nuclear generation has been a centrepiece of Japanese energy policy for some time now, the rate of increase in nuclear power generation remains slow and uncertain. As at August 2021, only 10 of 33 operable nuclear reactors are online.

Japan's LNG imports are estimated to fall marginally to 73 million tonnes in 2021, from 74 million tonnes in 2020, as potentially higher nuclear generation offsets higher electricity demand from the economic recovery. LNG imports are expected to fall marginally in 2023, due to energy efficiency improvements and higher nuclear output.

**Figure 7.2: Asian LNG imports and spot price**




Source: Bloomberg (2021)

## China forecast to be the world's largest LNG importer in 2021

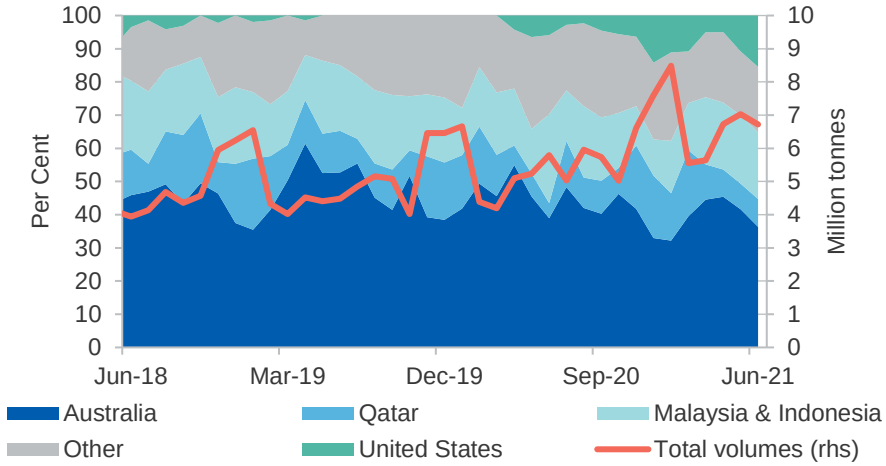
China's LNG imports increased by 17% in 2020 — reaching 69 million tonnes — which made it the world's second largest LNG importing country. In 2021, it is expected that China will import 74 million tonnes of LNG, to become the world's largest LNG importer.

Demand for gas is continuing to grow in China — increasing about 20% over the outlook period — driven by the industrial and residential sectors and ongoing gas-to-coal switching. China's 14th Five Year Plan indicates that gas will play an important role in the country's energy transition to meet its 'carbon-neutral by 2060' pledge.

Whilst the share of LNG in Chinese gas demand remained historically high in 2020 — at 28% — this share is expected to decline marginally as domestic supply and pipeline imports ramp up. Despite China facing geological challenges in tapping its extensive gas reserves, domestic gas output is expected to rise, as the Government targets higher domestic gas production. Pipeline gas imports are also expected to grow — the Power of Siberia pipeline opened in 2019, and is ramping up to its nameplate capacity of 38 billion cubic metres (equal to 28 million tonnes of LNG) from the 4 billion cubic metres imported in 2020.

Despite this, Chinese LNG imports are expected to remain a key driver of global LNG demand growth, rising by an average 5.4% per year over the next three years. China currently has a pipeline of 24 new or expansion projects under construction to increase regasification capacity. However, it is projected that terminal capacity will grow faster than demand during the outlook period. It is expected that China will increasingly turn to the spot market, as a considerable gap emerges between demand and contracted volumes. In 2020, Australia accounted for the largest share of China's LNG imports, at around 43% (Figure 7.3).

**Figure 7.3: China's gas supply by source**




Source: Bloomberg (2021); National Bureau of Statistics of China (2021) General Administration of Customs

In May 2021, there were media reports that at least two of China's second-tier LNG importers were instructed by the Chinese government to avoid purchasing additional Australian LNG cargoes. Second-tier Chinese LNG importers account for around 10% of Chinese imports, with large state-owned enterprises accounting for the rest. At the time of writing, these alleged directives have not materially affected Australia's LNG exports to China. With second-tier LNG importers less active on spot markets, the impacts from these directives are likely to be limited.

### South Korea's LNG demand to increase due to coal-to-gas switching

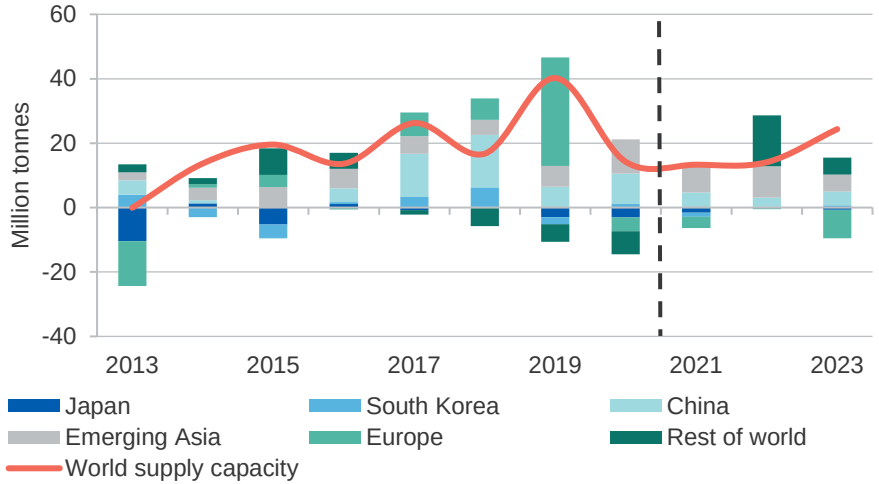
In 2020, South Korea's LNG imports were weighed down by the impacts of the COVID-19 pandemic on power demand, increasing nuclear generation, and high levels of gas inventories. Overall, imports fell 4.8% to 40 million tonnes in 2020. Demand is recovering in 2021, with strong 23.2 million tonnes of usage in the first half of 2021, driven by the on-going economic recovery and the continued trend of coal-to-gas switching. Growth in LNG imports is expected to be relatively moderate in 2022 and 2023, as new nuclear and coal capacity puts downward pressure on LNG usage in the power sector.

Following the announcement of a net zero by 2050 target in late 2020, Korea has released a number of detailed strategies — including the 14th Natural Gas Plan — which outline the country's move to net-zero through an increase in renewables and a move away from both nuclear and coal-powered generation. These policies are expected to directly support LNG imports through to 2034.

### Taiwan's LNG demand dependent on new import terminals

Taiwan's LNG demand was resilient in 2020. In the first half of 2021, imports have continued to grow, reaching 9.4 million tonnes, up 4% year-on-year. Gas-fired power generation is expected to continue to grow through the outlook period, as the government pursues a policy which would see all nuclear power phased out by 2025. Gas is expected to make up 50% of the electricity mix by 2025, up from 35% in 2020.

**Figure 7.4: World LNG import changes**




Notes: Emerging Asia includes India.
Source: Nexant (2021) World Gas Model; Department of Industry, Science, Energy and Resources (2021)

However, both of Taiwan's existing LNG import terminals are already operating at full capacity. The government has announced that there are three new import terminals in the pipeline. A referendum will be held in December 2021 allowing the public to vote on the proposed location of the first terminal, after concerns were raised by environmental groups.

Taiwanese LNG imports are forecast to be fairly stable at 18 million tonnes over the outlook period.

### Indian LNG demand remains volatile and price sensitive

India's LNG imports were volatile in 2020, with demand initially affected by the COVID-19 pandemic and associated restrictions, before imports rose due to opportunistic buying of cheap LNG. Overall, India's LNG imports in 2020 rose by 16.7% to 27 million tonnes. To date, this volatility has persisted in 2021. India's LNG imports were 3% lower year-on-year in the first half of 2021, as spot prices reached record highs and the country experienced a second wave of COVID-19. The latter half of 2021 is likely to see some growth in imports as economic activity rebounds, however

given the price-sensitivity of Indian importers, the higher spot prices forecast over the rest of 2021 pose a downside risk.

Looking forward, India's LNG demand growth depends on a number of factors. In the near term, domestic gas output is surging, with output expected to be 17% higher in 2021, compared to 2020, and further volumes being added over 2022 and 2023. In addition, a range of infrastructure — including import terminals and pipeline connections to transmission systems — is expected to come online over the outlook period, boosting the prospects for LNG demand.

### European imports down as cargoes diverted to Asia

Europe has often played a key role in balancing the global LNG market, absorbing excess supply through to its extensive storage capacities. However, from late 2020 and into the first half of 2021, the region has absorbed fewer cargoes. European LNG imports over the heating season (October 2020 to March 2021) were 40% lower compared to the previous heating season. Increased demand from Asia has seen European deliveries diverted, with the spread between Asian LNG and European prices significant enough to drive flows to the region. As a result, European storage volumes are currently 23% below the 5-year average, which should create space for added deliveries in the second half of 2021.

Looking forward, European LNG import demand is forecast to fall, reflecting the ramp up of two new gas pipelines and softening gas demand generally (Figure 7.4). The Trans Adriatic Pipeline began commercial operations in November 2020, and has an annual nameplate capacity of 10 billion cubic metres (about 7.4 million tonnes of LNG). In the first half of 2021, 3 billion cubic metres were delivered through the pipeline, and it is expected to deliver more than 5 billion cubic metres in 2021.

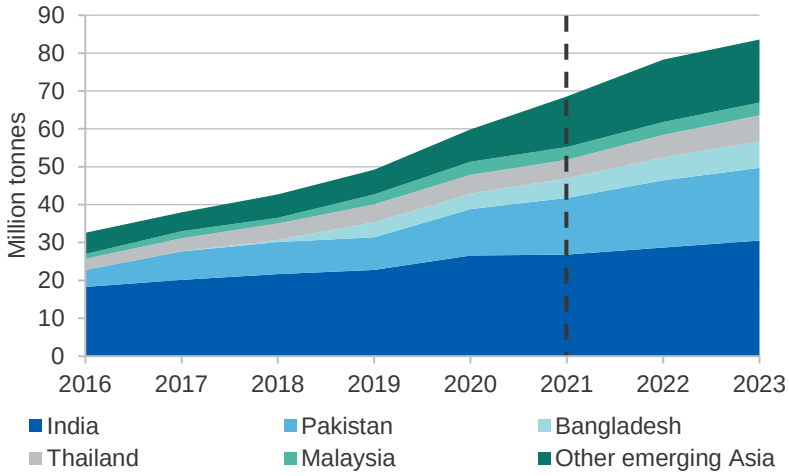
The other European gas pipeline, Nord Stream 2, has faced delays due to geopolitical tensions. The first line has been laid and US President Biden announced in May 2021 that the US government was waiving sanctions on the companies involved with Nord Stream 2. But gas is not expected to flow until the December quarter at the earliest. The pipeline will transport up to 55 billion cubic metres of pipeline gas each year from Russia to Germany (equivalent to 40 million tonnes of LNG). As a result of assumed higher pipeline gas imports, European LNG imports are forecast to fall from 82 million tonnes in 2020 to 69 million tonnes in 2023.

### Emerging Asia to significantly increase LNG imports

Other South and South-East Asian economies were a major source of demand growth in late 2020 and early 2021. In the first half of 2021, Pakistan's LNG imports rose by 7.3% year-on-year, and Bangladesh's by 10%. In the short term, re-gasification capacity is hindering further growth, however both nations have plans in train to add further capacity.

Over the outlook period, imports from emerging Asian economies are expected to increase, due to declining domestic gas production, the expansion of gas-fired power generation and new LNG infrastructure developments. Individually, these countries are relatively small importers of LNG, although collectively they are expected to account for a growing share of global LNG demand going forward. The region (including India) is forecast to import 84 million tonnes of LNG by 2023, 44% higher than 2020 volumes (Figure 7.5).

**Figure 7.5: LNG imports from emerging Asian countries**




Source: Nexant (2021) World Gas Model; Department of Industry, Science, Energy and Resources (2021)

## 7.4 World exports

### Lingering 2020 impacts to affect LNG export capacity

In 2020, weak spot LNG and oil prices, along with general uncertainty from the COVID-19 pandemic, caused multiple final investment decision (FID) deferrals, and only one liquefaction project was approved — Sempra Energy's 2.5 million tonnes per annum (mtpa) Costa Azul project in Mexico. At the end of 2020, global LNG capacity was about 450 mtpa, with another 125 mtpa of capacity being built or sanctioned for development.

So far, 2021 has seen a modest, post COVID-19 investment rebound. An FID was made on Qatar Petroleum's North Field East project, worth US$29 billion — potentially the world's largest LNG project by capacity at 33 mtpa. Santos also announced a FID on the US$3.6 billion Barossa gas project. Numerous other projects are scheduled for FID in the second half of 2021, such as Australia's Scarborough project.

Capacity growth in 2021 has been largely driven by the US and some smaller scale projects in Africa. LNG capacity is expected to rise later in the decade. This growing capacity among low-cost producers is likely to affect future investment decisions by other producers, which could impact the timing of the next wave of LNG capacity additions.

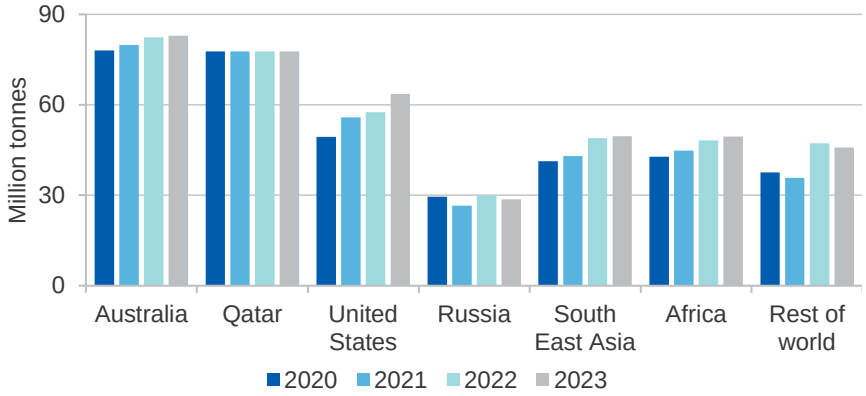
### US exports to rise in the short-term

Despite record lows in the US summer of 2020, US LNG exports recovered strongly in the latter half of 2020, to reach record-highs in March 2021. Since then, export volumes have moderated, but still remain historically high. Exports in June were slightly lower than average, due to routine maintenance on some domestic pipelines that deliver gas to liquefaction facilities. However, at 15.4 million tonnes, June quarter 2021 exports were 2nd highest on record after the March quarter 2021.

Driving the higher than average US LNG exports has been higher prices in both Asian and European markets, due to a cold northern hemisphere winter and a hotter than average Asian summer, leading to demand for US cargoes (as supply outages played out in other major exporters). US LNG capacity rose in 2020, with the completion of some new facilities.

The September quarter is expected to be relatively strong, though a slight dip is expected due to routine maintenance at several plants. Overall, it is expected that US LNG exports will consistently outpace pipeline exports in 2022. With capacity growth stalling in 2022, US exports are forecast to rise only marginally, before quickening in 2023 as new capacity comes online.

**Figure 7.6: Outlook for global LNG exports**




Source: Nexant (2021) World Gas Model; Department of Industry, Science, Energy and Resources (2021)

### Qatar's exports to remain relatively steady over the short-term

Qatar's LNG exports were largely resilient in 2020. Shipping data indicates that Qatar was likely the world's largest LNG exporter in 2020, slightly surpassing Australia. However, given the marginal difference between the two country's exports and uncertainty surrounding the precise level of Qatar's LNG exports, an accurate assessment is difficult. Australia is expected to export higher amounts over the outlook period.

Qatar's LNG exports are forecast to be relatively steady in 2021 and 2022, at about 79 million tonnes, with high levels of capacity utilisation (Figure 7.6). Beyond the outlook period, Qatar's LNG exports are expected to rise noticeably, as a result of the $US29 billion North Field East project — scheduled for completion in late 2025. This project could lift Qatar's export capacity to about 110 million tonnes.

## 7.5 Prices

### LNG spot prices expected to be high through December quarter

Asian LNG spot prices varied significantly over the first half of 2021. After reaching a record high of US$39.72 a mmBtu on 13 January 2021 (due to a bitterly cold Northern Hemisphere winter), prices stabilised between US$5-9 a mmBtu by the end of April. In the months following, the price has steadily climbed, averaging US$9.95 a mmBtu in May, US$12 a mmBtu in June, US$14.1 a mmBtu in July and US$16.7 a mmBtu in August. The price increase has been driven by the need for cooling demand from a hotter-than-expected Asian summer, with purchasers turning to the spot market to complement contracted cargoes. In addition, Asian buyers were competing with European buyers for LNG cargoes, as they sought to raise gas storage levels following an unusually cold winter. The combination of a cold northern hemisphere winter and a hot Asian summer has contributed to expectations of future market tightness.

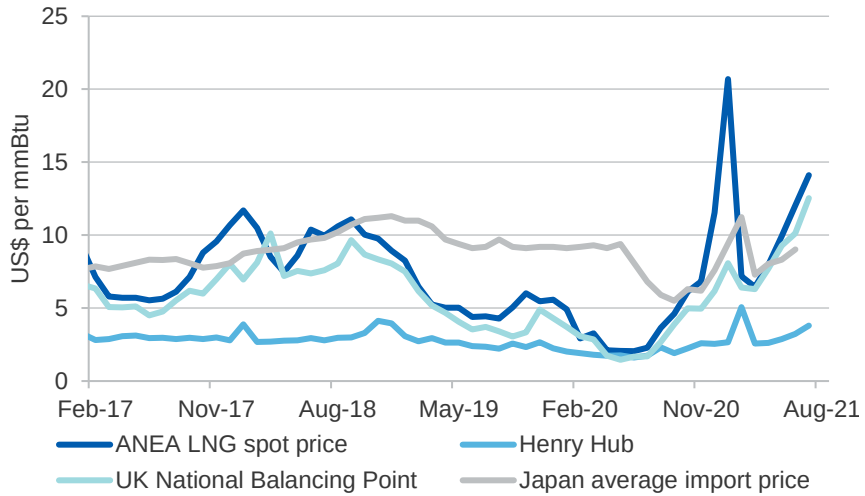
Prices are being driven by high temperatures in Asia during the summer, preventing storage being refilled after an extended cold winter, and US cargoes heading to South America and away from Europe.

Benchmark LNG spot prices continued to diverge in the September quarter. The difference between Asian spot prices and Henry Hub prices continues to grow, although it is unlikely to reach the levels seen in January 2021 (Figure 7.7). Henry Hub prices are rising steadily, having increased 57% between March and August 2021. However, the increases have not been at the same rate as Asian spot prices. The gain in US prices is being driven by the increase in exports as production remains relatively steady. TTF prices have continued to rise in line with Asian spot prices, and are exerting upward pressure on them.

North-East Asian spot prices are expected to average US$16 a mmBtu in the September quarter 2021. Prices are expected to hold at a relatively high level going in to the northern hemisphere winter. As such, the December quarter is expected to average US$19.1 a mmBtu. The December quarter average in 2022 is expected to be lower, due to a forecast mild winter and significantly fewer supply constraints.

Prices are expected to average US$13.7 a mmBtu in 2022, and US$11.4 a mmBtu in 2023. Similar to recent years, prices are expected to pick up over the December quarters, reflecting higher demand in the northern hemisphere winter (Figure 7.8). However, any price increases are likely to be moderated by growing export capacity, which will keep the LNG market well supplied.

**Figure 7.7: Global gas and LNG prices, monthly**




Notes: ANEA is the Argus Northeast Asia spot price. LNG prices are DES (Delivered Ex Ship), which include shipping and insurance.

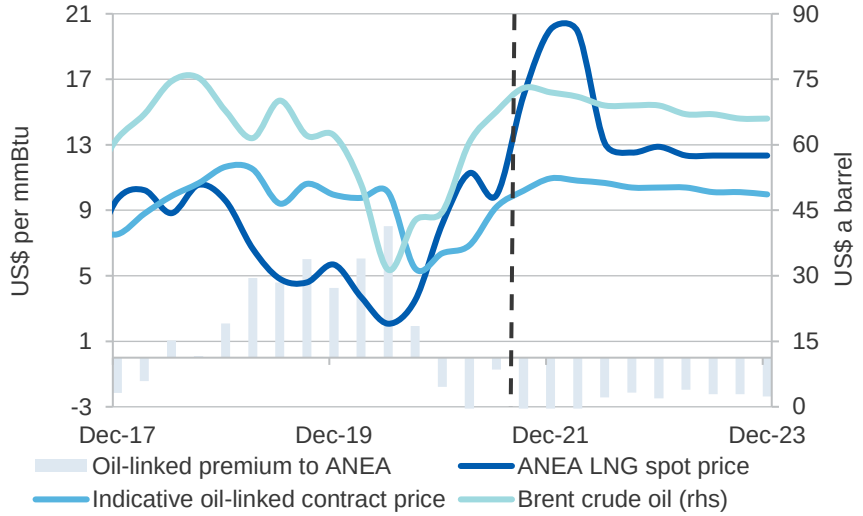
Source: Argus (2021); Bloomberg (2021)

### Oil prices forecast to remain above US$65 a barrel

Almost 70% of the LNG traded in Asia is sold via long-term contracts, which link the price of LNG to the price of oil (commonly the Japanese customs-cleared crude price) — typically lagged by around three to six months, depending on contractual arrangements.

Oil prices averaged around US$69 a barrel in the June quarter 2021, driven by supply restraint across major producers and a strong rebound in consumption. Due to the contract lag of several months, these oil prices were reflected in LNG contract prices in the September quarter 2021.

**Figure 7.8: ANEA LNG spot and contract prices, quarterly**




Notes: ANEA is the Argus Northeast Asia spot price. LNG prices are DES (Delivered Ex Ship), which include shipping and insurance. The long-term oil-linked contract price is indicative, and is estimated at 14% of the 3-month lagged JCC oil price plus shipping. The oil-linked premium to ANEA represents the differential between these two prices.

Source: Argus (2021); Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

Contract prices are likely to have increased further in the September quarter 2021, reflecting ongoing oil price gains. Early in the September quarter, oil prices were sitting well above US$70 a barrel, but have started to moderate. Oil prices in the September quarter 2021 are expected to average around US$73 a barrel, as production starts to respond to higher price signals (see Oil chapter).

Over the outlook period, oil-linked contract LNG prices are expected to fall slightly, as oil prices settle back: oil producers are responding to higher prices and OPEC+ is raising production targets as world demand gradually recovers from the impact of the COVID-19 pandemic. Oil prices are forecast to settle around US$65 a barrel over the outlook period.

## 7.6 Australia

### Australia's LNG export volumes broadly stable

Australia's LNG export volumes have been relatively stable despite the COVID-19 pandemic. Over the previous 2 years, export volumes have ranged between 18 and 21 million tonnes each quarter, with fluctuations largely explained by technical issues and routine maintenance. In the June quarter 2021, Australia's LNG exports totalled 18.8 million tonnes, 5.8% lower quarter-on-quarter and 1.1% lower year-on-year. This was largely driven by production issues at Gorgon.

Production at Gorgon has increased following the completion of repair works at the end of July. Production has been limited since May 2020, when technical issues were detected in the heat exchanger of Train 2. After repairs were completed, Train 1 was taken offline for inspection, and similar issues to Train 2 were found in January 2021. Production in August was at 108% of nameplate capacity, and was at the highest level since May 2019.

Prelude FLNG has also gone through significant production disruptions, and was offline between February 2020 and January 2021. Production has increased in subsequent months, with Prelude shipping its nameplate capacity in June. In the first half of 2021, Prelude FLNG has shipped about 1Mt, which is slightly above 50% of nameplate capacity for the period.

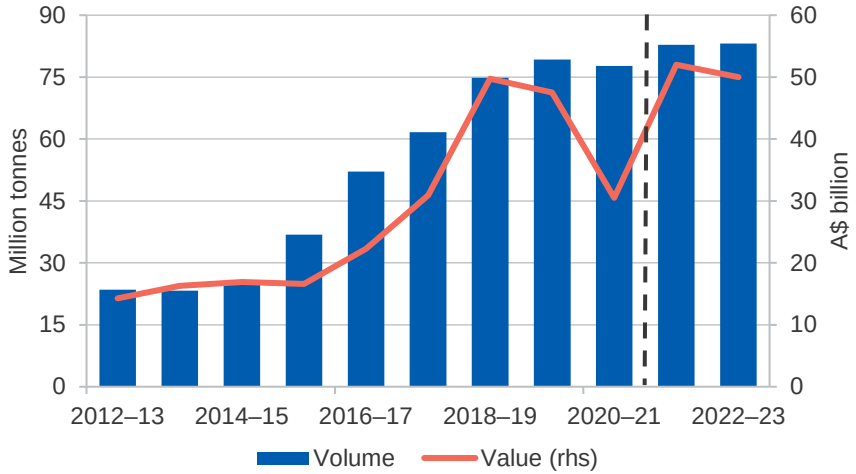
In 2020–21, Australian LNG export volumes fell marginally to 77.7 million tonnes, reflecting the technical issues at the Gorgon and Prelude LNG plants.

### Australia's export earnings recovering

In the June quarter 2021, Australia's LNG export earnings increased to $8.8 billion, up 5% quarter-on-quarter. Despite a good quarter-on-quarter gain, export earnings remained 36% lower year-on-year, as relatively low oil-linked contract prices affected export earnings. Around three-quarters of Australian LNG is sold via long-term contracts that link the price of LNG to the price of oil with a lag of around three to six months, depending on contractual arrangements. The low oil prices throughout 2020 have had a

significant impact on earnings in the first half of 2021. Australian export earnings are expected to have returned to average levels in the September quarter 2021, as LNG contract prices reflected the March and June quarter 2021 recovery in oil prices to over US$70 a barrel. For 2020–21, Australian LNG exports were valued at $30 billion, down 36% from 2019–20 (Figure 7.9).

**Figure 7.9: Australia's LNG exports**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

### LNG export volumes expected to return to above pre-COVID-19 levels

In January 2021, Santos announced an FID for an infill drilling program in the Bayu-Undan field. Production commenced in late July 2021, with initial outcomes better than expected. This program will extend output at the Darwin LNG facility, which was previously expected to halt production in 2022. This investment decision is expected to narrow the time between its depletion and the start-up of the Barossa backfill project. Santos announced a FID for Barossa on 30 March 2021, and is expecting initial gas production in the first half of 2025. Barossa is expected to extend the facility life of Darwin LNG by around 20 years.

Capacity utilisation at the North West Shelf (NWS) is expected to decline in 2022, as gas from existing fields is depleted. NWS has secured short-term infill from Pluto (for the period 2022-2025) and Waitsia (for the period 2023-2028), which both have shorter lead times. However, large scale backfill projects are required for the longer term. Given the complex commercial arrangements associated with the NWS and high capital costs, there is potential for further backfill project delays. Browse is earmarked as backfill to the NWS, but this project has faced FID deferrals until at least 2023, due to weak market conditions.

LNG exports are forecast to rebound to around 82 million tonnes in 2021–22. The rebound reflects an assumed resolution of technical issues at various facilities, and Prelude FLNG ramping up towards its nameplate capacity. In 2022–23, Australian exports are expected to remain around 83 million tonnes.

### Higher prices expected to lift Australia's LNG export earnings

Australia's LNG export earnings fell sharply in 2020–21, down to $30 billion from $48 billion in 2019–20 (Figure 7.9).

The majority of this decline was due to weak contract prices, particularly in the September and December quarters in 2020. Export earnings are forecast to increase to $56 billion in 2021–22, with oil-linked contract prices expected to be higher than pre-COVID-19 levels and supported by high Asian LNG spot prices. Export values in 2022–23 are forecast to be $50 billion, as export prices fall in line with oil prices.

### Uncertainty surrounds the next wave of investment

The outlook for the next wave of investment in Australian LNG projects faces considerable uncertainty, with weak market conditions resulting in FID deferrals (see the *Resources and Energy Major Projects 2020* publication). Most LNG projects in the investment pipeline are backfill projects, required to support the ongoing operation of existing LNG facilities. The proposed Scarborough to Pluto LNG expansion — where a second gas processing train would be constructed, adding capacity of 5mtpa — is the only substantial expansion to Australia's LNG capacity in

the investment pipeline. Woodside is expected to announce a FID on the Scarborough to Pluto project in the second half of 2021. The recently announced merger between Woodside and BHOP's petroleum business is expected to benefit the Scarborough project, as BHP held a 26.5% share in the joint-venture.

In the next few years, it is likely that at least one import terminal will be constructed and commence importing LNG. Five potential projects have been proposed, all concentrated in south eastern Australia. Construction has started on the $250 million import terminal located in Port Kembla, with the project expected to be ready to receive imports from early 2023. There are four other projects proposed, all located around south eastern Australia, however it is likely only one other will proceed.

### Revisions to the outlook

Australia's LNG export earnings have been revised up by $6.7 billion in 2021–22, and by $4.5 billion in 2022-23, reflecting higher assumed LNG spot prices and oil-linked contract prices.

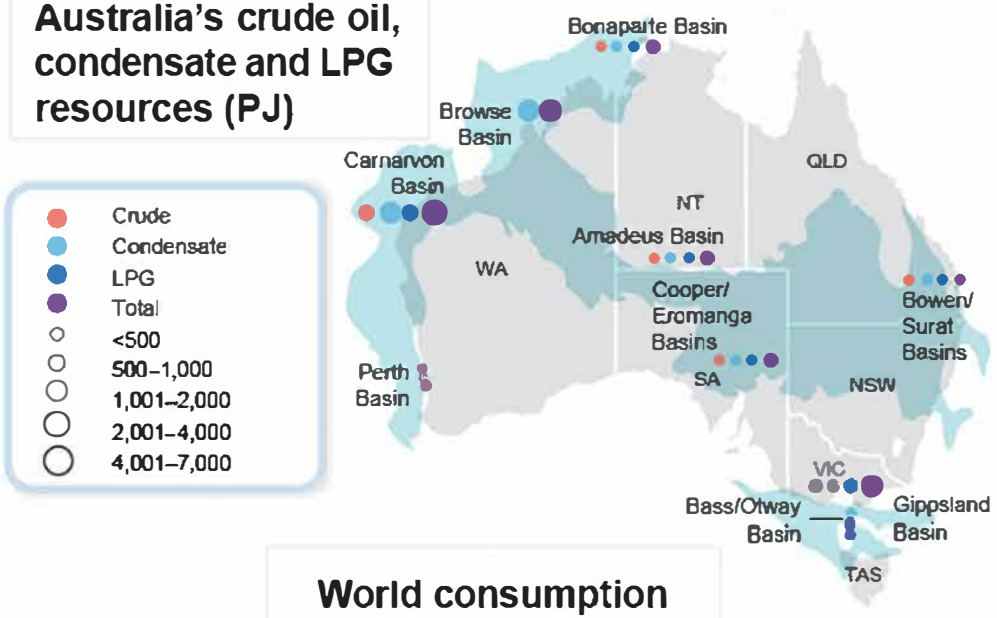
## Table 7.1: Gas outlook

| World | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| JCC oil price[a] | | | | | | | | |
| – nominal | US$/bbl | 45.3 | 66.9 | 67.4 | 66.4 | 47.5 | 0.7 | -1.5 |
| – real[h] | US$/bbl | 46.9 | 66.9 | 65.8 | 63.2 | 42.6 | -1.6 | -3.9 |
| Asian LNG spot price[g] | | | | | | | | |
| – nominal | US$/MMbtu | 4.4 | 14.3 | 13.7 | 11.4 | 228.1 | -4.2 | -17.0 |
| – real[h] | US$/MMbtu | 4.5 | 14.3 | 13.4 | 10.8 | 217.3 | -6.5 | -19.0 |
| Gas production[s] | Bcm | 3,975 | 4,085 | 4,199 | 4,262 | 2.8 | 2.8 | 1.5 |
| Gas consumption[s] | Bcm | 3,969 | 4,122 | 4,199 | 4,262 | 3.9 | 1.9 | 1.5 |
| LNG trade[ds] | Mt | 356.3 | 363.6 | 392.1 | 397.8 | 2.0 | 7.8 | 1.5 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Production[b] | Bcm | 157.6 | 151.8 | 159.1 | 160.4 | -3.7 | 4.8 | 0.8 |
| – Eastern market | Bcm | 57.5 | 57.0 | 54.2 | 54.7 | -0.8 | -4.8 | 0.8 |
| – Western market | Bcm | 85.7 | 80.9 | 89.8 | 90.7 | -5.7 | 11.0 | 1.0 |
| – Northern market[c] | Bcm | 14.4 | 13.9 | 15.1 | 15.1 | -3.5 | 8.6 | 0.0 |
| LNG export volume[d] | Mt | 79.2 | 77.7 | 81.9 | 82.6 | -2.0 | 5.4 | 0.9 |
| – nominal value | A$m | 47,525 | 30,473 | 55,730 | 50,204 | -35.9 | 82.9 | -9.9 |
| – real value[e] | A$m | 49,208 | 31,049 | 55,730 | 49,347 | -36.9 | 79.5 | -11.5 |
| LNG export unit value[g] | | | | | | | | |
| – nominal value | A$/GJ | 11.4 | 7.4 | 12.9 | 11.5 | -34.6 | 73.5 | -10.7 |
| – real value[e] | A$/GJ | 11.8 | 7.6 | 12.9 | 11.3 | -35.6 | 70.3 | -12.3 |
| – nominal value | US$/MMBtu | 8.1 | 5.9 | 10.0 | 9.2 | -27.2 | 71.2 | -8.6 |
| – real value[h] | US$/MMBtu | 8.3 | 6.0 | 10.0 | 9.0 | -28.3 | 68.0 | -10.2 |

Notes: **a** JCC stands for Japan Customs-cleared Crude; **b** Production includes both sales gas and gas used in the production process (i.e. plant use) and ethane. Historical gas production data was revised in the June quarter 2017 to align with Australian Petroleum Statistics; **c** Gas production from Bayu-Undan Joint Production Development Area is not included in Australian production. Browse basin production associated with the Ichthys project is classified as Northern market; **d** 1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres of gas; **e** In 2020–21 Australian dollars; **f** Forecast; **g** 1 MMBtu is equivalent to 1.055 GJ; **h** In 2021 US dollars**; s** Estimate.
Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021); Company reports; Nexant (2021) World Gas Model

# Oil

## Australia's crude oil, condensate and LPG resources (PJ)



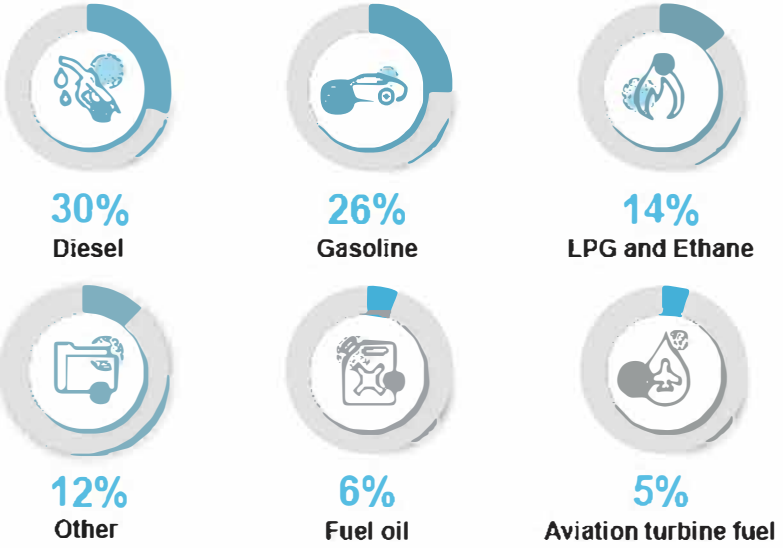

## Oil facts

Carnavon basin produces around **3/4 of Australia's crude & condensate**

Over the last 5 years the Brent spot price ranged from US$17-$86 a barrel

In 2020, around 29% of refinery feedstock was domestically produced.

## World consumption




## Australia's oil

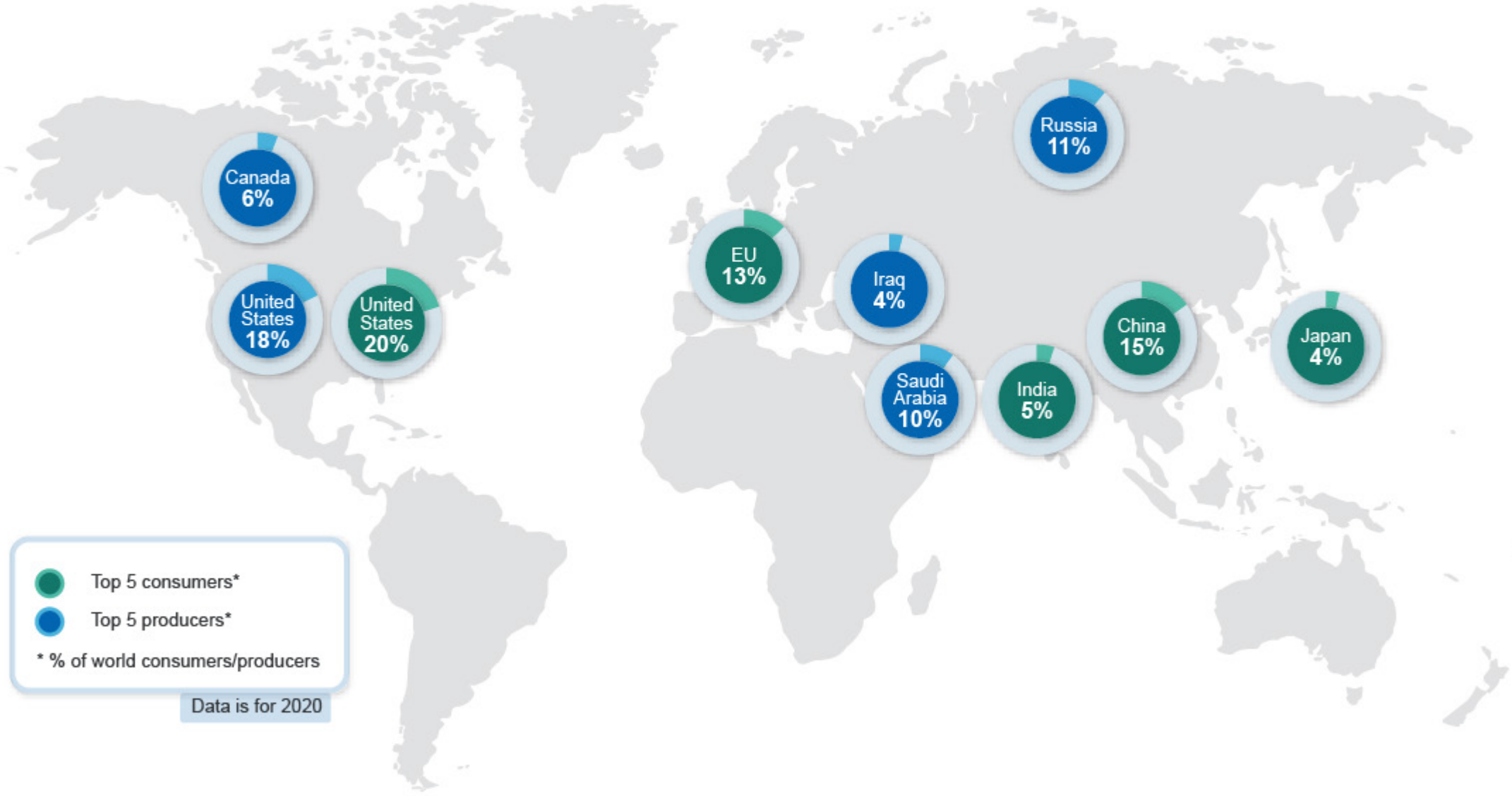
Holds **0.3%** of the world's **oil resources**

In 2020-21 **oil exports** were worth **$7.4bn**

Accounts for **0.3%** of **oil production**

# Oil

## Trade map | September 2021



## 8.1 Summary

- Oil prices are forecast to remain at around US$70 a barrel for the remainder of 2021, as global consumption continues to recover and outpaces global production. Brent crude prices are forecast to stabilise at around $US67 a barrel throughout 2022 and 2023, up from US$42 a barrel in 2020.
- Australian crude oil and feedstock exports declined to 276,000 barrels a day in 2020-21. Exports are forecast to increase to 295,000 barrels a day in 2021-22 before returning to 282,000 barrels a day in 2022-23.
- Australian oil export earnings declined to $7.4 billion in 2020-21, reflecting low prices early in the year. Higher prices are expected to lift earnings to $11.2 billion in 2021–22. Earnings for 2022-23 are forecast to be $9.9 billion.

## 8.2 World consumption

### Consumption continues to recover in 2021

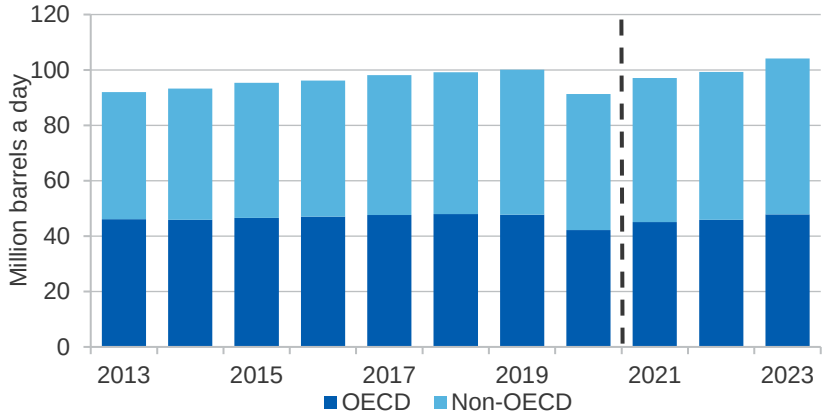
Global oil consumption has been significantly impacted by the COVID-19 pandemic, and impacts are likely to be ongoing over the outlook period. Global oil consumption in the June quarter 2021 surged by 1.6% compared to the March quarter 2021, and by 14% compared to the June quarter 2020. The rise reflects a gradual recovery in world economic activity. However, consumption growth has varied considerably across months and regions, affected by regional differences in vaccination rates and containment measures, and by the recent spread of the COVID-19 Delta variant.

Consumption has been boosted by the significant increase in mobility in both the US and Europe over the recent Northern Hemisphere summer holiday season. Relaxed social distancing measures and mass vaccination campaigns in both regions have resulted in growing demand for transport fuels. At the beginning of September, flight departures in the Eurocontrol area were roughly 71% of September 2019 levels and road traffic in the US measured 68% of pre-virus levels.

Outbreaks of the highly transmissible Delta variant of the COVID-19 virus continue to impact global consumption, and bring uncertainty for consumption forecasts for the remainder of 2021 and into 2022. While vaccination rates in China — the world's second largest consumer of oil — are progressing well, the nation is maintaining a COVID-zero strategy. This includes implementing harsh movement restrictions in an effort to eliminate outbreaks of the virus. A surge in Delta variant cases triggered localised lockdowns and a sharp reduction in air travel and traffic congestion at the end of July and the beginning of August. Recent outbreaks elsewhere in Asia — particularly where vaccination rates remain low — will be a downside risk to global consumption for the remainder of 2021.

Industrial oil consumption for the June quarter 2021 stabilised at close to pre-COVID-19 levels; industrial usage had a more muted decline than other elements of oil consumption, and has picked up on the rebound in industrial production, especially in China. As such, growth in consumption demand in the short-run is likely to be more muted. However, it is expected that ethane, LPG and naphtha together will account for a majority of the increase in oil product demand to 2023.

**Figure 8.1: Oil consumption, OECD and non-OECD**



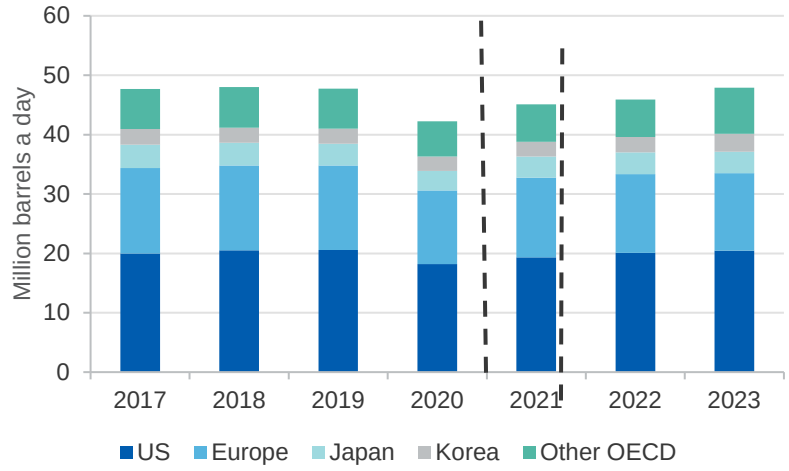

Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021)

Consumption is forecast to increase by 2.3% to 99 million barrels a day in 2022, and then rise above pre-pandemic levels to 104 million barrels a day in 2023 (Figure 8.1). However, it is expected that global aviation fuel consumption — which was hit hardest by COVID-19 — will not return to pre-pandemic levels until later in the outlook period. Behavioural shifts towards working from home, conducting online business meetings and avoiding public transport also provide uncertainty to consumption forecasts.

### OECD driving overall recovery in consumption

OECD oil consumption increased in the June quarter 2021, following weak outcomes earlier in the year. Consumption has surged in the US and Europe, where COVID-19 containment measures have gradually eased and resulted in increased mobility over the summer holiday season. Consumption fell in OECD Asia Pacific, where the COVID-19 Delta variant forced Australia, Japan and Korea to re-impose containment measures.

**Figure 8.2: OECD total consumption, by major nations**




Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021)

The continued roll-out of vaccination campaigns across much of the OECD should support positive growth in oil consumption. Consumption is forecast to average 45 million barrels a day in 2021 and grow by a further 1.8% in 2022. OECD consumption is forecast to increase to 47 million barrels a day by 2023 (Figure 8.2). However, OECD consumption may never surpass 2019 levels, driven by improved fuel efficiency in passenger cars and increasing penetration of electric vehicles (EVs).

### Non-OECD consumption being driven by Chinese demand

Non-OECD consumption increased marginally in the June quarter 2021. Consumption is estimated to have increased a further 1.2% in the September quarter 2021, to 52 million barrels a day. By the December quarter, consumption is forecast to surpass pre-pandemic levels, averaging 53 million barrels a day.

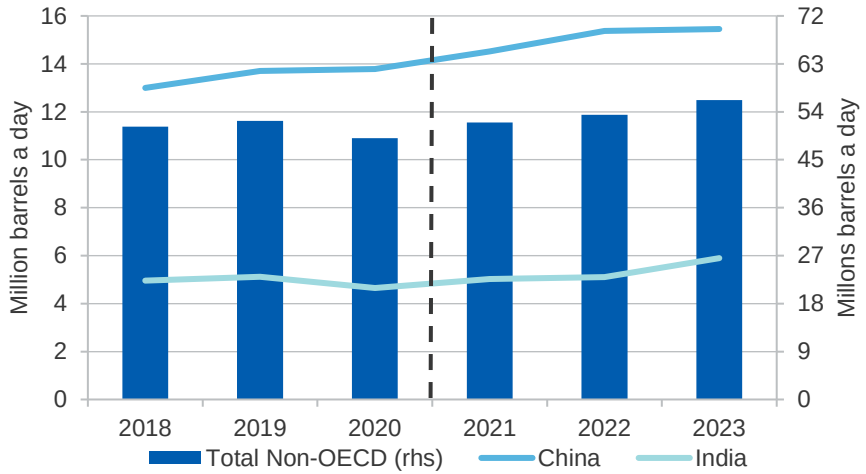
Chinese oil consumption increased steadily over the first half of 2021, with strong growth in gasoline and jet fuel usage, due to a booming aviation sector. However, Chinese demand growth is estimated to have slowed sharply since then, as an outbreak of the Delta variant triggered partial lockdowns and travel restrictions in July and early August. By the end of August, traffic in China's larger cities appeared to be recovering, due to reports the nation had quashed the resurgence in COVID-19 cases.

India is recovering strongly from its COVID-19 outbreak, which peaked in May 2021. Indian mobility is now at March 2021 levels, with demand for transportation fuels, including jet fuel, continuing to increase.

South East Asian nations, including Indonesia, Malaysia, Thailand, Vietnam, and Myanmar are facing a new wave of COVID-19 infections, caused by the Delta variant. The slower pace of the vaccinations in these nations — which collectively make up about 10% of global oil demand — will reduce the speed of economic re-opening and a rebound in mobility.

Non-OECD consumption in 2022 is forecast to rise by 2.7% to 53 million barrels a day, largely driven by higher demand in China and India. In 2023, consumption is forecast to reach 56 million barrels a day (Figure 8.3).

**Figure 8.3: Non-OECD consumption**




Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021)

## 8.3 World production

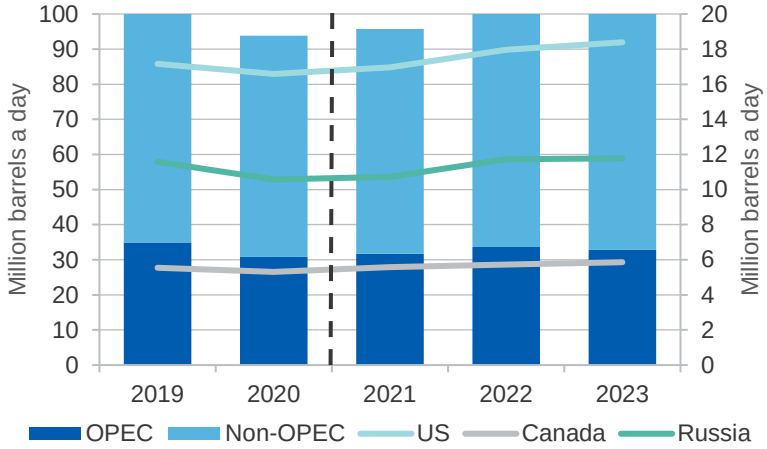
### Production continuing to recover

Global oil production is forecast to grow in 2021, as OPEC+ increases production targets — restoring significant volumes of oil to the global market. Output is forecast to rise 2.8% to average 96 million barrels a day. In 2022, global oil production is forecast to increase to 100 million barrels a day, reflecting OPEC+'s increased production quotas, which are due to remain in place until September 2022 (Figure 8.4).

### OPEC+ supply progressively being increased

In response to plummeting prices in April 2020, OPEC+ reached an agreement to reduce production by 9.7 million barrels a day. Throughout 2020 and early 2021, OPEC+ compliance with output cuts was high, with the countries that exceeded monthly quotas compensating with lower production in later months. OPEC+ also announced they would hold monthly meetings, where they could decide to adjust production for the following month by up to 0.5 million barrels a day.

**Figure 8.4: Oil production**




Notes: This assumes OPEC+ members fully comply with increased production quotas from August 2021.
Source: Department of Industry, Science, Energy and Resources (2021); International Energy Agency (2021)

Between May 2020 and July 2021, OPEC+ reduced their production cuts from 9.7 million barrels a day to 5.8 million barrels a day. On 5 July 2021, OPEC+ concluded its monthly ministerial meeting without reaching an agreement on an expansion of future production. On 18 July, OPEC+ members announced they had reached an agreement for a significant winding back of the 2020 production cuts over the remainder of 2021 and into 2022. Starting from August 2021, OPEC+ is planning on increasing production every month by an additional 0.4 million barrels a day. OPEC+ is intending to end production adjustments in September 2022, however, they will reassess market conditions in their monthly meetings. The group will meet next on 4 October 2021. While compliance within the group is currently high, compliance with the OPEC+ agreement remains a key risk to excess global output.

The potential re-entry of Iran into the global oil market would have a significant impact on world production. However, talks between the US and Iran to revive the Joint Comprehensive Agreement Plan of Action and

lift current sanctions have stalled. At the time the deal was made in 2015, Iran's crude output rose by 1 million barrels a day over a 9 month period.

The outlook for future Libyan output also remains uncertain. For much of 2020, Libyan output was affected by blockades on oilfields and export facilities — imposed in January 2020 and in place until September 2020. After this blockade passed, Libyan output rose noticeably, from 0.1 million barrels a day in September 2020 to 1.3 million barrels a day in March 2021. However, the outlook for future Libyan production will depend on the UN-mediated truce remaining in effect. A new government was sworn in on 15 March 2021, with elections slated for December 2021, the results of which will likely influence oil output. Libyan production is forecast to average 1.2 million barrels a day in 2021.

### Non-OPEC+ production growing modestly

Production in non-OPEC+ nations is also growing, albeit modestly. The recovery in non-OPEC+ output dragged in the first half of 2021, due to heavy maintenance programmes — as operators caught up on works delayed from 2020. Non-OPEC+ production is expected to increase by 0.95 million barrels a day in 2021.

While normally highly responsive to changes in prices, US producers have remained disciplined this year and have not come back online as rapidly as expected. Severe winter temperatures caused major disruptions to drilling operations in Texas in February. In late August, more than 90% of crude oil production in the Federal Offshore Gulf of Mexico was offline following Hurricane Ida. Pending a smooth recovery to operations, US producers are expected to accelerate drilling activity as global prices remain high. In 2022, US production is forecast to increase by 5.9% to average 18 million barrels a day.

The main drivers of non-OPEC+ supply growth in 2021 are anticipated to be Canada, Russia, China, Norway and Brazil. In 2022, non-OPEC+ production is expected to recover to pre-COVID-19 levels, averaging 67 million barrels a day, before rising to 69 million barrels a day in 2023.

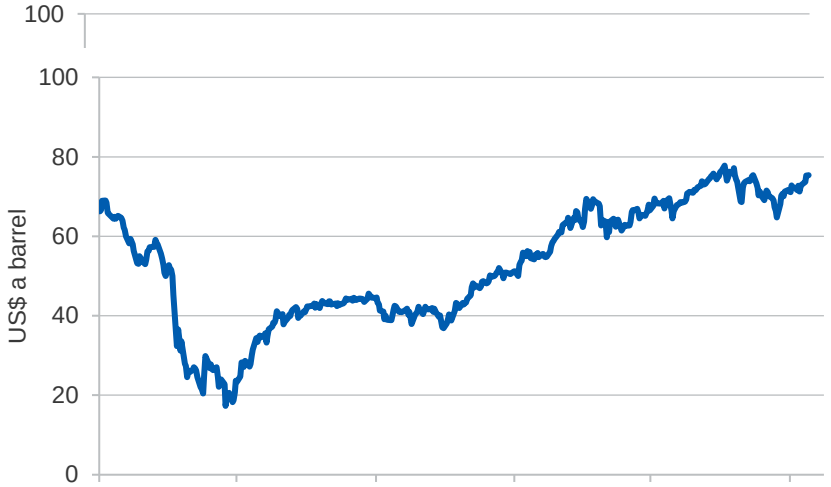
## 8.4 Prices

### Brent prices have recovered to around US$73 a barrel in September

Brent oil prices have continued to recover in the last quarter, following the dramatic falls in the first half of 2020. An uptick in global demand, due to a gradual easing of COVID-19 containment measures, has supported price recovery. High compliance among OPEC+ member countries and a limited recovery in production throughout other major producers (such as the US), has facilitated stock draw-downs, benefiting prices this year.

Following a fall in prices to around US$62 a barrel in early April — as some countries (including India) reimposed restrictions — prices continued to rise through to early July. Prices averaged $US73 a barrel in June and $US74 a barrel in July 2021. OPEC+'s initial failure to reach agreement on rolling back production cuts, and a surge in the Delta variant COVID-19 cases across the globe, led to fluctuations in prices throughout late July and early August. Prices have since stabilised, averaging US$70 a barrel in August, which is 58% higher than the August 2020 average. Prices are estimated to average $US73 a barrel for September (Figure 8.5).

**Figure 8.5: Brent oil prices in 2020 and 2021**




Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

### Prices expected to remain around $US70 a barrel over the outlook period

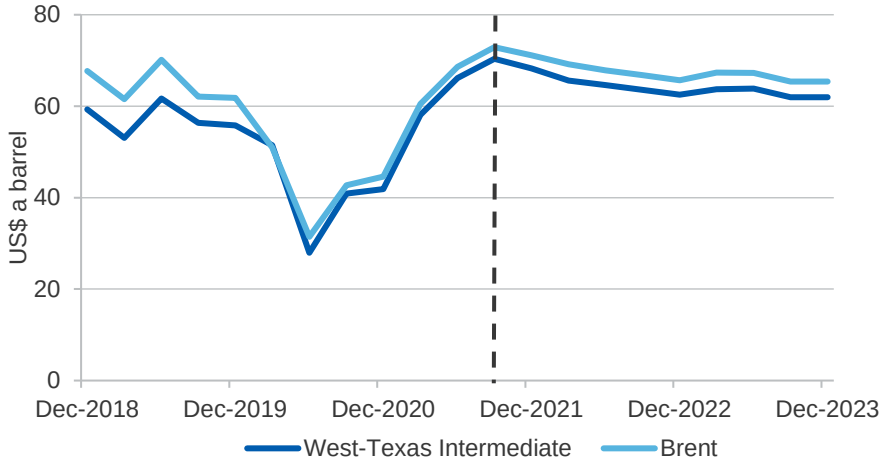
Oil prices are estimated to increase to US$73 a barrel in the September quarter 2021, before decreasing marginally to US$71 a barrel in the December quarter. Rising global demand, due to relaxed mobility restrictions in major nations, will support prices. In 2022 and 2023, prices are forecast to slowly decrease before stabilising at about US$67 a barrel, as countries such as the US look to recover production rates and the COVID-19 recovery consolidates (Figure 8.6).

Despite these relatively flat price forecasts, there is potential for volatility over the coming months, largely due to demand-side uncertainty. The rollout of COVID-19 vaccines in advanced nations is gathering pace, leading to an easing of containment measures, and increased mobility, which will benefit consumption. However, a surge in cases of the Delta variant of COVID-19, particularly in countries where vaccination rates remain low, has the potential to negatively impact demand, and affect market sentiment.

Price forecast uncertainty is also being driven by the supply-side. In July 2021, OPEC+ agreed to increase oil production by 0.4 million barrels a day, lasting through to September 2022. However, given an evolving demand outlook, the group could make major adjustments to production targets, thus affecting future output. Output is also uncertain for those OPEC+ members who are currently exempt from production targets, including Libya, Iran and Venezuela. With production in these countries affected by either blockades or international sanctions, any geopolitical flare ups are likely to impact global prices. The unfolding political turmoil in Afghanistan also has the potential to affect global prices, due to the nation's close proximity to a number of major producers.

It is expected that US producers will look to ramp up drilling activity in response to current prices and operational problems which have occurred this year. The increased US output will impact future prices.

**Figure 8.6: Price outlook**




Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

## 8.5 Australia

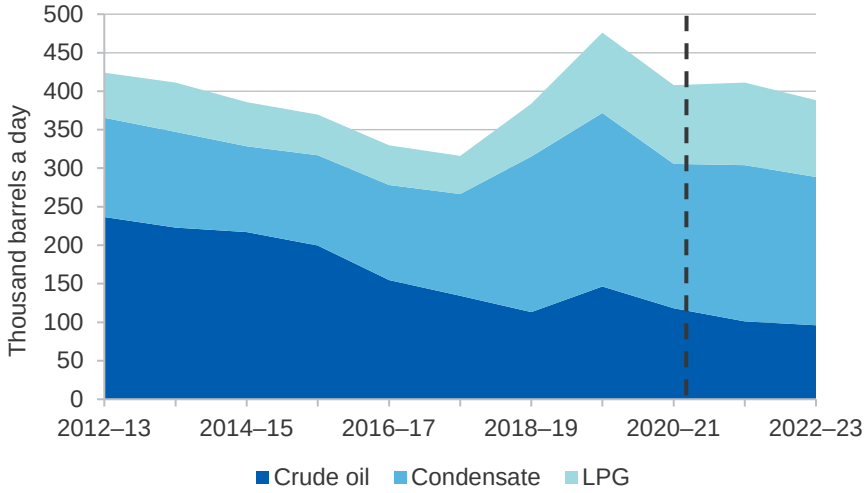
### Final investment decisions on gas projects to influence oil production

In 2020–21, Australian crude and condensate production declined by 17.8% to 306,000 barrels a day. Condensate output was negatively impacted when the Prelude FLNG project was offline — from February 2020 to January 2021. Gorgon also experienced a number of technical issues throughout 2020 and early 2021, further affecting condensate production figures. Technical issues at Gorgon were resolved at the end of July, so production is likely to lift in 2021–22.

Beyond the outlook period, the deferral of final investment decisions (FIDs) for several gas projects may affect future condensate and LPG production, with the production of both commodities typically associated with gas production (see the gas chapter).

In 2020–21, condensate accounted for 46% of total Australian crude oil, condensate and LPG production. LPG accounted for 25% (Figure 8.7).

**Figure 8.7: Composition of Australian oil production**




Source: Australian Bureau of Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

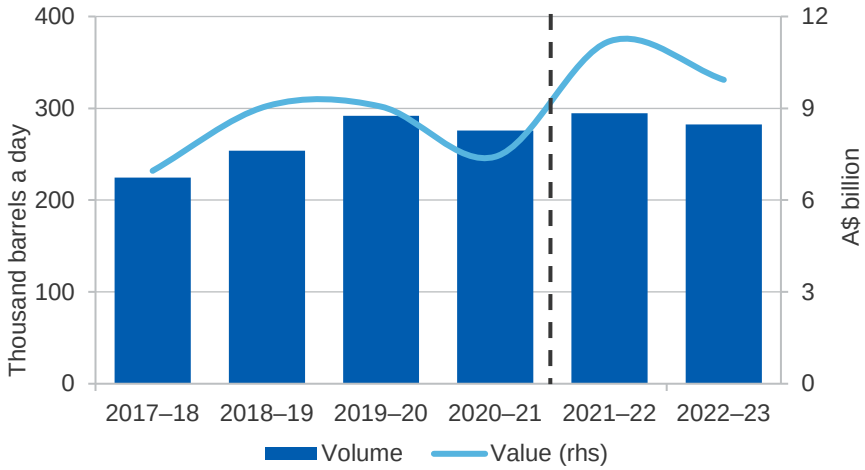
Santos has deferred a FID on the Dorado oil project to 2022, with first production unlikely before 2025. This project has an estimated new capacity of 85,000 barrels a day — about a quarter of 2020–21 Australian crude oil and condensate production. In June 2021, Santos announced the project had entered the front-end engineering and design (FEED) phase.

Australian production is forecast to continue to fall in 2021–22 and 2022–23, as output continues to decline at existing fields, with no major new projects commencing production.

### Australian export earnings to recover

In 2020–21, export values declined by 17.6% to $7.4 billion, reflecting low oil prices at the beginning of the period. Exports are forecast to rise to $11.2 billion in 2021–22, driven by higher prices. In 2022–23, export values are forecast to decrease to $9.9 billion (Figure 8.8).

**Figure 8.8: Australian oil and feedstock exports**




Notes: Includes crude oil and condensate, but excludes LPG.
Sources: Australian Bureau of Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

### Australian refinery closures to reduce Australia's throughput

Australian refined product consumption fell by 6.7% in 2020–21, as COVID-19 containment measures weighed heavily on activity in 2020. Consumption picked up in the first half of 2021, as mobility levels increased with some improvement in domestic travel. Demand for diesel continues to drive consumption recovery. Diesel consumption for 2020-21 was 2% higher than in 2019-20, reflecting its broad consumption base. While jet fuel sales in June 2021 were 80% higher than June 2020 levels, they were still less than half pre-pandemic levels. Australian refined product consumption is forecast to recover in 2021–22, as the COVID-19 vaccine rollout gains speed and allows for increased mobility. However, the east coast state lockdowns in the second half of 2021 are likely to slow consumption growth. Aviation demand is still expected to remain low in 2021–22, as restrictions on international travel remain ongoing.

There was an improvement in Australian refinery throughput in the first six months of the 2020–21 fiscal year, however throughput declined in

2020–21 as a whole. Low transport demand and fierce international competition continues to weigh on the profitability of the Australian refineries. BP decommissioned their Kwinana refinery in March 2021, and will convert it to an import terminal. Exxon Mobil commenced the shutdown process for their Altona refinery from 31 August 2021. The two remaining refineries, Ampol's refinery in Lytton (Queensland) and Viva Energy's refinery in Geelong (Victoria) have announced they will continue to operate until at least mid-2027, subject to Government support. As part of Budget 2021–22, the Australian Government announced a comprehensive fuel security package, which includes a variable fuel security services payment to the remaining refineries.

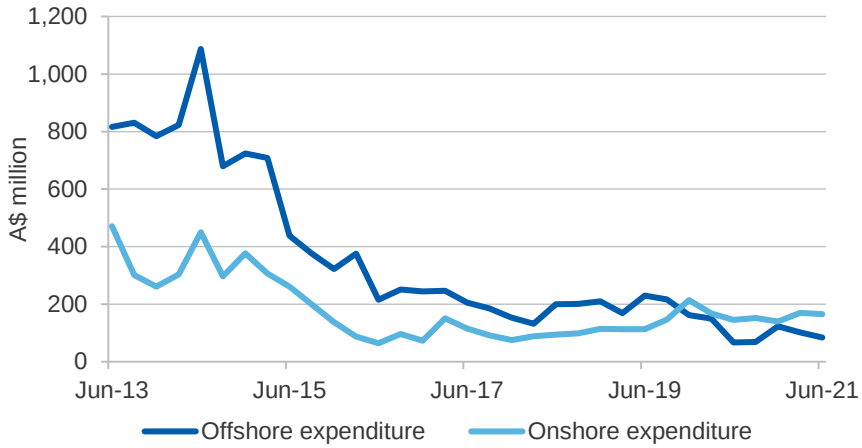
Refinery production is not expected to recover to pre-pandemic levels, given the permanent closure of a significant portion of Australia's refining capacity. Refinery throughput is expected to decline further in 2021–22 and 2022–23.

### Exploration

In the June quarter 2021, Australia's petroleum exploration expenditure was $249 million on a seasonally adjusted basis, a quarterly decrease of $22.7 million or 8.4%. Onshore exploration fell 2.9% to $165 million, while offshore dropped 17.5% to $83.8 million (Figure 8.9). Production lease areas fell by 14.6% to $124.7 million over the quarter.

The recent recovery in oil prices, coupled with a tighter domestic gas market could support growth in onshore petroleum exploration. The Australian Energy Market Operator is forecasting a possible shortfall of natural gas in Australian southern states by 2024.

**Figure 8.9: Australian petroleum exploration**




Source: ABS (2021) Mineral and Petroleum Exploration, Australia, 8412.0

### Revisions to forecasts

Since the June 2021 *Resources and Energy Quarterly*, the forecast for Australia's crude and condensate export earnings has been revised up by around $286 million in 2021–22, reflecting upward revisions to oil price forecasts. Export earnings for 2022-23 have been revised down by $176 million.

## Table 8.1: Oil Outlook

| World | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| Production[a] | mb/d | 93 | 96 | 100 | 102 | 2.8 | 4.9 | 1.4 |
| Consumption[a] | mb/d | 91 | 97 | 99 | 104 | 6.6 | 2.3 | 4.8 |
| WTI crude oil price | | | | | | | | |
| – nominal | US$/bbl | 41 | 66 | 64 | 63 | 62.1 | -2.5 | -1.9 |
| – real[b] | US$/bbl | 42 | 66 | 63 | 60 | 56.8 | -4.8 | -4.3 |
| Brent crude oil price | | | | | | | | |
| – nominal | US$/bbl | 42 | 68 | 67 | 66 | 60.9 | -1.4 | -1.5 |
| – real[b] | US$/bbl | 44 | 68 | 66 | 63 | 55.6 | -3.7 | -3.9 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| **Crude and condensate** | | | | | | | | |
| Production[a] | kb/d | 372 | 306 | 304 | 288 | -17.8 | -0.5 | -5.1 |
| Export volume[a] | kb/d | 291 | 276 | 295 | 282 | -5.3 | 6.8 | -4.2 |
| – Nominal value | A$m | 9,009 | 7,419 | 11,191 | 9,931 | -17.6 | 50.8 | -11.3 |
| – Real value[g] | A$m | 9,328 | 7,560 | 11,191 | 9,761 | -19.0 | 48.0 | -12.8 |
| Imports[a] | kb/d | 317 | 247 | 182 | 182 | -22.1 | -26.3 | -0.2 |
| **LPG production[ac]** | kb/d | 104 | 102 | 107 | 100 | -1.9 | 4.7 | -7.0 |
| **Refined products** | | | | | | | | |
| – Refinery production[a] | kb/d | 449 | 382 | 238 | 235 | -14.9 | -37.8 | -1.2 |
| – Export volume[ad] | kb/d | 17 | 13 | 9 | 9 | -21.4 | -32.4 | 1.9 |
| – Import volume[a] | kb/d | 640 | 648 | 850 | 870 | 1.1 | 31.2 | 2.4 |
| – Consumption[ae] | kb/d | 978 | 913 | 1,003 | 1,027 | -6.7 | 9.9 | 2.4 |

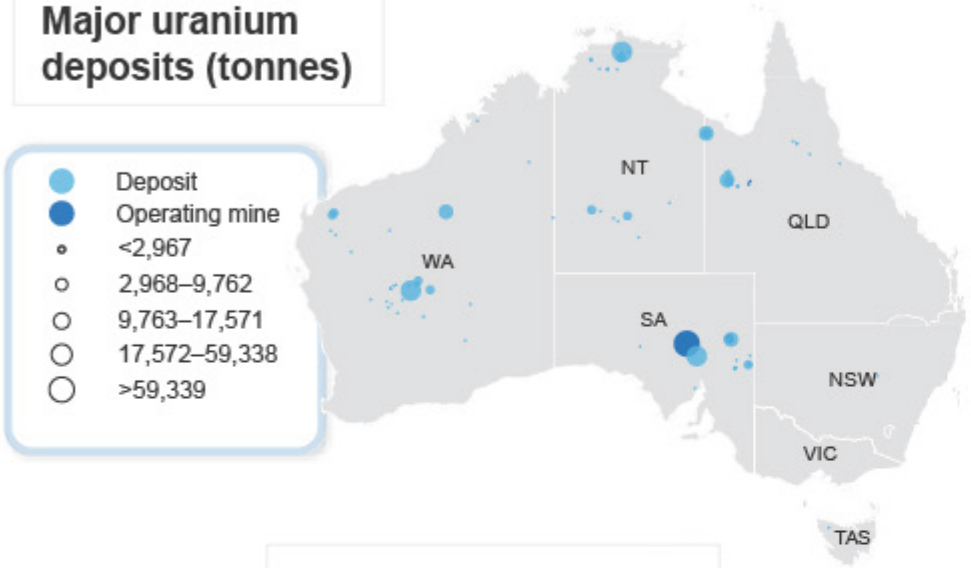
Notes: **a** The number of days in a year is assumed to be 365, and a barrel of oil equals 158.987 litres; **b** In 2021 calendar year US dollars; **c** Primary products sold as LPG; **d** Excludes LPG; **e** Domestic sales of marketable products, including imports; **f** Forecast; **g** In 2020-21 financial year Australian dollars; **s** estimate.

Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; International Energy Agency (2021); EnergyQuest (2021); US Energy Information Administration (2021); Department of Industry, Science, Energy and Resources (2021).

# Uranium

92 U 238.029

## Major uranium deposits (tonnes)



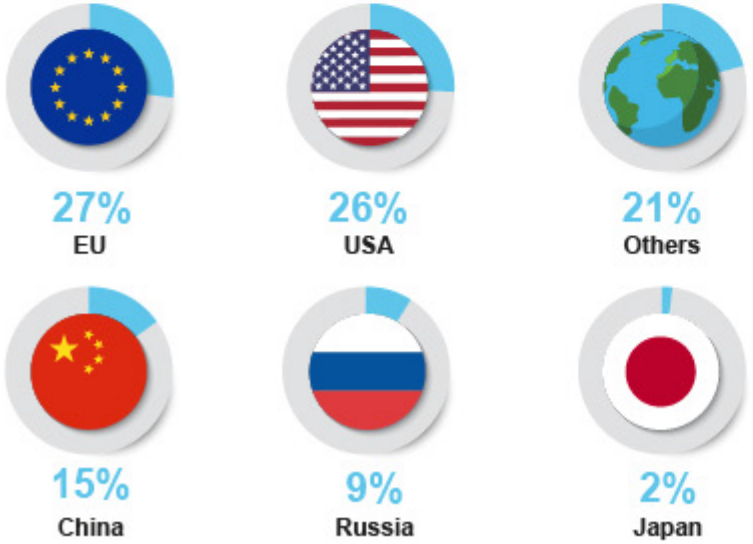

## Uranium facts

Originally formed in supernovae more than **6 billion years ago**

Nuclear plants can supply electricity to **4-5 million people**

Nuclear has among the **lowest death and accident rates** of any power source

## Consumer markets




## Australia's Uranium

**Ranked no 1** for **uranium resources**

**3rd largest uranium producer** in the world

**Exports** worth more than **$400m**

## 9.1 Summary

- On balance, uranium prices are expected to grow over the forecast period, growing from US$30 a pound in 2020 to US$41.70 a pound by 2023. Supply cuts at large mines in Canada and Kazakhstan, as well as the closure of Australia's Ranger mine in early 2021, will lead to some supply pressures. However, large producers retain the capacity to ramp up their output rapidly should prices surge.
- Australian production is forecast to decline from 2021, as the number of active uranium mines falls from three to two (see *Australia section*).
- Uranium export values are forecast to increase from a low of $465 million in 2021–22, to reach $551 million by 2022–23.

## 9.2 World consumption

### More countries are showing interest in nuclear reactors

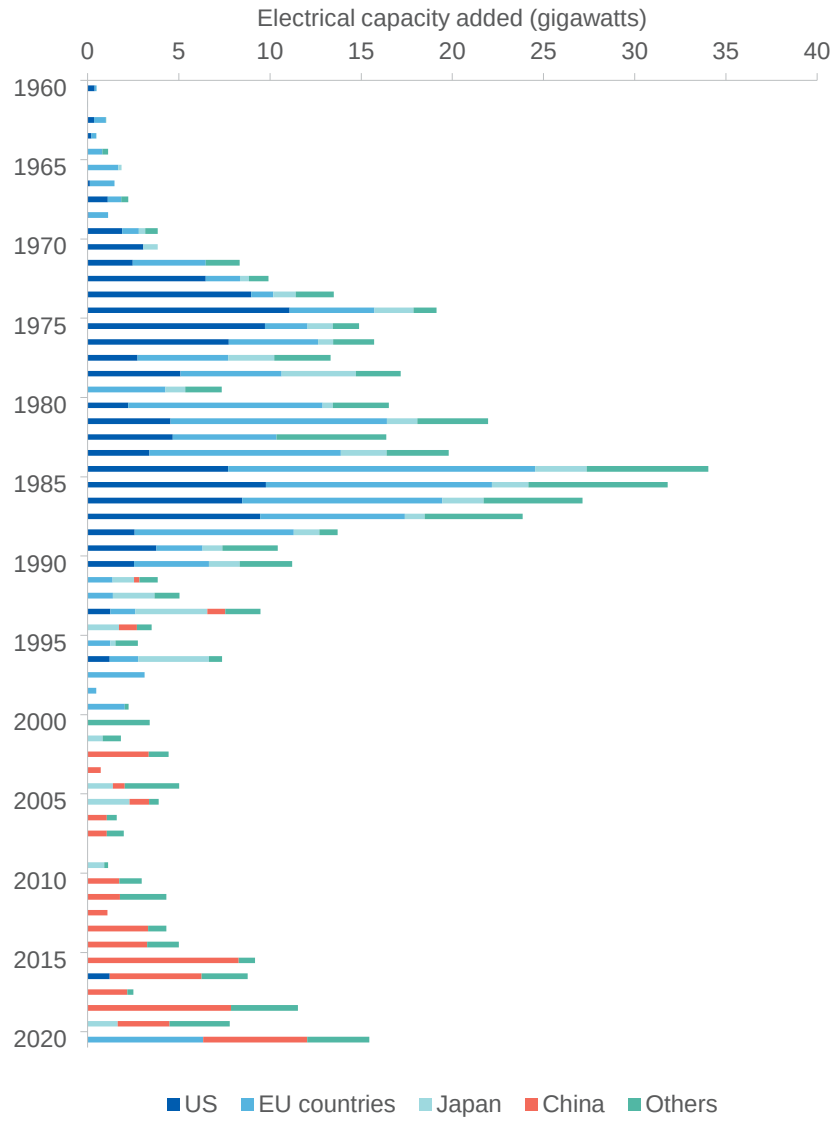
Nuclear power use is growing gradually, partly through a rise in the number of countries developing nuclear plants (Figure 9.1), and partly as a result of rising energy use as the global economy recovers from the COVID-19 pandemic.

China remains important to the global uranium market, with the nation now operating 25 nuclear plants (with a total capacity above 28,000 MWe) and with more underway. Unit 5 of the Hongyanhe plant completed final tests in August, and is expected to enter commercial operation shortly. Unit 6 of the Fuqing nuclear plant also completed tests on its containment function in July, and is expected to commence commercial operation by the end of 2021. While China retains high inventories, its purchases are likely to face greater internal scrutiny, due to growing political strains on its relationships with several key suppliers, notably Canada, Australia and the US.

In Japan, restart of the Kashiwazaki-Kariwa nuclear power plant has been delayed until early 2023, following a revision by the Tokyo Electric Power Company to its timetable.

Unit 1 of the Shin Hanul plant in South Korea has received approval to start up in March 2022, subject to additional safety tests. A second reactor at the same site is expected to follow.

**Figure 9.1: Growth in world nuclear power generation**




Source: International Energy Agency (2021); World Nuclear Association (2021); Department of Industry, Science, Energy and Resources (2021)

In Slovenia, GEN Genergija has received approval for a second reactor at its Krško nuclear power plant. However, a final investment decision by the company will still need to be made before any construction can begin.

Four power plants in Illinois face closure in the near-term, likely reducing US demand for uranium from the end of 2021. The first plant remains scheduled to close in September. However, the recent success of the plants in providing 15,000 days of uninterrupted power has bolstered campaigns to keep them open, and some officials have recently made efforts to enable an extension to operations.

On balance, uranium consumption is expected to pick up only marginally in the short term (Figure 9.2), though with some diversification of demand sources.

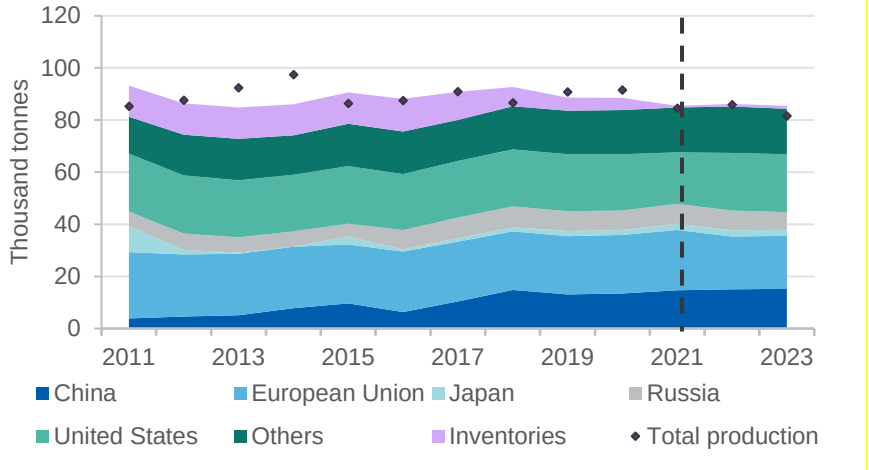
## 9.3 World production

### Large suppliers are shifting back to full production

Global supply remains relatively constrained (Figure 9.3), despite a gradual easing of COVID-19 disruptions across most countries, and a partial reversal of previous cutbacks in Canada and Kazakhstan. It is expected that supply will nonetheless lag growth in demand in the short-term, adding moderate price pressure in a climate of still-ample global inventories.

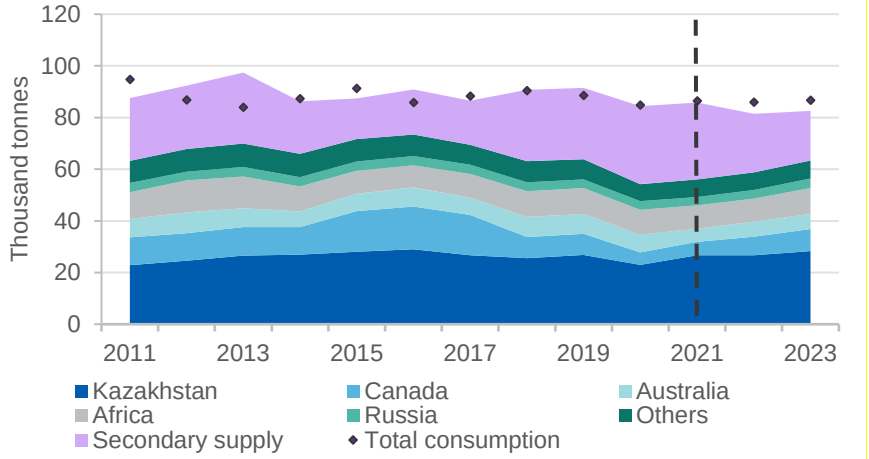
Uranium production may be facilitated in the long-term by a recent technological breakthrough. The McClean Lake deposit in Saskatchewan is the first to be scanned by the newly developed cosmic-ray muon detector. The device — developed by Ideon Technologies — has been developed to study boreholes, and its successful use on the McClean uranium deposit potentially opens opportunities across many more forms of mineral exploration. The technology produces imaging similar to X-rays, and can detect mineral deposits up to a kilometre beneath the Earth's surface.

**Figure 9.2: World uranium consumption and inventory build (U3O8)**




Source: International Energy Agency (2021); World Nuclear Association (2021); Ux Consulting (2021)

**Figure 9.3: World uranium production and secondary supply (U3O8)**




Source: International Energy Agency (2021); World Nuclear Association (2021); Ux Consulting (2021)

## 9.4 Prices

### Prices are expected to rise slowly over the outlook period

Uranium prices have continued to edge up, increasing by around $3 a pound since the March quarter. This growth has been driven, in part, by growing Chinese reactor deployments, but also by renewed demand from financial entities. This has, in turn, led to additional interest from utilities seeking to stay ahead of further potential price growth.

This leaves recent (and future) price gains highly subject to market sentiment. However, gains are expected to persist, shifting to a firmer footing as global demand gradually outgrows supply (Figure 9.4). Prices are expected to reach almost US$42 a pound by 2023.

## 9.5 Australia

### Production and exports are set to decline in the short term

Australian production has fallen following the closure of the Ranger mine (Figure 9.5), but added supply is expected to come online beyond the outlook period. Boss Energy, which owns the Honeymoon deposit, has announced that it now has all the necessary permits to mine, process, store and ship uranium from its proposed mine at Honeymoon. In Western Australia, Vimy Resources has announced that the Above Ground Tailings Storage Facility Monitoring and Management Plan associated with its proposed Mulga Rock project has received environmental approval, with early work at the site potentially starting in late 2021.

Export volumes are expected to remain at around 5,800 tonnes annually over the outlook period, with values increasing slowly as prices pick up (Figure 9.6). Volumes are expected to rise after 2023.

A total of $3.9 million was spent on uranium exploration in the June quarter 2021 — the highest quarterly spend for three years.

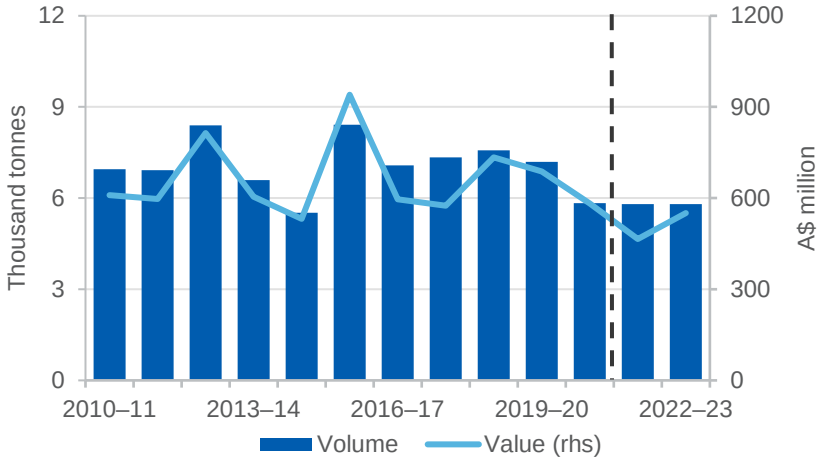
### Revisions to the outlook

Export revenue forecasts are largely unchanged from the June 2021 *Resources and Energy Quarterly*.

**Figure 9.4: Uranium price outlook**


Source: Cameco Corporation (2021) Uranium Spot Price; Ux Consulting (2021) Uranium Market Outlook

**Figure 9.5: Australia's uranium exports**




Source: Department of Industry, Science, Energy and Resources (2021)

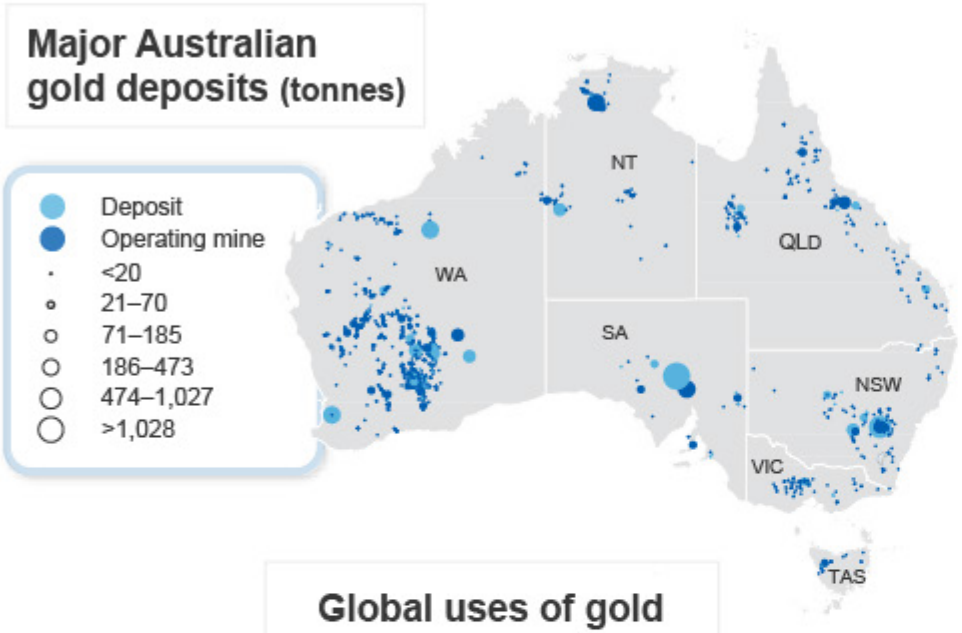
## Table 9.1 Uranium outlook

| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2020** | **2021[f]** | **2022[f]** |
| Production | kt | 54.4 | 56.5 | 58.8 | 63.4 | 3.7 | 4.2 | 7.7 |
| Africa[b] | kt | 9.6 | 9.0 | 8.9 | 10.0 | -5.7 | -1.3 | 12.4 |
| Canada | kt | 4.8 | 5.2 | 7.3 | 8.6 | 9.5 | 39.1 | 18.1 |
| Kazakhstan | kt | 22.7 | 26.6 | 26.6 | 28.3 | 17.6 | 0.0 | 6.3 |
| Russia | kt | 3.4 | 3.3 | 3.3 | 3.7 | -3.2 | 0.0 | 12.2 |
| Consumption | kt | 84.1 | 85.5 | 84.8 | 85.7 | 1.7 | -0.8 | 1.1 |
| China | kt | 13.5 | 14.7 | 15.1 | 15.2 | 8.9 | 2.6 | 1.1 |
| European Union 27 | kt | 22.4 | 23.1 | 20.3 | 20.3 | 3.2 | -12.4 | 0.1 |
| Japan | kt | 1.9 | 2.4 | 2.4 | 2.4 | 26.0 | 0.0 | 0.0 |
| Russia | kt | 7.4 | 7.6 | 7.6 | 6.8 | 2.6 | -0.6 | -10.6 |
| United States | kt | 21.7 | 19.8 | 22.0 | 22.2 | -8.6 | 11.5 | 0.7 |
| Spot price | US$/lb | 30.0 | 31.1 | 36.3 | 41.7 | 3.9 | 16.6 | 14.8 |
| real[c] | US$/lb | 31.0 | 31.1 | 35.5 | 39.7 | 0.5 | 13.9 | 12.0 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[f]** | **2021–22[f]** | **2022–23[f]** |
| Mine production | t | 7,349 | 5,665 | 5,800 | 5,800 | -22.9 | 2.4 | 0.0 |
| Export volume | t | 7,195 | 5,649 | 5,800 | 5,800 | -21.5 | 2.7 | 0.0 |
| – nominal value | A$m | 688 | 551 | 465 | 551 | -19.9 | -15.6 | 18.4 |
| – real value[d] | A$m | 713 | 562 | 465 | 542 | -21.2 | -17.2 | 16.4 |
| Average price | A$/kg | 95.6 | 97.6 | 80.2 | 95.0 | 2.1 | -17.8 | 18.4 |
| – real[d] | A$/kg | 99.0 | 99.5 | 80.2 | 93.4 | 0.4 | -19.3 | 16.4 |

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2021 US dollars; **d** in 2020–21 Australian dollars; **s** estimate; **f** forecast;
Source: Department of Industry, Science, Energy and Resources (2021); Cameco Corporation (2021); Ux Consulting (2021) Uranium Market Outlook

# 79 Au 196.967 Gold

## Major Australian gold deposits (tonnes)




## Gold

Approx 187,200 tonnes of gold mined since the **beginning of civilisation**

The US Federal Reserve holds **6,700 tonnes of gold**

Gold makes up **3 parts per billion** of the Earth's outer layer

## Global uses of gold

**37%** Jewellery

**24%** Coins and bars

**23%** Gold-backed exchange traded funds

**8%** Electronics, industrial, dental and medical

**8%** Central bank reserves

## Australia's gold

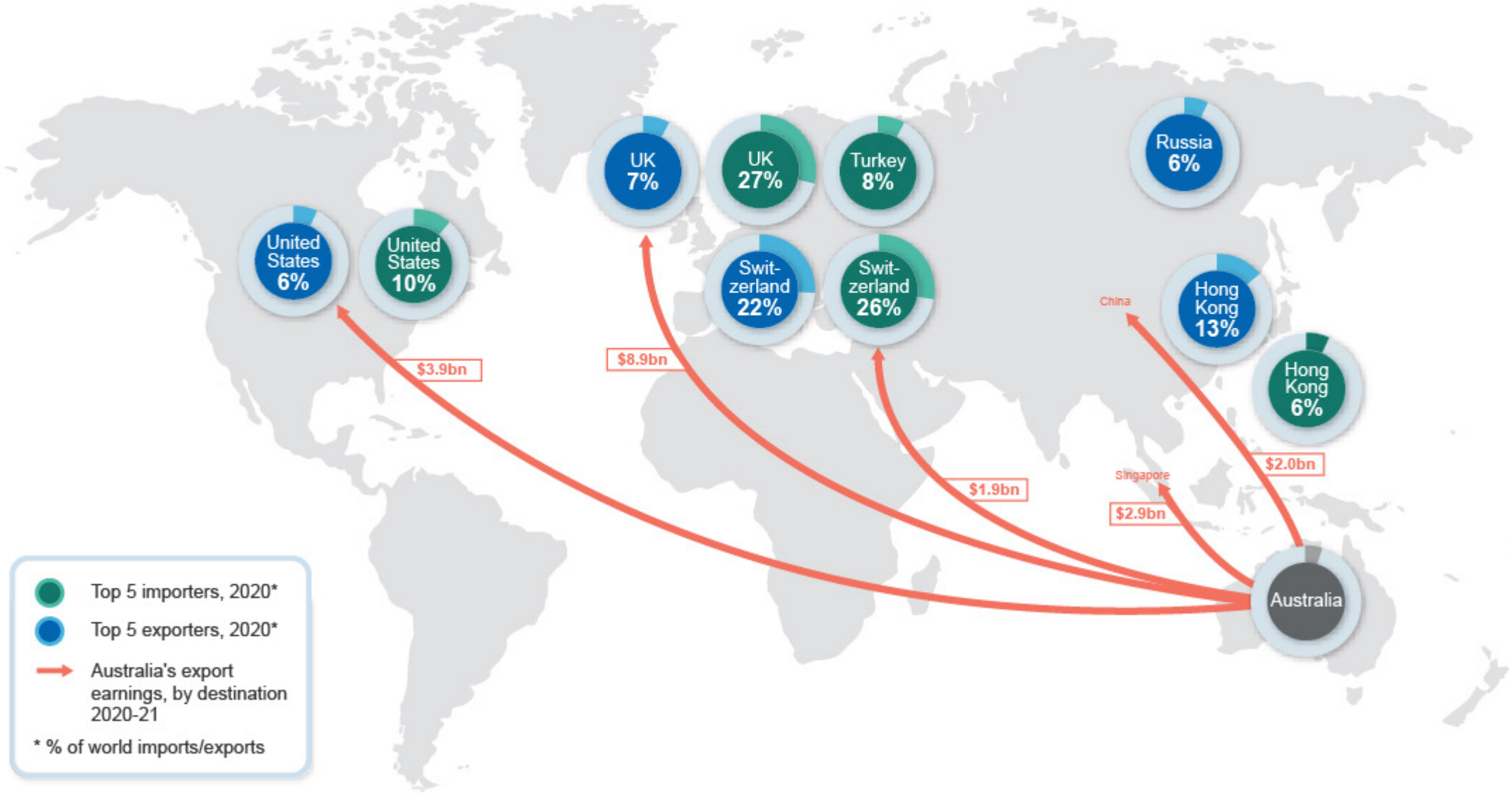
**World's no. 1** producer of gold in first-half of **2021**

**World's largest reserves** of gold

**World record** holder for **largest gold nugget** 72kg

# 79 Au 196.967 Gold

## Trade map | September 2021



## 10.1 Summary

- Renewed waves of COVID-19 infections in many parts of the world, and an uneven vaccine rollout, is forecast to push the gold price up to US$1,785 an ounce in 2021, after averaging US$1,770 in 2020. An expected global economic rebound is projected to see the gold price slide to around US$1,635 an ounce in 2023.
- Australia has overtaken China as the world's largest gold producing country in the first-half of 2021. Production from new mines and existing mine expansions is expected to boost gold mine production to 378 tonnes in 2022–23 (see Australia section).
- Gold export earnings are forecast to be $29 billion in 2021–22, before a decline to $27 billion in 2022–23, as gold prices ease back.

## 10.2 Consumption

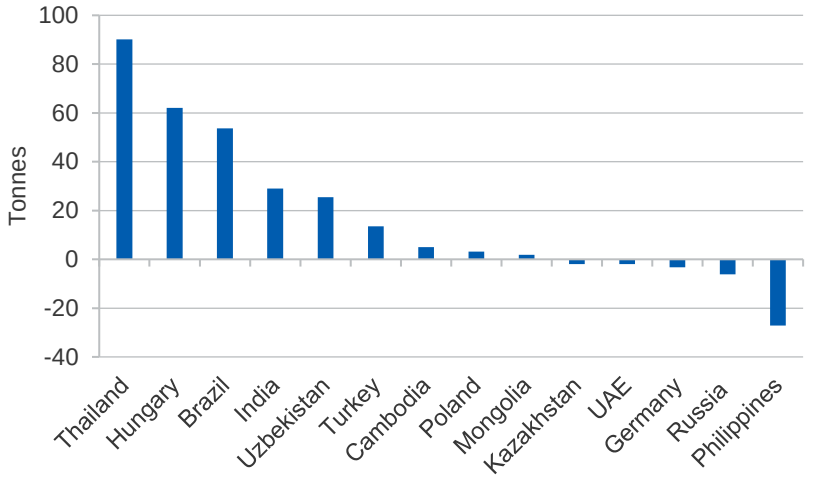
### World gold consumption decreased in the first half of 2021

World gold demand decreased by 10% year-on-year to 1,833 tonnes in the first-half of 2021, led by a strong outflow from gold-backed exchange traded funds (ETFs). Over this period, investors pulled out 129 tonnes (worth US$7.5 billion) of gold from gold-backed ETFs. An improvement in the global economy and COVID-19 vaccine roll-out, led to an exodus of institutional investors' funds from safe haven assets (such as gold ETFs) to riskier assets. Global stock markets continued to reach record highs in the first-half of 2021 attracting investment funds.

Offsetting the fall in gold-backed ETFs was a 62% rise year-on-year in official gold buying (that is, from central banks and other government financial institutions) in the first-half of 2021. A desire to diversify reserves, growing debt levels and rising inflation, were the catalyst for central banks' growing appetite towards gold. According to the World Gold Council, Thailand, Hungary and Brazil were the largest gold buyers in the first-half of 2021, buying 206 tonnes of gold. The Philippines, Russia and Germany were the largest suppliers to governments, selling 37 tonnes (Figure 10.1).

Over this period, jewellery demand rose by 57% year-on-year to 874 tonnes, led by a 124% (or 189 tonnes) rise in consumption in China

**Figure 10.1: Central banks' gold buying and selling, first-half 2021**



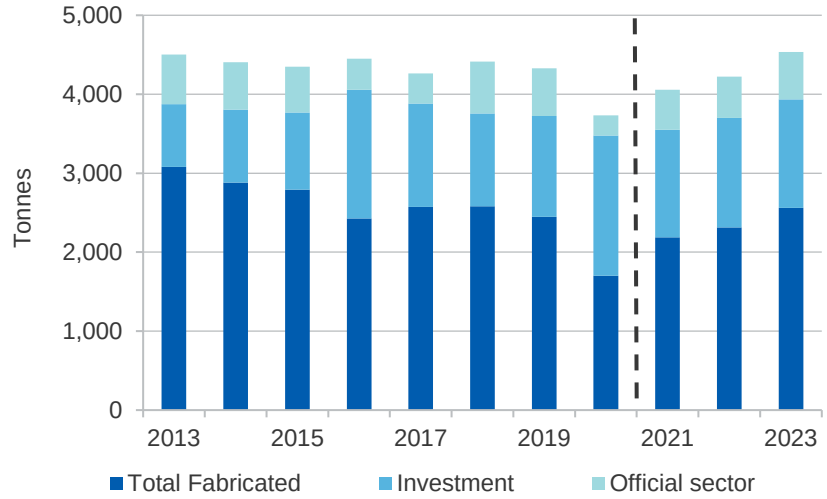

Notes: Positive indicates buying, and negative indicates selling
Source: World Gold Council (2021)

(excluding Hong Kong) — the world's largest gold jewellery consuming nation.

The recovery of the Chinese economy was the main contributing factor to China's increasing jewellery demand in the first-half of 2021, reaching its highest level since 2015. In the US, led by the economic recovery and improved consumer sentiment, jewellery consumption increased by 55% year-on-year to 64 tonnes in the first-half of 2021. In India, the second wave of COVID-19 pandemic reduced jewellery demand by 46% quarter-on-quarter to 55 tonnes in the June quarter 2021.

Demand for gold bars and coins also grew strongly in the first-half of 2021 (up 45% or 185 tonnes year-on-year). The growth in gold bar and coin retail investment was propelled by an 85% (or 66 tonnes) year-on-year rise in China's bar and coin demand. Encouraged by lower gold prices, Chinese retail investors stepped up their purchases in anticipation of short to medium term gains.

**Figure 10.2: World gold consumption by sector**




Note: Total fabricated includes jewellery consumption and industrial applications
Source: World Gold Council (2021) Gold Demand Trends; Department of Industry, Science, Energy and Resources (2021)

## World gold consumption forecast to rise in 2021

World gold consumption is forecast to increase by 8.7% to 4,057 tonnes in 2021 (Figure 10.2), as uncertainty persists — due to the uneven pace of the COVID-19 vaccine roll out and rising COVID-19 cases in many nations.

In 2021, jewellery demand is forecast to rebound strongly from the heavy reduction in 2020, up 32% year-on-year, to 1,855 tonnes. China is expected to contribute the most to this recovery. Government stimulus, sales promotions and seasonal patterns are expected to lift gold demand in the second half of 2021. In the US, gold jewellery consumption grew by 55% in the first-half of 2021, and is expected to remain strong over the rest of 2021, driven by an effective COVID-19 vaccine rollout, improved consumer sentiment and high household savings. In Europe, jewellery consumption is expected to be weak, as the Eurozone economies continue to struggle with the COVID-19 pandemic.

The risk to China's jewellery consumption is the resurgence of COVID-19 cases in China. In light of this development, the COVID-19 containment measures are expected to be implemented across many cities, and are likely to impact the country's physical gold demand.

In India, a poor monsoon season is likely to affect the economic recovery in rural regions, and thus the demand for gold during the wedding and festive season starting in October 2021. In south-east Asia, surges in COVID-19 cases are likely to reduce gold demand in the September quarter 2021. On 21 May 2021, the Russian government tabled legislation that allows the country's national wealth fund to buy and hold gold with the Russian central bank. This is likely to result in higher Russian holdings.

## Gold consumption expected to rise in 2022 and 2023

World gold consumption is forecast to grow at an average annual rate of 5.7% in 2022 and 2023, to 4,535 tonnes in 2023 (Figure 10.2). The growth is expected to be largely driven by jewellery consumption, which is forecast to rise by 9.1% a year in 2022 and 2023, to 2,208 tonnes in 2023. Jewellery demand from China is expected to remain strong, supported by rising consumer sentiment and income. Demand from India is expected to recover in 2022 and 2023, as more people are vaccinated and the economy recovers. In the US, jewellery demand is expected to be lower than 2021, as consumer discretionary spending is expected to move towards leisure activities when the economy returns closer to normality.

Gold retail investment is expected to help global gold consumption, with demand for gold bars and coins forecast to rise at an average annual rate of 1.0% between 2022 and 2023, to 1,207 tonnes by 2023. This is supported by a forecast pull-back in gold prices (see *Section 10.4 prices*).

The official sector is expected to add to gold demand in 2022 and 2023. Many central banks are expected to shift their focus from accommodative liquidity requirements — to support economic growth during the COVID-19 pandemic — to reserves diversification — to help protect their wealth. As a result, central bank gold buying is forecast to rise by an average 9.2% a year over the outlook period, reaching 600 tonnes in 2023.

## 10.3 Production

### World gold supply increased in the first-half of 2021

World gold supply increased by 4.3% year-on-year in the first-half of 2021, to 2,308 tonnes, driven by an 8.8% (144 tonnes) increase in global gold mine production.

Gold mine production in Canada rose by 57% year-on-year in the first-half of 2021, propelled by higher ore grades from the Meadowbank, Canadian Malartic and LaRonde gold mines, and the return to full production at the Musselwhite gold mine following a fire incident in the March quarter 2019.

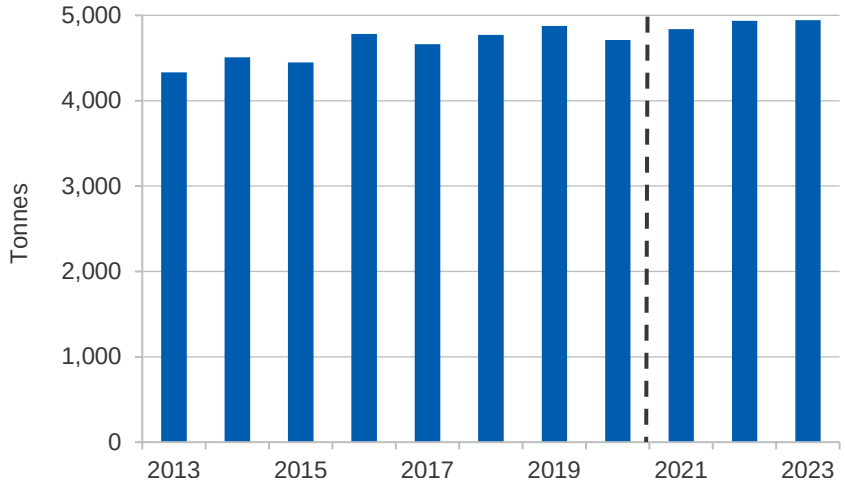
In the first-half of 2021, gold mine production in Mexico, Peru and South Africa rose by 67%, 50% and 46% year-on-year, respectively, driven by the easing of COVID-19 containment measures and improved ore grades.

Production in China — the world's second largest gold producer — decreased by 10% year-on-year to 153 tonnes in the first six months of 2021, after two fatal accidents in the Hushan and Caojiawa gold mines in Shandong province in January and February 2021. This led to production suspensions at several gold mines in the region, as safety checks were undertaken.

Production in Australia — the world's largest gold producing nation — decreased by 4.1% year-on-year to 157 tonnes in the first half of 2021, due to skill and labour shortages, planned and unplanned maintenance, and lower ore grades in some mines.

In the first half of 2021, gold scrap supply declined by 5.4% year-on-year to 546 tonnes, as lower US dollar gold prices, improved economic activity and employment opportunities, reduced the sale of distressed gold from consumers to jewellery retailers in China, the US, the UK, Europe and India (in the March quarter 2021). However, distress selling of gold rose in the June quarter of 2021, as India and other parts of the world encountered a new wave of COVID-19 infections. In India, gold recycling increased by 33% quarter-on-quarter in the June quarter 2021. In Lebanon, gold recycling rose by 100% year-on-year, as consumers struggled with lower economic growth and currency weakness.

**Figure 10.3: World gold supply**




Source: World Gold Council (2021) Gold Demand Trends; Department of Industry, Science, Energy and Resources (2021)

### World gold supply forecast to rise in 2021

In 2021, world gold supply is forecast to increase by 2.7% to 4,840 tonnes, driven by higher gold mine production in Australia, the US and Canada (Figure 10.3). Australian output is forecast to rise by 3.2% to 338 tonnes in 2021 (see *Section 10.5 Australia's exports and production*).

In 2021, production in Canada and the US is forecast to rise by 24% and 6.5% to 224 and 212 tonnes, respectively, driven by a production recovery from the disruption of the COVID-19 pandemic.

Canada's newest gold mine, Pure Gold, located in Ontario, started commercial operation on 2 August 2021. The mine is expected to add 3.1 tonnes of gold a year to Canadian gold output. Hudbay Minerals' New Britannia gold mine produced first gold on 12 August 2021, and is expected to add 5.6 tonnes a year to Canadian gold output.

Equinox is advancing an expansion at its Castle Mountain gold mine in California in the US, from 1.2 tonnes in 2021 to 6.2 tonnes a year in 2023.

Chinese gold mine output is forecast to fall by 11% in 2021, to 335 tonnes, as stricter environmental and safety regulations lead to mine closures.

Gold mine production in Latin America is expected to recover in 2021, following heavy losses in 2020. Production is forecast to increase in Mexico (by 14% in 2021 to 121 tonnes), Peru (up 15% to 100 tonnes) and Brazil (up 3.4% to 90 tonnes).

Gold recycling activity is expected to remain subdued in 2021, as many parts of the world are expected to implement containment measures to contain new waves of the COVID-19 pandemic. Jewellery store closures during lockdowns cut the physical exchange of gold for cash. As a result, world gold recycling supply is forecast to fall by 5.2% to 1,211 tonnes in 2021.

### World gold supply expected to rise further in 2022 and 2023

Propelled by higher mine production, world gold supply is forecast to rise at an average annual rate of 1.1% between 2022 and 2023, reaching 4,942 tonnes by the end of the outlook period (Figure 10.3).

World mine production is forecast to increase by 3.0% (to 3,758 tonnes) in 2022 and by 2.0% (to 3,834 tonnes) in 2023, driven by increased production in Australia, Canada and Chile. In Australia, a solid pipeline of projects is expected to bring the country's gold mine production to 396 tonnes in 2023. In Canada, gold mine production is forecast to rise over the outlook period, reaching 233 tonnes in 2023. Sabina Gold and Silver's Back River gold mine in Nunavut province is expected to start operation in 2023, adding 4.7 tonnes of gold a year to Canadian gold output. In Chile, Gold Fields' 8.8 tonnes a year Salares Norte gold project in the Atacama region is expected to come online in 2023.

In 2022 and 2023, lower gold prices and improving economic situations of many households are likely to discourage future sale of gold jewellery, thus gold scrap supply is forecast to fall by 5.0% in 2022 (to 1,150 tonnes) and 8.0% in 2023 (to 1,058 tonnes).

## 10.4 Prices

### Gold prices remain at the US$1,800 an ounce mark

The London Bullion Market Association (LBMA) gold price fell in the March quarter 2021, as the rollout of COVID-19 vaccines and the US economic recovery (and an associated rise in real bond yields) undermined some of gold's appeal to institutional and retail investors. The price then regained the US$1,800 an ounce mark during the June and September quarters of 2021, as renewed waves of COVID-19 infections in many parts of the world, and an uneven vaccine rollout, helped gold demand.

The inverse relationship between gold price and the real US 10-year Treasury bond yield seems to have weakened since the June 2021 Federal Open Market Committee meeting. Although the real bond yields are even lower now than they were in August 2020, the LBMA gold price is still US$200 below its peak of US$2,064 an ounce on 6 August 2020 (Figure 10.4).

The LBMA gold price is forecast to average US$1,785 an ounce in 2021, a 0.9% rise from the 2020 price average (Figure 10.5). This forecast reflects the sluggish rollout of the COVID-19 vaccines, persistent high cases of COVID-19 in many parts of the world, and the maintenance of relatively low interest rates in the US. The US and European governments have indicated that they are focusing less on inflation and more on employment in the short term. As a result, highly stimulatory monetary policy is expected to continue for the remainder of 2021. Geopolitical tensions in the Middle East are expected to remain high, also supporting gold prices.

### Gold prices expected to fall in 2022 and 2023

After 2021, gold prices are forecast to fall by an average 4.3% a year, to US$1,634 an ounce in 2023, due to the recovery of the global economy and a higher interest rate environment (Figure 10.5). The prospect of rising real bond yields is likely to be a major factor in curbing institutional investment demand for gold. With (real) interest rates increasing, the opportunity cost of holding gold is high, lowering its attractiveness as an investment asset.

There are several risks to the gold price assessment, including the effectiveness of COVID-19 vaccines now being rolled out across the world. Some new strains of the virus are much more infectious than others. The rise of COVID-19 cases in many parts of the world is affecting the global economic recovery which, in turn, supports the demand for gold as a safe haven asset.

A rise in the US dollar would put downward pressure on the US gold price. The US dollar is likely to rally, as US economic growth outpaces other major nations.

Geopolitical issues are expected to persist over the outlook period. Tensions in the Middle East and parts of the Indo-Pacific are expected to persist. An escalation in the Middle East tensions would potentially push gold prices higher.

## 10.5 Australia's exports and production

### Export values increased in 2020–21

The value of Australia's gold exports increased by 7.0% in 2020–21 to a record high of $26 billion. The rise was driven by high gold prices and large exports to gold-backed ETFs in the US and UK in the first-half of 2020–21, and the removal of China's gold import restrictions in the second-half of 2020–21 (Figure 10.6).

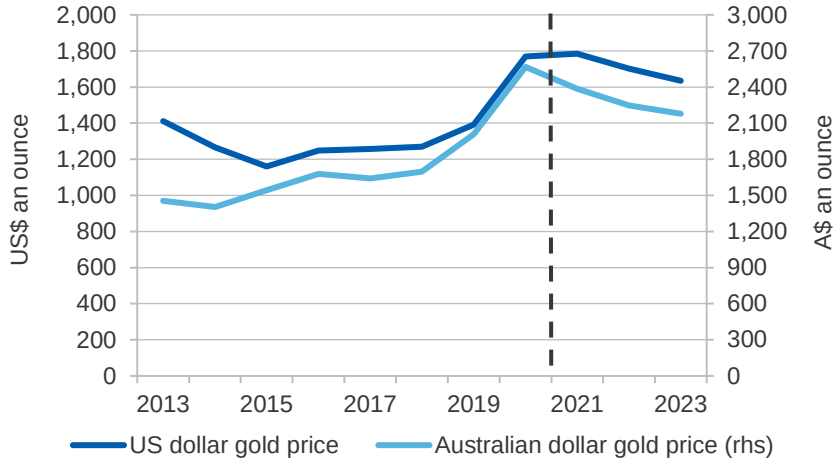
On average, Australia exported $1,267 million and $496 million of gold a month to the UK and US in the first six months of 2020–21, respectively, driven by a strong inflow of global gold-backed ETFs. However, exports to these countries dropped to an average $221 million and $160 million a month in the last six months of 2020–21, respectively, due to a strong outflow of global gold-backed ETFs.

The People's Bank of China (China's central bank) has given domestic and international banks permission to import gold into the country from mid-April 2021. The decision boosted Australian gold exports to China, from zero in the first-half of 2020–21 to $2.0 billion in the second-half of 2020–21.

**Figure 10.4: US dollar gold price and real US 10-Year Treasury yield**


Source: Bloomberg (2021)

**Figure 10.5: US and Australian dollar gold prices**




Source: LBMA (2021); Department of Industry, Science, Energy and Resources (2021)

## Australian gold exports increase in 2021–22, and slightly lower in 2022–23

Australia's gold export earnings for 2021–22 are forecast to increase by 10% to $29 billion in 2021–22, before falling to $27 billion in 2022–23 (Figure 10.6). The decline is expected to be driven by lower US and Australian dollar gold prices (see *Section 10.4 prices*).

## Australian gold mine production decreased in 2020–21

Australia's gold mine production fell by 2.2% in 2020–21 to 321 tonnes, due to planned and unplanned maintenance and lower ore grades in some gold mines (Figure 10.8).

Production at Kirkland Lake Gold's Fosterville operation in Victoria decreased by 11% in 2020–21 to around 18 tonnes, due to the transition to lower ore grades at the Swan Zone of the mine.

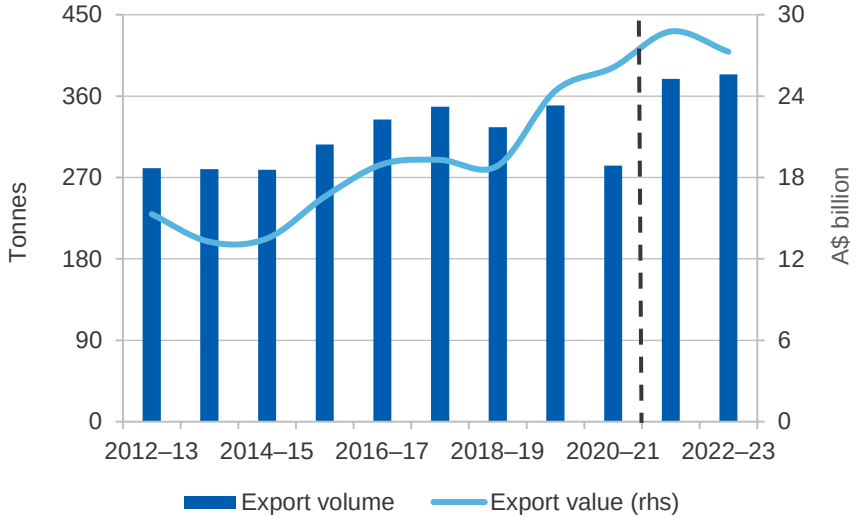
Output at Newcrest's Cadia mine in New South Wales (NSW) declined by 9.3% to nearly 24 tonnes in 2020–21, due to planned maintenance and lower mill throughput.

Evolution Mining's Cowal gold mine in NSW saw output fall by 20% to 6.6 tonnes in 2020–21, due to unplanned ball mill motor repairs.

In 2020–21, a labour and skills shortage became an emerging issue for Australian gold producers. Some miners downgraded their production guidance and operated at reduced capacity. In mid-May 2021, St Barbara announced a production downgrade for its flagship Gwalia gold mine in WA, from 5.4 tonnes to 4.7 tonnes in 2020–21. The production downgrade is mainly due the labour and skills shortage encountered by its mining contractor, Macmahon Holdings. Other gold miners such as AngloGold Ashanti, Northern Star Resources, Regis Resources and Red 5 also experienced labour and skills shortages.

Red River's 1.6 tonnes a year Hill Grove gold mine in NSW poured its first gold in March 2021. Novo Resources' 3.1 tonnes a year Beatons Creek gold mine in WA commenced operation in February 2021. Ora Banda Mining's 2.9 tonnes a year Davyhurst gold mine in WA poured first gold in February 2021.

**Figure 10.6: Australia's gold exports**




Notes: Export volume contains ash, waste and scrap gold, of which the gold content is unknown.
Source: ABS (2021) International Trade, 5464.0; Department of Industry, Science, Energy and Resources (2021).

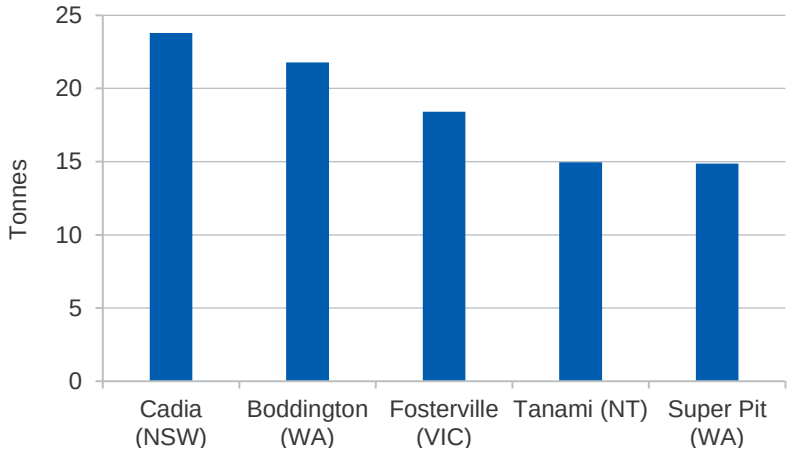
Production at Newmont's Boddington gold mine in WA rose by 4.0% in 2020–21 to nearly 22 tonnes, propelled by higher ore grades.

The top 5 gold producing mines in Australia in 2020–21 were Cadia in NSW (23.8 tonnes), Boddington in WA (21.8 tonnes), Fosterville in Victoria (18.4 tonnes), Tanami in the Northern Territory (15.0 tonnes), and Super Pit in WA (14.9 tonnes). These mines accounted for 29% of Australian total gold mine production in 2020–21 (Figure 10.7).

## Higher production in the short term

Australian gold mine production is forecast to rise at an average annual rate of 8.8% between 2021–22 and 2022–23. Production of 379 tonnes by 2022–23 will be propelled by both production from new mines and existing mine expansions (Figure 10.8).

**Figure 10.7: Top 5 gold producing mines in Australia, 2020–21**




Source: Department of Industry, Science, Energy and Resources (2021)

Newcrest is expected to proceed with the $246 million West Dome Stage 5 Cutback project to extend the life of its Telfer mine in WA. The first ore from the cutback is expected in March quarter 2022.

In August 2021, Evolution Mining has implemented a new software, Aspen Technology's Mtell software, at its Mungari gold mine in WA with the aim of mitigating unplanned downtime and improving the mine's output.

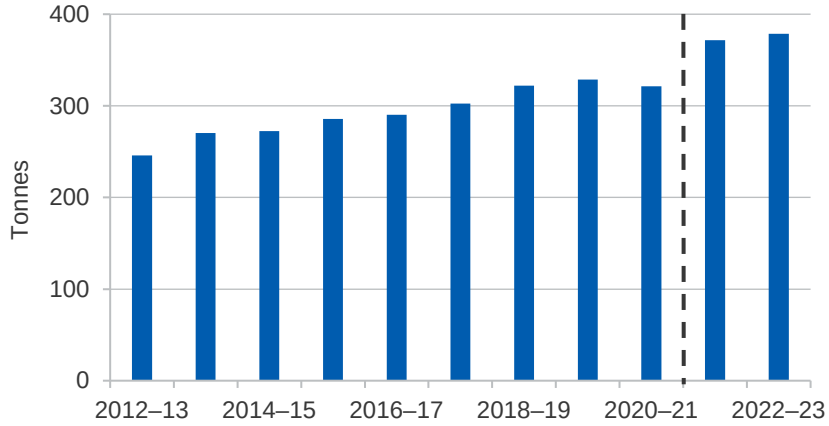
Capricorn Metals has started the commissioning phase of its 3.0 tonnes a year Karlawinda gold mine project in WA in early June 2021. Red 5's 6.2 tonnes a year King of the Hills gold project in WA is expected to start production in mid-2022, with 50% of project construction completed. Ramelius Resources commenced ore mining at its Tampia gold mine in WA on 18 June 2021. It is expected that the mine will add 3.2 tonnes of gold to the Australian gold output from 2021–22 onwards.

Vista Gold received an approval from the Northern Territory government in mid-June 2021 to recommence operations at the mothballed Mount Todd gold mine. The site has been on care and maintenance since 2006. Heritage Minerals plans to reopen the 1.6 tonnes a year Mount Morgan gold mine in Queensland in 2023. The mine was once one of the richest in the world, but was contaminated with acid water and abandoned in 1990. Four companies have previously attempted and failed to revive the historic mine site — which produced its first gold in 1882.

Calidus' 4.3 tonnes of gold a year Warrawoona gold mine in WA is expected to commence production in the June quarter 2022, with 53% of project construction having been completed.

On 19 August 2021, Newcrest announced the approval of its Cadia PC 1-2 pre-feasibility study, and the allocation of $120 million funding towards the feasibility study and early works program to be commenced in the December quarter 2021.

**Figure 10.8: Australia's gold production**




Source: Department of Industry, Science, Energy and Resources (2020)

The construction of Oz Minerals' $600 million Wira shaft expansion at the Prominent Hill copper and gold mine in South Australia is expected to be completed in 2024. The average production is expected to be 3.4 tonnes a year from 2025 and onwards.

Resources and Energy Group restarted its Granny Venn gold mine in WA in July 2021. The mine ceased operations for 23 years, and is expected to produce 0.3 tonne of gold a year.

The risk to the outlook is the potential impacts of labour and skills shortages on Australian gold miners. Some parts of Australia are still implementing COVID-19 containment measures. Together with international border closures, these measures are likely to cause a postponement of new projects and a production cut from existing gold mines.

### Record gold exploration expenditure in 2020–21

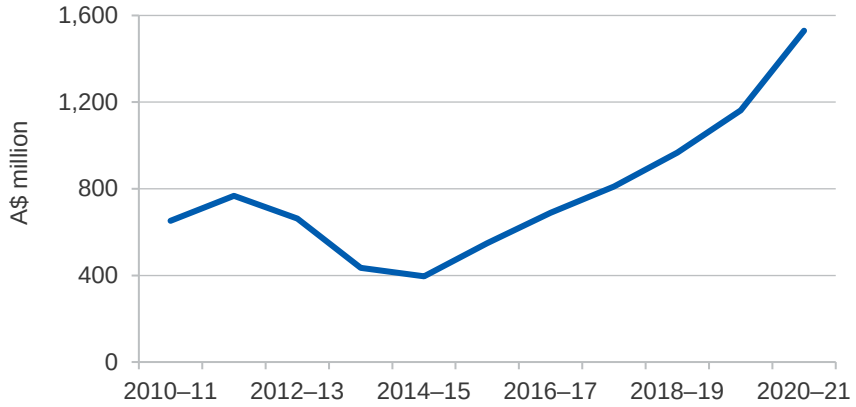
Australia's gold exploration expenditure reached a record high of $1.5 billion in 2020–21, up 32% from 2019–20, driven by higher US and Australian dollar gold prices (Figure 10.9). Gold accounted for 47% of Australia's total mineral exploration expenditure (at $3.2 billion) in 2020–21. Western Australia remained the centre of gold exploration activity in Australia in 2020–21, accounting for 70% (or $1.1 billion) of total gold exploration expenditure, followed by Victoria (10% or $153 million) and NSW (7.5% or $115 million).

Figure 10.10 shows Australia's major gold discoveries from 1990 to 2020. The largest discovery is Cadia East gold mine in NSW, found in 1994 and currently owned by Newcrest Mining. The mine has the gold contained total reserves resources of 995 tonnes of gold. The last major gold discovery in Australia is Winu copper and gold mine in WA, discovered in 2017 and currently owned by Rio Tinto. Winu has the contained total reserves resources of 137 tonnes of gold.

### Australia overtakes China as the world's largest gold producing country

Australia has overtaken China as the world's largest gold producing country in the first-half of 2021. Over this period, Australia produced 157 tonnes of gold, while China produced 153 tonnes of gold. China's gold production is forecast to fall by 11% in 2021, to 335 tonnes, as stricter environmental and safety regulations lead to mine closures. With a healthy investment pipeline, Australia's gold production is forecast to grow by 3.2% in 2021, to 338 tonnes. This growth is expected to confirm Australia's lead over China in 2021.

**Figure 10.9: Australian gold exploration expenditure**




Source: ABS (2021) Mineral and Petroleum Exploration, Australia, 8412.0

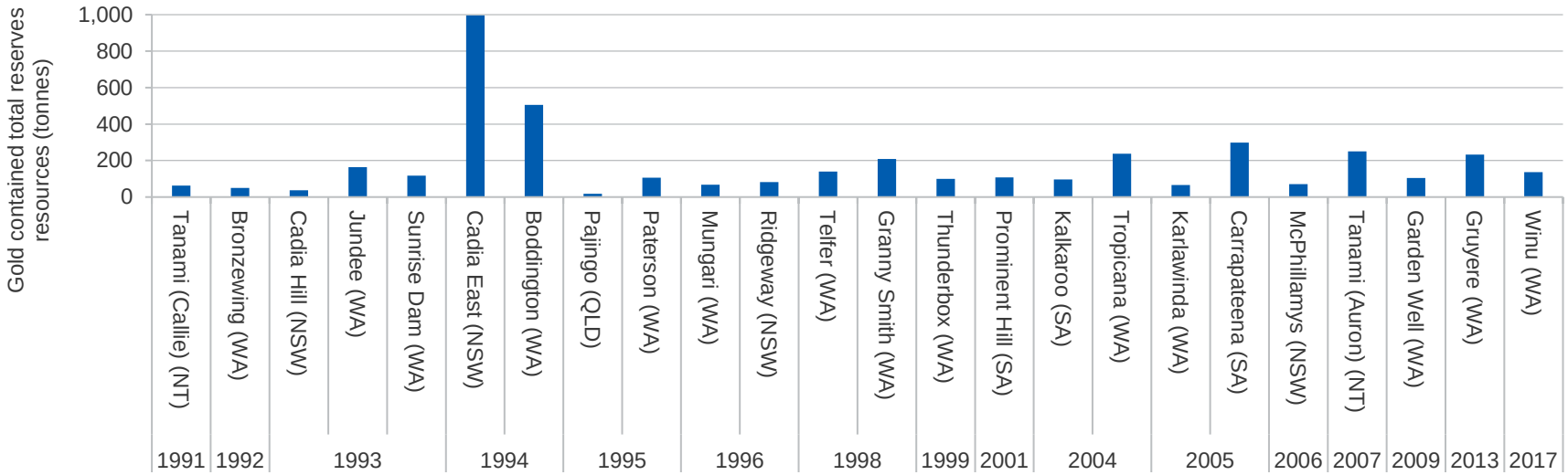
### Revisions to the outlook

The forecast for world gold supply in 2021 has been revised up by 1.1%, to 4,840 tonnes, reflecting a 2.0% upward revision of world gold supply in 2020 from the World Gold Council.

The forecast for Australian gold mine production in 2021–22 and 2022–23 has been revised down by 1.8% and 2.3%, to 372 and 379 tonnes, respectively, due to a downward revision of gold mine production of 3.0% in 2020–21.

The forecast for Australian gold exports in 2021–22 has been revised down by $240 million to $29 billion. Export earnings in 2022–23 have been revised down to $27 billion, down $1.2 billion from the forecast in the June 2021 *Resources and Energy Quarterly*, reflecting a larger than expected fall in export volumes to the UK, US and Switzerland.

**Figure 10.10: Australia's major gold discoveries, 1990 to 2020**




Source: S&P Global Market Intelligence

## Table 10.1: Gold outlook

| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| Total demand | tonnes | 3,732 | 4,057 | 4,222 | 4,535 | 8.7 | 4.1 | 7.4 |
| Fabrication consumption[b] | tonnes | 1,703 | 2,190 | 2,313 | 2,560 | 28.6 | 5.6 | 10.7 |
| Mine production | tonnes | 3,487 | 3,649 | 3,758 | 3,834 | 4.7 | 3.0 | 2.0 |
| Price[c] | | | | | | | | |
| Nominal | US$/oz | 1,770 | 1,785 | 1,701 | 1,634 | 0.9 | -4.7 | -3.9 |
| Real[d] | US$/oz | 1,830 | 1,785 | 1,662 | 1,557 | -2.5 | -6.9 | -6.3 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21** | **2021–22[f]** | **2022–23[f]** |
| Mine production | tonnes | 329 | 321 | 372 | 379 | -2.2 | 15.7 | 1.9 |
| Export volumes | tonnes | 350 | 283 | 379 | 384 | -19.0 | 33.9 | 1.3 |
| Export value - Nominal | A$m | 24,394 | 26,107 | 28,765 | 27,266 | 7.0 | 10.2 | -5.2 |
| Export value - Real[e] | A$m | 25,258 | 26,601 | 28,765 | 26,800 | 5.3 | 8.1 | -6.8 |
| Price | | | | | | | | |
| Nominal | A$/oz | 2,338 | 2,481 | 2,361 | 2,209 | 6.1 | -4.8 | -6.5 |
| Real[e] | A$/oz | 2,421 | 2,528 | 2,361 | 2,171 | 4.4 | -6.6 | -8.1 |

Notes: **b** includes jewellery consumption and industrial applications; **c** London Bullion Market Association; **d** In 2021 calendar year US dollars; **e** In 2021–22 financial year Australian dollars; **f** Forecast. Gold export volume contains ash, waste and scrap gold, of which the metal content is unknown.

Source: ABS (2021) International Trade, 5464.0; London Bullion Market Association (2021) gold price PM; World Gold Council (2021); Department of Industry, Science, Energy and Resources (2021).

# Aluminium

13 Al 26.982

## Major Australian bauxite deposits (Gt)


## Aluminium

- **Bauxite** 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 world's largest producer & consumer of **primary aluminium**
- Each electric vehicle **contains 0.25 tonne** of aluminium

## Key consumer markets for primary aluminium, 2020

**60%** China

**7%** United States

**3%** India

**3%** Germany

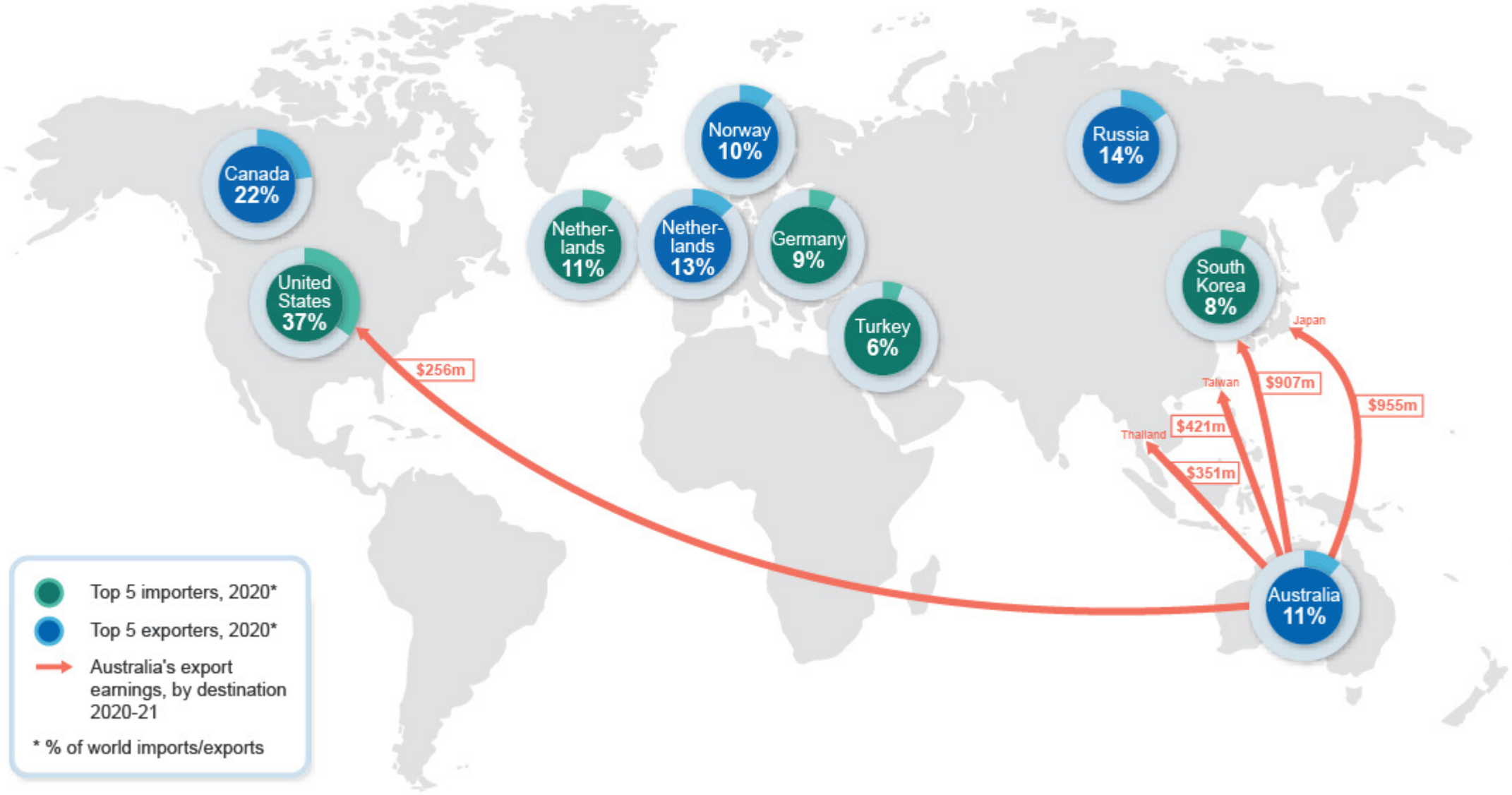
**3%** Vietnam

## Australia's aluminium

- **World's 1st** **bauxite** producing nation
- **World's 1st** **alumina** exporter in 2020
- **World's 2nd** **alumina** producer in 2020

# Aluminium

## Trade map | September 2021



## 11.1 Summary

- Political instability in Guinea, strong Chinese demand and constrained supply pushed the London Metal Exchange spot price for aluminium to a 13-year high of US$2,950 a tonne on 13 September 2021. World demand is expected to remain strong, and likely to see the primary aluminium price average US$2,384 a tonne in 2021 (up 40% from 2020), and to average over US$2,590 a tonne in 2023.
- Annual Australian output is expected to be broadly steady over the outlook period, remaining at around 1.6 million tonnes of aluminium and 21 million tonnes of alumina (see Australia section).
- The total value of Australian exports of aluminium, alumina and bauxite is forecast to increase at an annual average rate of 5.8% between 2021–22 and 2022–23, to reach nearly $14 billion by the end of the outlook period.

## 11.2 Consumption

### China drove global aluminium, alumina and bauxite usage in H1 2021

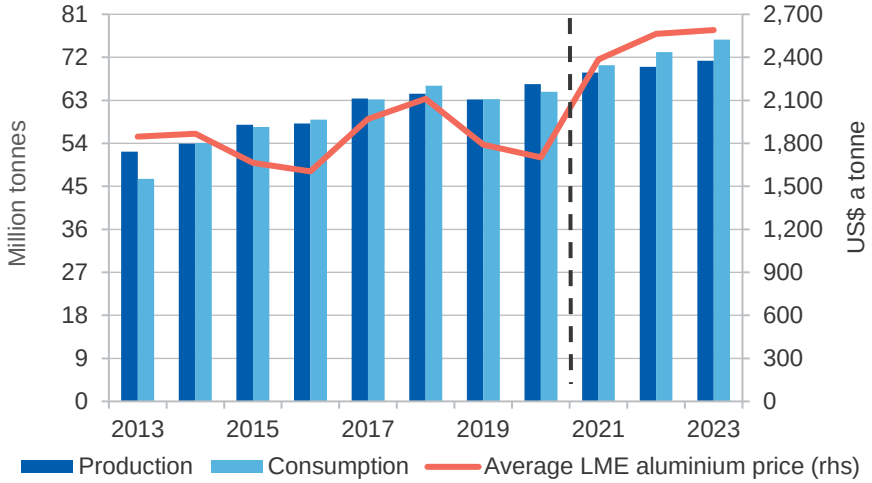
Global primary aluminium consumption increased by 11% year-on-year to 35 million tonnes in the first-half of 2021. This was driven by a 13% year-on-year rise in aluminium consumption in China — the world's largest aluminium consuming nation. The Chinese government's spending on infrastructure projects added substantially to primary aluminium demand.

India's primary aluminium consumption rose by 19% year-on-year to 966,000 tonnes in the first-half of 2021. Consumption is expected to rise further in the second half of 2021, after the Indian government recently announced further economic stimulus measures.

In Japan, primary aluminium demand increased by 13% year-on-year to 899,000 tonnes in the first-half of 2021, driven by increased aluminium use in new car models.

In the US, primary aluminium consumption fell by 8.9% year-on-year in the first-half of 2021, to 2.2 million tonnes, due to supply constraints.

**Figure 11.1: World aluminium production, consumption and prices**




Source: World Bureau of Metal Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

World primary aluminium consumption is forecast to increase by 8.6% to 70 million tonnes in 2021, propelled by a 10% rise in aluminium usage in China (Figure 11.1). China's primary aluminium imports are expected to continue to rise for the remainder of 2021, as the demand for primary aluminium is expected to outpace supply in China. While the Chinese government appears to have started to normalise monetary policy — to help contain inflation — economic growth is expected to remain high for the remainder of 2021.

A faster than expected withdrawal of stimulus from China would likely reduce the demand for primary aluminium. However, the proposed infrastructure spending in the US is likely to provide some offsetting support for primary aluminium demand.

The risk to primary aluminium demand is an expected fall in global automotive production and sales, due to supply issues. On 20 August

2021, Toyota announced a reduction of car production by 40% in September 2021, due to the shortage of microchips. According to IHS

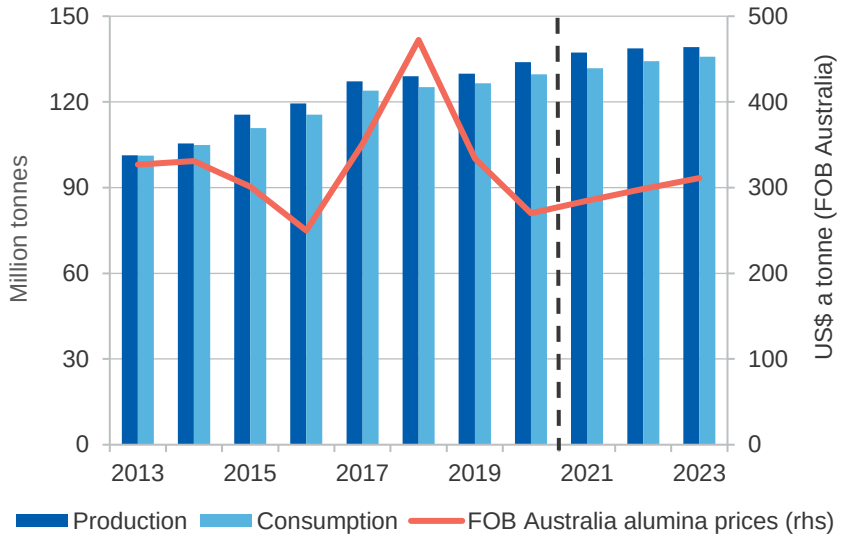
Markit, the global shortage of semiconductors is likely to cut global auto production by over 7.0 million units in 2021. The supply disruption is expected to remain until the second-half of 2022.

World alumina usage increased by 1.7% year-on-year in the first-half of 2021, to 65 million tonnes, driven by higher aluminium production (which was up by 6.1% year-on-year in the first-half of 2021).

World alumina demand is estimated to increase by 1.7% to nearly 131 million tonnes in 2021 (Figure 11.2). An expected 3.7% rise in global primary aluminium production in 2021 is likely to lift global alumina demand.

China is expected to contribute strongly to the growth in global alumina

**Figure 11.2: World alumina production, consumption and prices**




Source: World Bureau of Metal Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

demand, with an estimated 2.0 million tonnes of new primary aluminium capacity being added in 2021.

World bauxite usage increased by 4.1% year-on-year to 160 million tonnes in the first-half of 2021, propelled by increased global alumina production (up 6.2% year-on-year in the first-half of 2021) (see *Section 11.4 production*).

World bauxite consumption is forecast to grow by 5.0% to 323 million tonnes in 2021. The gains are expected to be driven by higher alumina output from existing refinery capacity in China and Brazil.

### Global recovery to lift aluminium/alumina/bauxite demand in 2022/2023

World primary aluminium demand is forecast to increase at an average annual rate of 3.7% in 2022 and 2023, to nearly 76 million tonnes by 2023 (Figure 11.1). The global economic recovery is expected to support demand for cars, houses and electrical equipment, and thus aluminium consumption. An expected increase in the use of renewable energy equipment — such as wind and solar power generators — will also boost primary aluminium demand over the outlook period.

China's primary aluminium consumption is expected to continue to grow strongly over the next two years, reaching 46 million tonnes in 2023. The Chinese government's ambitious initiatives for promoting electric vehicle production are expected to bolster the demand for aluminium. These initiatives are likely to at least partly offset the withdrawal of some economic stimulus programs.

World alumina consumption is forecast to rise at an average annual rate of 1.5% in 2022 and 2023, reaching 136 million tonnes in 2023 (Figure 11.2). The rise in alumina demand will be driven by a 1.8% rise in primary aluminium production forecast in 2022 and 2023.

World bauxite consumption is forecast to grow at an average annual rate of 3.6% in 2022 and 2023, reaching 346 million tonnes in 2023. This is expected to be driven by the ramp up of new alumina capacity in China and India.

## 11.3 Production

### Bauxite output fell, but aluminium and alumina output rose in H1 2021

Global primary aluminium production increased by 6.1% year-on-year to 34 million tonnes in the first-half of 2021, propelled by higher output in China — the world's largest aluminium producer. China produced nearly

20 million tonnes of primary aluminium over the first-half of 2021, up by 9.8% year-on-year, as primary aluminium producers responded to decade high primary aluminium prices.

Over the same period, primary aluminium production in Iran rose by 53% year-on-year to 250,000 tonnes, driven by the ramp up of production at the 1.0 million tonnes per year SALCO aluminium smelter. Primary aluminium production in Canada grew by 6.4% year-on-year, to 1.6 million tonnes. The growth is driven by the ramp up of production at the Alouette aluminium smelter (600,000 tonnes a year).

The Chinese government has implemented limits on some Chinese aluminium smelters to reduce their call on the nation's power grid. In April 2021, China's Industry and Information Technology Ministry started collecting energy consumption from smelters and refineries in energy intensive industries such as steel and aluminium. The Ministry is also conducting ongoing inspections to ensure the tiered electricity pricing systems for the aluminium industry are being properly implemented.

In March 2021, the provincial authority of Inner Mongolia in China requested two aluminium smelters in Baotou city to reduce output by 23,000 tonnes, in order to meet regional energy consumption targets.

The Yunnan Electric Power Dispatching Control Centre reduced the power supply to aluminium smelters in the Yunnan province between 10 and 20 May 2021, due to low hydro power generation in the midst of a drought. In a similar action, the Guangxi Power Corporation requested aluminium smelters in southern China's Guangxi region to reduce power consumption by more than 30% from 15 August 2021.

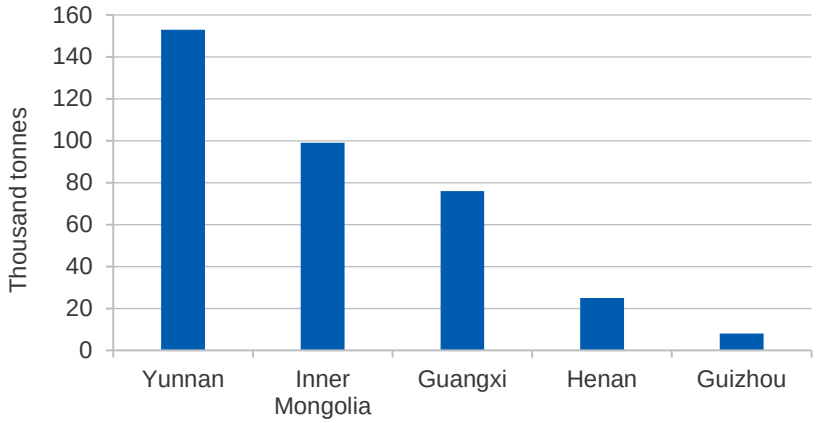
According to Macquarie Research, China's year-to-date reduction in primary aluminium production has reached 519,000 tonnes in August 2021, with Yunnan province accounting for 60% (or 153,000 tonnes), Inner Mongolia province 19% (or 99,000 tonnes), Guangxi province 15% (or 76,000 tonnes), Henan province 4.8% (or 25,000 tonnes) and Guizhou province 1.5% (or 8,000 tonnes) (Figure 11.3).

Offsetting this reduction, around 2.0 million tonnes of new primary aluminium capacity will be added to Chinese primary aluminium production capacity in 2021 — which is lower than the original forecast of an additional 3.3 million tonnes. As a result, China's total primary aluminium production in 2021 is forecast to be 39 million tonnes (up 5.2% from 2020).

Given such high world demand, Russian output is forecast to be impacted only modestly by a 15% export tax imposed from 1 August to end 2021.

Primary aluminium output in Norway is forecast to rise by 1.2% in 2021, to 1.3 million tonnes, driven by the restart of Hydro's Husnes aluminium smelter B line in November 2020. This B line is expected to add over 90,000 tonnes of primary aluminium a year to Norway's output.

**Figure 11.3: China's year-to-date primary aluminium production losses by province**




Source: Macquarie Research (2021)

In the United Arab Emirates, Emirates Global Aluminium recently brought online 26 new reduction cells at potline 1 of its Al-Taweelah aluminium smelter. These new reduction cells will add an extra 30,000 tonnes a year. Another 66 new reduction cells are expected to be operational by the end of 2021, adding a further 48,000 tonnes of annual capacity.

In the US, primary aluminium production is forecast to decline by 9.2% in 2021, to 933,000 tonnes, due to supply chain bottlenecks.

As a result, world primary aluminium production is forecast to increase by 3.7% in 2021 to nearly 69 million tonnes (Figure 11.1).

World alumina supply increased by 6.2% year-on-year in the first half of 2020, to 69 million tonnes, driven by a 13% year-on-year rise in China's alumina output. Chinese alumina refiners raised output to accommodate higher aluminium production. Over this period, production in Australia — the world's second largest alumina producer — fell by 1.1% year-on-year, to 10 million tonnes. The fall was due to the planned maintenance of South 32's Worsley alumina refinery in Western Australia.

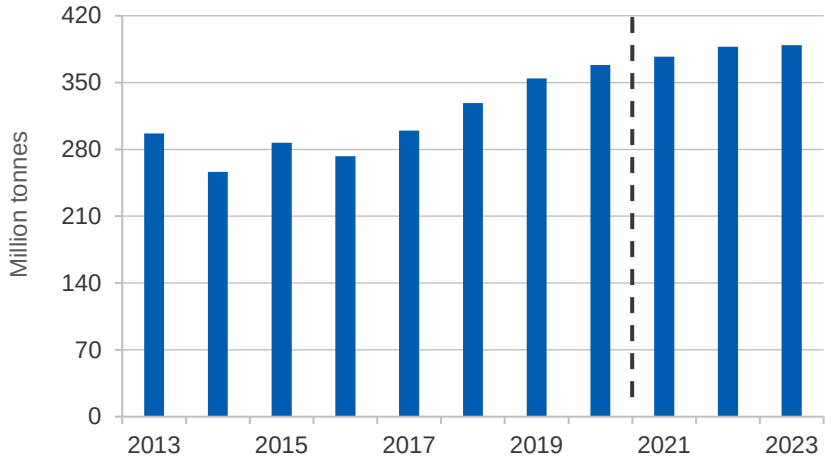
World alumina supply is forecast to rise by 3.3% to over 137 million tonnes in 2021, driven by higher output in China and India. In China, Aluminium Corporation of China's 2.0 million tonnes per year Huasheng Alumina Refinery started producing in September 2020, and is ramping up output in 2021. In India, Vedanta's 3.0 million tonnes per year Lanjigarh expansion project is expected to be completed in early 2023.

Production at the 1.4 million tonnes a year Jamalco alumina refinery in Jamaica has been in curtailment, following a fire incident in August 2021 that damaged the plant's power station. It is unlikely that the curtailment will be lifted in the coming months, as the refinery is struggling to find alternative power supply.

World bauxite supply decreased by 1.5% year-on-year in the first-half of 2021, to 185 million tonnes. Output in Australia — the world's largest bauxite producing country — fell by 2.0% year-on-year due to planned maintenance at Metro Mining's Bauxite Hills operation.

Over this period, bauxite production in Guinea — the world's second largest bauxite producing country — increased by 2.7% year-on-year, as the ramp up of production has continued.

**Figure 11.4: World bauxite production**




Source: Department of Industry, Science, Energy and Resources (2021)

For 2021, world bauxite supply is forecast to rise by 2.3%, to 377 million tonnes, driven by higher production in Australia (up 3.1% to 107 million tonnes) and Guinea (up 4.8% to 92 million tonnes) (Figure 11.4).

In Australia, the restart of Metro Mining's Bauxite Hills mine following wet season shutdown from September 2020 to March 2021 is likely to add 4.0 million tonnes to Australian bauxite output in 2021.

In Guinea, Chalco's Boffa bauxite mine is expected to reach its full capacity during the second-half of 2021, boosting output from 7.0 million tonnes in 2020 to 9.0 million tonnes in 2021.

In Inner Mongolia and Yunnan provinces, declining bauxite output (due to power restrictions) is likely to have an impact on China's alumina output in 2021.

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

World primary aluminium output is forecast to rise at an average annual rate of 1.8% in 2022 and 2023, to reach 71 million tonnes by 2023 (Figure 11.1). The gains are expected to be driven by additional capacity in China.

China's primary aluminium output is forecast to reach 41 million tonnes by 2023. This is edging closer to the capacity cap of 45 million tonnes of primary aluminium per year — a policy introduced by China's government in 2017, in response to environmental and oversupply concerns. The Chinese government's Five Year Plan (2021–25), set in October 2020, calls for China's production and capacity of both primary aluminium and alumina to peak by 2025. The closer China edges to its primary aluminium capacity cap, the greater the opportunity for other primary aluminium producing nations — such as Russia and Saudi Arabia — to fill the output gap.

Central and provincial authorities in China are expected to continue implementing strict environmental regulations — restricting energy consumption and emissions — from 2021 onwards.

World alumina supply is forecast to rise at an average annual rate of 0.7% in 2022 and 2023, reaching 140 million tonnes in 2023 (Figure 11.2). This growth will be driven by India and other small alumina refining nations.

In India, bauxite sourcing has improved, with Vedanta planning to lift capacity at its Lanjigarh refinery to 2.7 million tonnes in the short term, and to 6.0 million tonnes in the medium term. Hindalco's 1.5 million tonnes a year Utkal Alumina Refinery is expected to come online in 2022.

In Vietnam, Vietnam Coal and Minerals Industries Group's 650,000 tonnes a year Tan Rai Alumina Refinery is expected to commence commercial production in 2023.

In Indonesia, China Hongqiao and joint-venture partners' 2.0 million tonnes a year Well Harvest alumina refinery expansion project is expected to come online in 2022.

World bauxite output is forecast to grow at an average annual rate of 1.6% in 2022 and 2023, reaching 389 million tonnes by 2023 (Figure 11.4). The gains are expected to be driven by newly added capacity in Guinea, where production is rising rapidly.

Guinea's bauxite output is forecast to grow at an average 4.0% a year in 2022 and 2023. The Compagnie des Bauxites de Guinée mine in Guinea, which expanded from 13 to 18 million tonnes a year in 2019, is due to expand to 28 million tonnes by 2022. Emirates Global Aluminium is planning to ramp up output at its bauxite mine in Guinea, targeting 12 million tonnes per year towards the end of the outlook period.

The Indonesian government's decision to delay the reintroduction of bauxite export bans (from 2022 to June 2023) is expected to increase global bauxite supply. In August 2021, China's Tianshan Aluminium signed a cooperation deal with an unnamed Indonesian bauxite supplier to secure bauxite supply for its alumina refineries and aluminium smelters in China.

## 11. Prices

### Aluminium prices reached a 13-year high in September 2021

The spot price of aluminium reached a thirteen-year high of US$2,950 a tonne on 13 September 2021, driven by political instability in Guinea. At US$2,356 a tonne, the average London Metal Exchange (LME) spot price for primary aluminium has increased by 43% so far in 2021, compared to an average of US$1,809 a tonne in the second half of 2020.

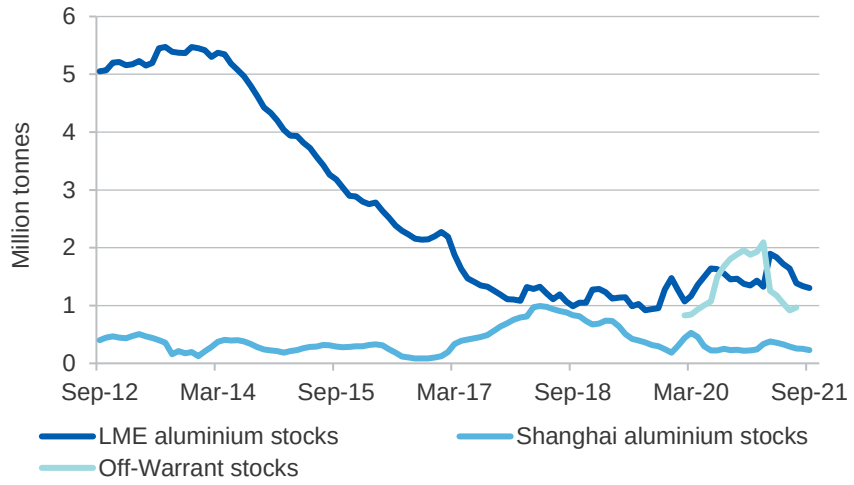
Rising demand is the main contributor to the price increase. Global demand for everything from beer cans to packaging has rebounded from the lows of the COVID-19 pandemic in 2020. Primary aluminium demand rose by 10% year-on-year in the first-half of 2021, consistent with the rise in global industrial production and the global economic recovery.

The increasing price of aluminium was also driven by production constraints placed on Chinese aluminium smelters to reduce energy demand (see *Section 11.4 production*).

Declining primary aluminium inventories are another contributor to the recent price strength. During the global financial crisis between mid-2007 and early 2009, most of the LME primary aluminium stocks were stored in Detroit (the US) and the Netherlands port of Vlissingen. However, the COVID-19 pandemic has changed the map of primary aluminium storage. Almost 90% of the LME primary aluminium stocks and 85% of off-warrant stocks are now sitting at Asian locations. Malaysia's Port Klang has overtaken Rotterdam as the largest hub of exchange approved warehousing capacity, reaching a 770,000 square metres capacity at the end of June 2021.

The redistribution of primary aluminium inventory from the US and Europe to Asia has increased the premiums (in excess of US$500 a tonne) that the US and European buyers need to pay to acquire aluminium. In the US, the premium was never higher than $485 a tonne in 2018, when the US government imposed import tariffs and sanctions on Russian aluminium producer Rusal.

**Figure 11.5: Exchange aluminium stocks**




Source: London Metal Exchange (2021); World Bureau of Metals Statistics (2021)

In an attempt to boost primary aluminium supply and to de-escalate the rise of aluminium prices, the Chinese government held three auctions in July and September 2021 to release 210,000 tonnes of primary aluminium from state reserves. It is estimated that around 900,000 tonnes of primary aluminium are still held in state reserves. The sale of state primary aluminium reserves seems to have had a very minimal impact on the markets, as it only accounts for 0.3% of China's total primary aluminium demand.

In a similar attempt to boost domestic primary aluminium supply and thus prevent prices from rising, the Russian government introduced new export taxes on primary aluminium, steel, nickel and copper on 24 June 2021. The export taxes commenced on 1 August 2021, and will end on 31 December 2021, with a base rate of 15% (or US$254 a tonne) of the export price.

Russia is the world's second largest primary aluminium exporter, accounting for 14% of global primary aluminium exports. In 2020, Russia produced 3.9 million tonnes of primary aluminium, and exported 1.8 million tonnes of primary aluminium. Russian primary aluminium export prices are lower than the LME primary aluminium spot prices by 25 to 33%, due to some transfer pricing mechanisms that allow a Russian subsidiary company to sell aluminium to a parent company at the costs to be absorbed by the parent company. Consequently, the increased taxes are likely to reduce Russian primary aluminium producer margins, and to have little impacts on global aluminium prices.

As a result, the LME primary aluminium spot price is forecast to average US$2,384 a tonne in 2021, up 40% from 2020 (Figure 11.6).

The free on board (FOB) Australian alumina price has increased 26% so far in 2021, at US$385 a tonne on 16 September 2021 — compared to an average of US$267 a tonne in the first nine months of 2020 — driven by the political instability in Guinea.

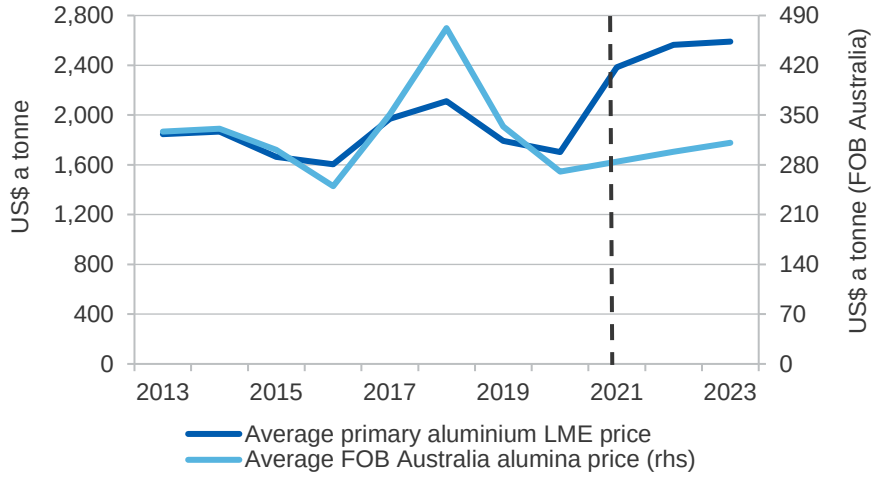
The FOB Australian alumina price is forecast to increase by 5.3% in 2021, to US$285 a tonne, driven by increased primary aluminium production in China (Figure 11.6).

### Aluminium and alumina prices expected to rise in 2022 and 2023

The LME aluminium spot price is forecast to increase by 7.6% to average US$2,565 a tonne in 2022, and to rise by a further 1.0% to average US$2,590 a tonne in 2023 (Figure 11.6). Rising primary aluminium consumption in China — the world's largest primary aluminium consuming nation — and in the global transport industry (aviation and car manufacturing) are expected to be significant drivers of increased aluminium prices.

The FOB Australian alumina price is forecast to rise at an average annual rate of 4.6% in 2022 and 2023, to US$310 a tonne by 2023 (Figure 11.6). A forecast 1.8% average annual rise in world aluminium production in 2022 and 2023 is expected to provide support to alumina prices.

**Figure 11.6: World primary aluminium and alumina prices**




Source: LME (2021) spot prices; Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

## 11.4 Australia's exports and production

### Lower aluminium/bauxite export volumes cut export values in 2020–21

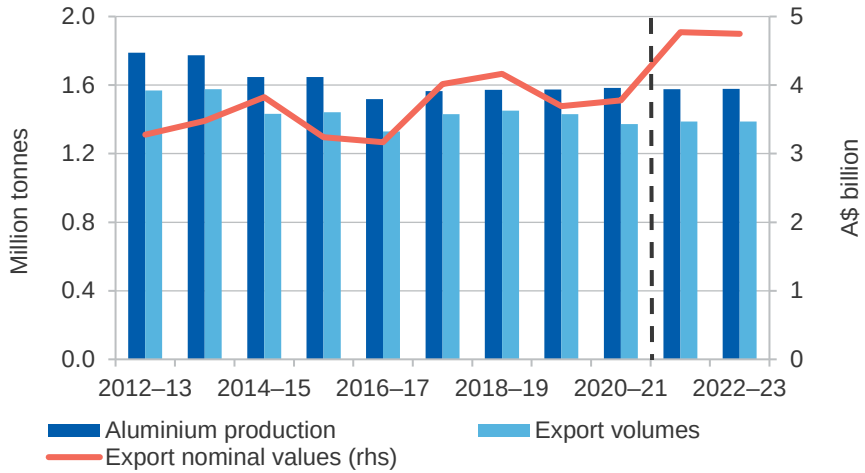
Australia's aluminium, alumina and bauxite exports declined by 5.7% to $12 billion in 2020–21. Lower aluminium and bauxite export volumes were offset by higher aluminium prices and higher alumina export volumes.

### Exports to rise over the outlook period

An expected gain in aluminium prices over the outlook period is likely to provide additional earnings for Australian aluminium smelters. Australia's aluminium, alumina and bauxite exports are forecast to increase by 12% in 2021–22 and by 0.5% in 2022–23, reaching nearly $14 billion in 2022–23.

The political instability in Guinea has the potential to impact global bauxite production and exports. Guinea is the world's second largest bauxite producer and the world's largest bauxite exporter. In 2020, Guinea produced 88 million tonnes of bauxite (accounted for 24% of global bauxite output), and exported 83 million tonnes of bauxite (accounted for 55% of global bauxite exports).

**Figure 11.7: Australia's aluminium exports and production**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

The political instability in Guinea is likely to provide an opportunity for Australian bauxite exporters to fill the potential production and export shortfall from Guinea. In 2020, Australia produced 104 million tonnes of bauxite (accounted for 28% of global bauxite output), and exported 37 million tonnes of bauxite (accounted for 25% of global bauxite exports). As the world's largest bauxite producer and the world's second largest bauxite exporter, Australia has the capacity to supply additional bauxite to the world, particularly to the Chinese bauxite market.

In the short-term, the risk to the assessment of Australian bauxite exports is the rise of Guinea as a major bauxite exporter to China (Figure 11.10). In July 2021, China Railway Construction Corporation completed the construction of a railway line from Boffa bauxite mine to Boke special economic zone. The railway line is expected to increase the transport of bauxite for export from 5,000 to 10,000 tonnes per freight trip.

The cost of shipping alumina from Australia to China has increased from an average US$18.00 to US$50.00 a tonne during the COVID-19 pandemic, due to the disruptions in the global shipping industry. This increased freight cost is impacting Australian alumina exporters' margins and competitiveness, and is unlikely to be completely resolved in 2021–22.

### Higher aluminium and alumina output, but 2020–21 bauxite output lower

Australia's aluminium output rose by 0.8% in 2020–21, to nearly 1.6 million tonnes, driven by a 1.0% output rise at Rio Tinto's Boyne Island aluminium smelter in Queensland and a 0.5% rise at Rio Tinto's joint-venture Tomago aluminium smelter in NSW.

Australia's alumina output increased by 1.6% in 2020–21 to nearly 21 million tonnes. The increase is attributed to an 8.1% rise in Rio Tinto's joint-venture Queensland Alumina Limited in Queensland, and a 0.2% rise in Rio Tinto's Yarwun alumina refinery in Queensland.

Australia's bauxite production fell by 3.8% to 103 million tonnes in 2020–21, due to the suspension of operations at Metro Mining's 6.0 million tonnes a year Bauxite Hills mine in Queensland (from September 2020 to March 2021) due to the wet season shutdown and planned maintenance.

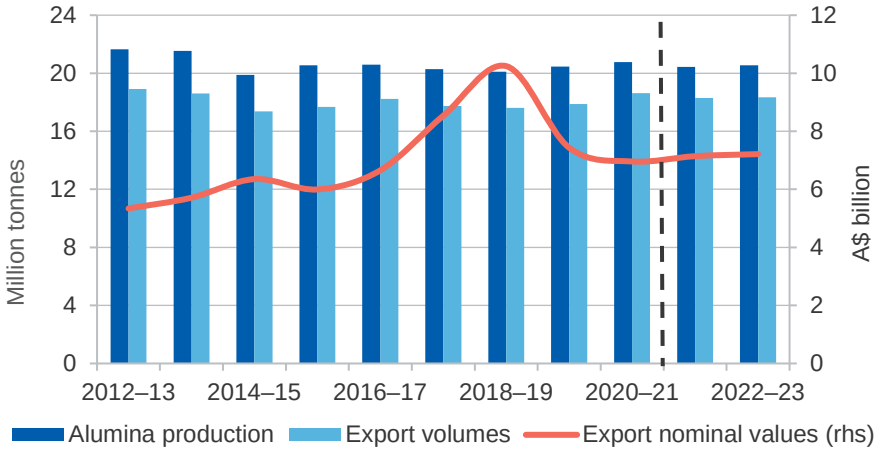
### Steady aluminium, alumina and bauxite production over the outlook period

No expansions or major disruptions are expected at existing aluminium and alumina operations in Australia over the outlook period. Australia's aluminium output is forecast to remain at about 1.6 million tonnes a year out to 2022–23 (Figure 11.7). Alumina output is expected to remain at about 21 million tonnes per annum over the outlook period (Figure 11.8).

Australia's bauxite output is forecast to rise at an average annual rate of 3.1% in 2021–22 and 2022–23, reaching 109 million tonnes in 2022–23 (Figure 11.9). Metro Mining's Bauxite Hills mine in Queensland is expected to reach full production capacity of 6.0 million tonnes a year by the December quarter 2021.

In June 2020, Alcoa Australia applied to the Western Australia Environmental Protection Authority (WA EPA) to increase alumina production at its Pinjarra refinery from 5.0 to 5.25 million tonnes a year.

**Figure 11.8: Australia's alumina exports and production**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

The company also applied to the WA EPA to increase bauxite production at its Huntly mine (annual production of 26 million tonnes). Both applications are being assessed by the WA EPA.

On 25 May 2021, Alumina Limited — the co-owner of Wagerup and Pinjarra alumina refineries in Western Australia — indicated the possibility of revisiting the expansion plan for Wagerup and Pinjarra in the coming years, as alumina demand is forecast to outpace the alumina supply.

On 10 August 2021, Tomago Aluminium — Australia's largest electricity user — indicated the smelter is in talks with a range of energy suppliers for wind, solar, hydro power. The smelter indicated that it aims to switch to a renewable power supply in 2029, with gas fired power as a back-up.

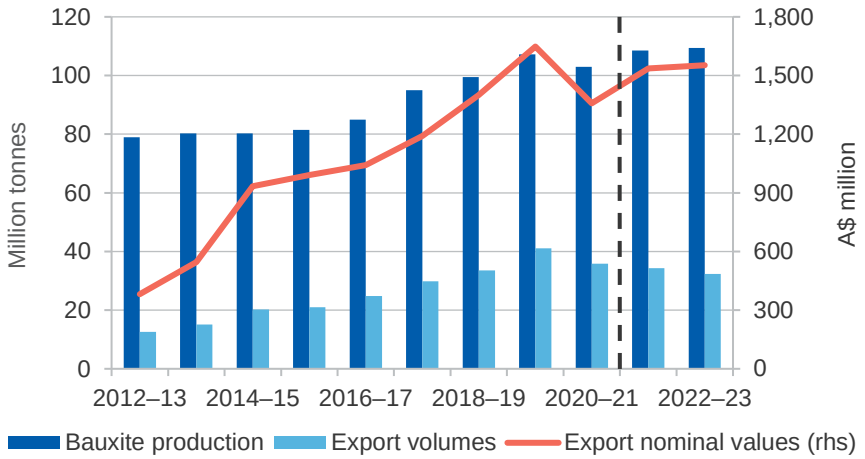
On 24 August 2021, Rio Tinto and Sumitomo Corporation of Japan announced a study of the construction of a hydrogen pilot plant at their joint-venture Yarwun alumina refinery in Gladstone, Queensland. The study is to explore the potential use of hydrogen at the refinery and in the Gladstone area.

## Revisions to the outlook

The forecast for Australia's aluminium, alumina and bauxite exports earnings has been revised up from the June 2021 *Resources and Energy Quarterly* — by $1.0 billion to $13.4 billion in 2021–22, and by $853 million to nearly $14 billion in 2022–23.

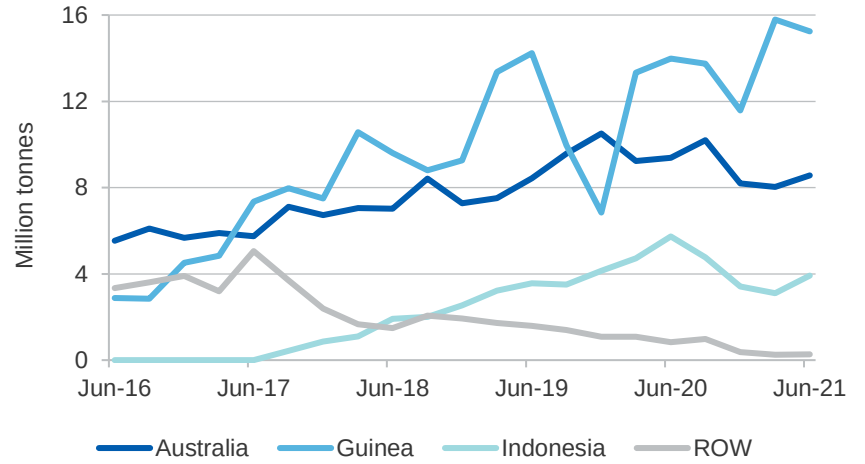
The revision reflects a larger-than-expected rise in aluminium prices in the first nine months of 2021. The forecast for the LME aluminium spot price has been revised up by 12% (or US$250 a tonne) in 2021 from the June 2021 *Resources and Energy Quarterly*.

**Figure 11.9: Australia's bauxite exports and production**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

**Figure 11.10: China's bauxite imports by country**




Notes: ROW: Rest of the world
Source: Bloomberg (2021)

## Table 11.1: Aluminium, alumina and bauxite outlook

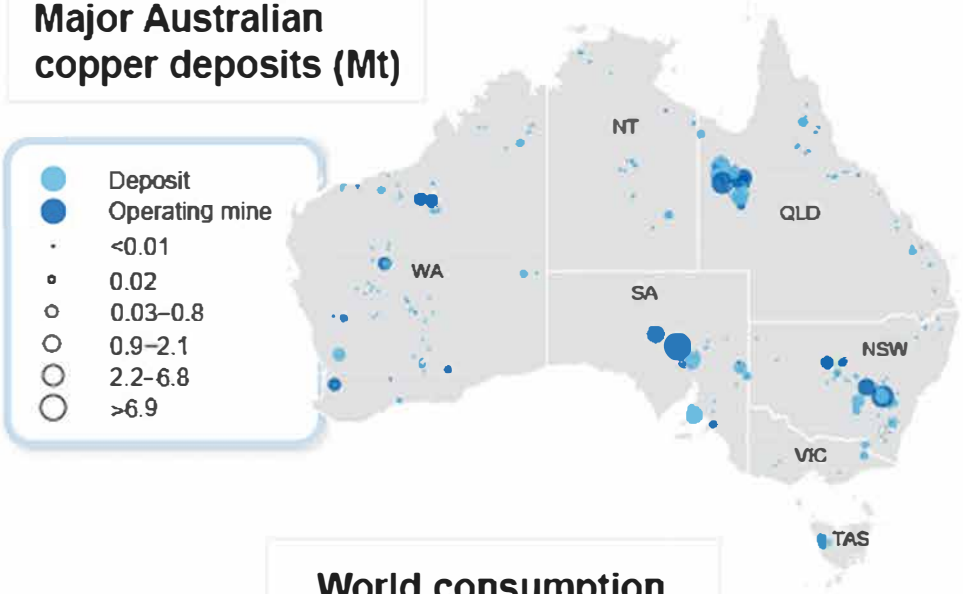
| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| **Primary aluminium** | | | | | | | | |
| Production | kt | 66,367 | 68,806 | 70,019 | 71,302 | 3.7 | 1.8 | 1.8 |
| Consumption | kt | 64,785 | 70,347 | 73,092 | 75,705 | 8.6 | 3.9 | 3.6 |
| **Prices aluminium[c]** | | | | | | | | |
| - nominal | US$/t | 1,702 | 2,384 | 2,565 | 2,590 | 40.1 | 7.6 | 1.0 |
| - real[d] | US$/t | 1,760 | 2,384 | 2,504 | 2,468 | 35.5 | 5.0 | -1.5 |
| **Prices alumina** spot | | | | | | | | |
| - nominal | US$/t | 270 | 285 | 299 | 311 | 5.3 | 4.9 | 4.2 |
| - real[d] | US$/t | 279 | 285 | 292 | 296 | 1.8 | 2.5 | 1.7 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21** | **2021–22[f]** | **2022–23[f]** |
| **Production** | | | | | | | | |
| Primary aluminium | kt | 1,574 | 1,584 | 1,576 | 1,577 | 0.6 | -0.5 | 0.1 |
| Alumina | kt | 20,451 | 20,948 | 20,443 | 20,556 | 2.4 | -2.4 | 0.6 |
| Bauxite | Mt | 107.2 | 103.0 | 108.6 | 109.4 | -4.0 | 5.4 | 0.7 |
| **Consumption** | | | | | | | | |
| Primary aluminium | kt | 199 | 280 | 237 | 238 | 40.5 | -15.3 | 0.3 |
| **Exports** | | | | | | | | |
| Primary aluminium | kt | 1,430 | 1,357 | 1,387 | 1,387 | -5.1 | 2.2 | 0.0 |
| - nominal value | A$m | 3,692 | 3,747 | 4,771 | 4,746 | 1.5 | 27.3 | -0.5 |
| - real value[e] | A$m | 3,823 | 3,818 | 4,771 | 4,665 | -0.1 | 25.0 | -2.2 |
| Alumina | kt | 17,876 | 18,600 | 18,299 | 18,336 | 4.0 | -1.6 | 0.2 |
| - nominal value | A$m | 7,431 | 6,949 | 7,143 | 7,214 | -6.5 | 2.8 | 1.0 |
| - real value[e] | A$m | 7,695 | 7,080 | 7,143 | 7,091 | -8.0 | 0.9 | -0.7 |
| Bauxite | kt | 41,026 | 35,753 | 34,289 | 32,384 | -12.9 | -4.1 | -5.6 |
| - nominal value | A$m | 1,648 | 1,348 | 1,537 | 1,552 | -18.2 | 14.0 | 1.0 |
| - real value[e] | A$m | 1,706 | 1,374 | 1,537 | 1,526 | -19.5 | 11.8 | -0.7 |
| Total value | | | | | | | | |
| - nominal value | A$m | 12,771 | 12,045 | 13,451 | 13,512 | -5.7 | 11.7 | 0.5 |
| - real value[e] | A$m | 13,224 | 12,272 | 13,451 | 13,282 | -7.2 | 9.6 | -1.3 |

Notes: **c** LME cash prices for primary aluminium; **d** In 2021 calendar year US dollars; **e** In 2021–22 financial year Australian dollars; **f** Forecast.

Source: ABS (2021) International Trade in Goods and Services, 5464.0; AME Group (2021); LME (2021); Department of Industry, Science, Energy and Resources (2021); International Aluminium Institute (2021); World Bureau of Metal Statistics (2021).

# 29 Cu 63.546 Copper

## Major Australian copper deposits (Mt)




## Copper facts

- The average home contains **180 kg of copper**
- 80% of copper ever produced **is still in use today**
- An electric car contains about **5x more copper** than an equivalent ICE car
- China consumes half of the **world's copper**

## World consumption

- **31%** Equipment
- **30%** Building Construction
- **15%** Infrastructure
- **12%** Transport
- **12%** Industrial

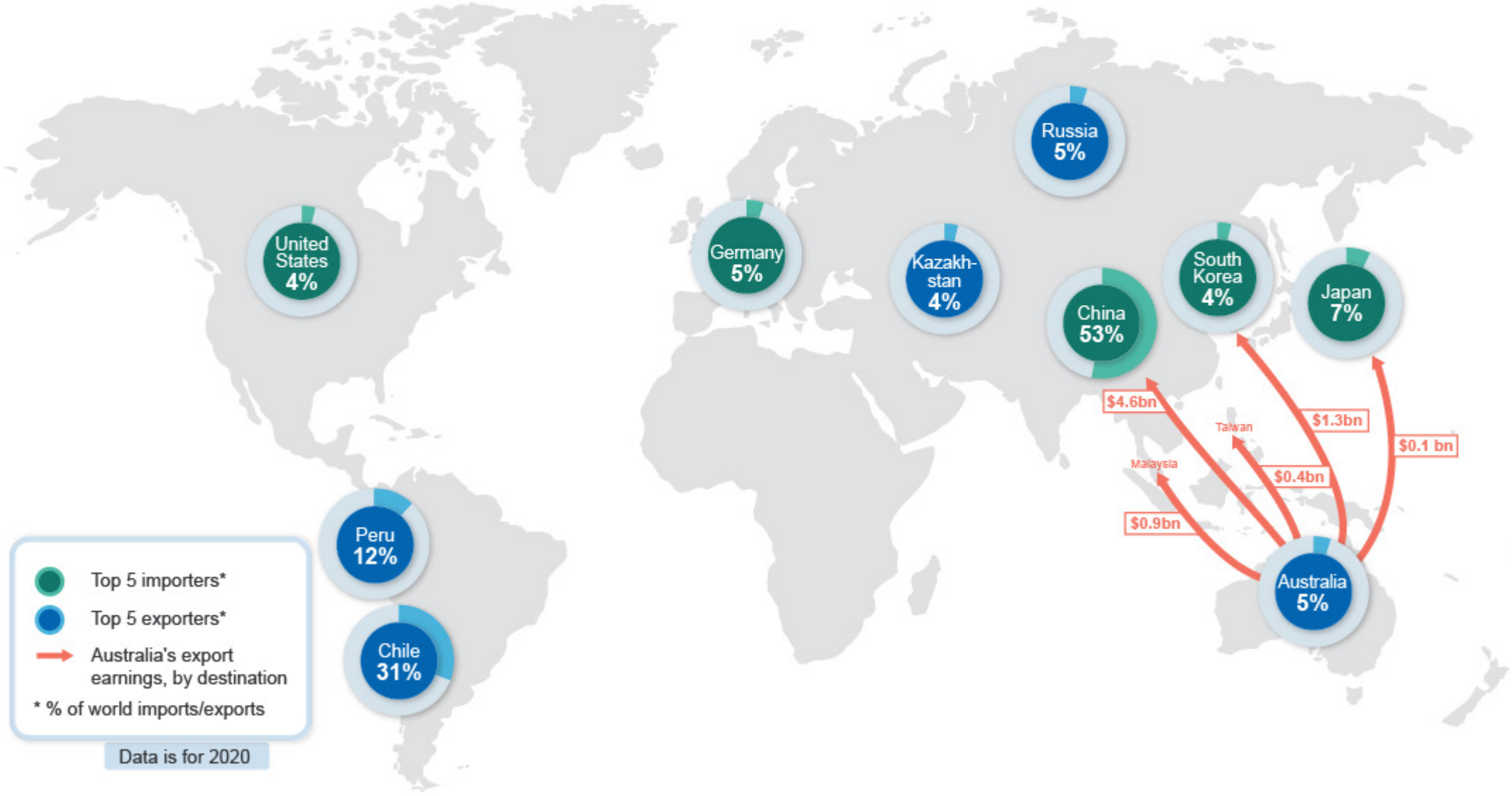
## Australia's copper

- **Ranked no 2** for **copper resources**
- **6th largest mined copper producer** in the world
- **Copper exports** worth more than **$10 billion** in 2020

29 Cu 63.546

# Copper

## Trade map | September 2021



## 12.1 Summary

- Copper prices have surged in 2021, and are expected to retain most of this gain in the years ahead, with demand supported by economic recovery and the expanding use of copper in low-emissions technology. Prices are forecast to ease back from US$9,122 a tonne in 2021, to a still strong US$8,650 a tonne by 2023.
- Australia's copper export volumes are expected to increase slightly over the outlook period, from 905,000 tonnes in 2020–21, to around 909,000 tonnes in 2022–23 (in metal content terms) (see *Australia section*).
- Australia's copper export earnings are expected to increase as price gains in late 2021 are carried into subsequent years. Export earnings are forecast to rise from $11.4 billion in 2020–21 to $14.4 billion by 2022–23.

## 12.1 World consumption

### Consumption boosted by infrastructure and 'green' stimulus

Copper is entering a stronger demand phase, supported in the immediate term by economic recovery and a pickup in industrial production, and in the longer term by the global energy transition — which is boosting demand for copper in renewable energy technology and battery storage. Emerging technologies, such as electric vehicles and portable consumer devices, are also likely to play a role in building copper demand over time. Infrastructure spending in a range of countries (most notably the US) presents a further potential upside to copper demand over the outlook period, though the scale of this is not yet clear.

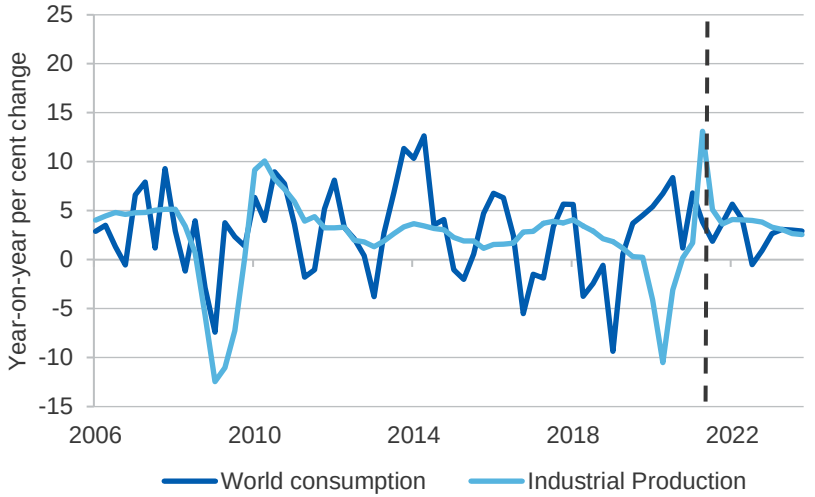
Refined copper consumption is expected to increase by 4.4% in 2021, to reach 26 million tonnes, with activity expected to follow broader trends in industrial production (Figure 12.1). Total world consumption is forecast to reach 27 million tonnes in 2023, increasing by 5% over the two years of the outlook period.

### China's consumption supports the copper market significantly

China accounted for more than half (54%) of global refined copper consumption in 2020 (Figure 12.2), in addition to being the largest refiner of copper (42%). This position at the heart of the global copper market makes China highly influential with regard to global copper prices and investment decisions.

A renewed wave of COVID-19 infections may reduce growth in Chinese industrial production, and has already closed several significant ports used in the shipment of copper. China's Performance of Manufacturing index fell to 50.3 in July 2021, indicating very slow growth from June. Chinese copper consumption peaked in the September quarter 2020 and subsequently declined for two quarters, but is now recovering again at a moderate pace.

**Figure 12.1: World copper consumption and industrial production**




Source: World Bureau of Metal Statistics (2021); Bloomberg (2021) Netherland CPB; Department of Industry, Innovation and Science (2021)

## 12.2 World production

### World production to grow, despite constraining factors

Mine production is forecast to reach 25 million tonnes in 2023, up from 22 million tonnes in 2021. High prices, and expectations of future price and demand growth, are creating a strong incentive for development projects, while producers balance declining ore grades and potential changes to taxation arrangements in Chile. Long project development timelines may result in production taking some time to come online, despite the incentive of recent price growth. Over the outlook period the largest production increases are expected to come from Peru and Chile (Figure 12.3), though both countries face some short-term issues in bringing product to export markets.

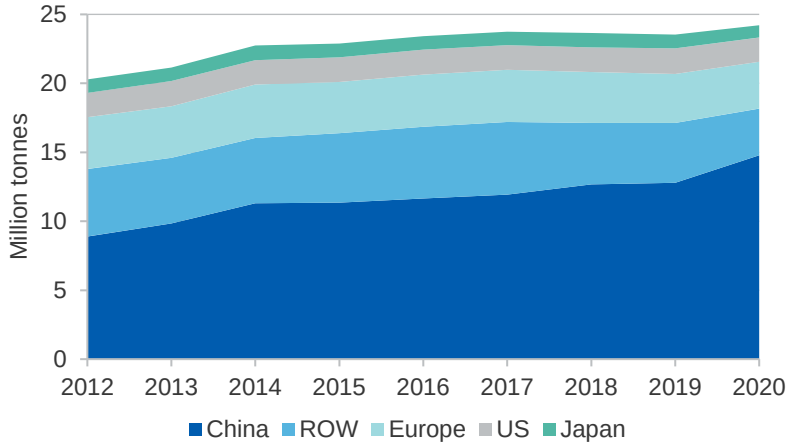
Growth is also expected in Russia, with a Russian and Kazakhstani joint development finalising an agreement to mine the large Tarutinsky copper deposit in Russia's Chelyabinsk region. The mine is expected to yield a capacity of 750,000 tonnes per year, over a 9.5 year mine life, and is expected to be largely directed to export markets.

### Chile and Peru look to expand production amid operating uncertainty

Peru, which is the second largest producer of copper, is facing production issues at its Las Bambas mine, which is one of the largest copper mines in the world. The mine has faced environmental issues due to heavy traffic imposed on local roads, and by the spread of mineral dust, which has been identified as a risk to agriculture in the region. A two-week truce negotiated by the Government has recently broken down, with road blockages and protest activity likely to result.

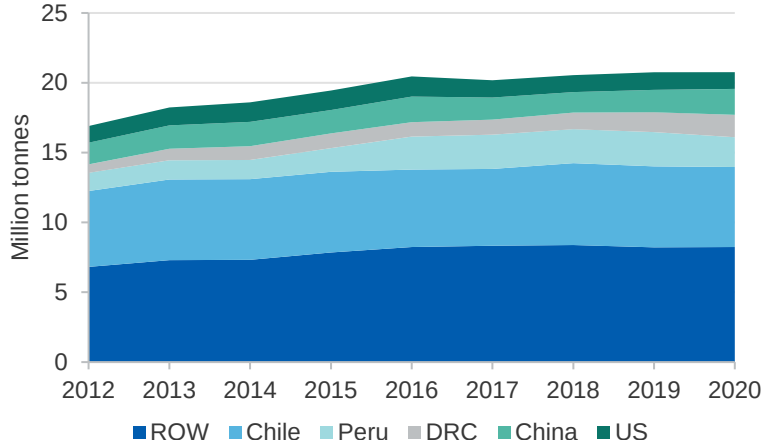
In Chile, production at the large Escondida mine dropped by 10% in 2020–21 as a result of lower feed grade and lower cathode production. Cuts in cathode production resulted from temporary workforce reductions associated with the COVID-19 pandemic. Declines in the grade at the mine (noted over the past 2-3 years in financial statements) are likely to continue in 2022, though output is expected to hold up through to 2023.

**Figure 12.2: Refined copper consumption by major market**




Source: World Bureau of Metal Statistics (2021); Department of Industry, Innovation and Science (2021)

**Figure 12.3: Mined copper production by major producers**




Source: World Bureau of Metal Statistics (2021); Department of Industry, Innovation and Science (2021)

### Strong momentum in refined production growth

After increasing by 3% in 2020, refined copper production is forecast to grow by 4.4% in 2021 to 25 million tonnes (Figure 12.4), as new refining capacity comes online in China, and high prices encourage increased processing rates. Refined production is expected to grow by 7% over the next two years, to reach 27 million tonnes in 2023. This is expected to slightly exceed growth in consumption, reducing some of the upward price pressure in the global copper market.

There remain some downside risks to production growth, which could potentially prevent any significant price easing over the next two years. China's refinery output has been affected by input shortages repeatedly since 2020. Refineries have also experienced concentrate shortages (influenced by reduced South American output) and sulphuric acid shortages. China's refineries may also moderate output in an effort to reduce carbon emissions, taking voluntary measures before becoming part of China's industry peak emissions target in 2025. Shifts towards emissions reductions and changes to scrap import restrictions have already seen rises in copper scrap imports.

## 12.3 Prices

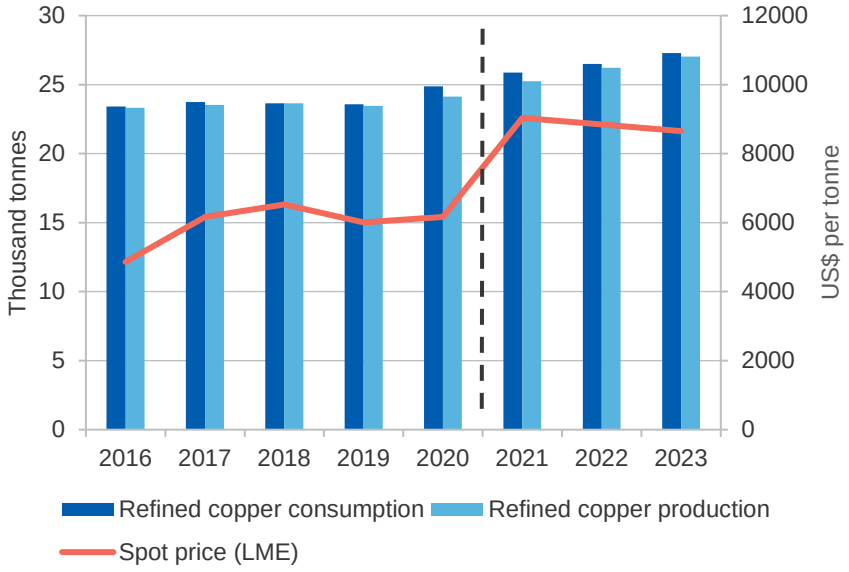
### Copper prices shoot beyond expectations

Copper prices rose to a record level (US$10,720 tonne) in May 2021, propelled by rising demand for material used in low emission technologies and batteries, fears of shortages, rising industrial activity in China, and the prospect of infrastructure rollouts in the US. However, some moderation in buying — particularly in China, amidst a rise in COVID-19 infections — and the release of Chinese strategic reserves of copper, has taken some heat out of the market. The scale of infrastructure investment likely to roll out in the US also remains unclear, adding to uncertainty over the pace of economic/industrial activity over the rest of 2021 and into 2022.

Prices are expected to remain at relatively strong levels over the remainder of 2021, supported by supply pressures. The spot copper price is forecast to average US$9,122 a tonne in 2021, and end the year just short of US$8,500 a tonne. Upside risks to this forecast include the possibility of labour disputes at the Escondida mine in Chile, which has potential to affect supply at short notice. Inventories, which remain somewhat depleted, could also pose risks to price forecasts, with the potential for prices to respond sharply in the event of further depletion or market fears of emerging shortages. However, China's recent announcement that more copper reserves could be released — in the event of price spikes — may moderate upward price effects over the remainder of 2021.

The steady release of government policy details relating to low-emissions technology uptake in major industrial economies, will also help stabilise markets. In 2023, the copper spot price is forecast to average US$8,650 a tonne, lower than current levels but well above 2020 prices.

**Figure 12.4: World balance of refined copper market**




Source: LME (2021) official cash price; World Bureau Metal Statistics (2021); Department of Industry, Science, Energy and Resources (2021)

## 12.4 Australia

### Price growth is providing strong revenue to exporters

Export earnings lifted from $10 billion in 2019–20 to $11.4 billion in 2020–21. Earnings are expected to rise further over the forecast period, to $14.4 billion by 2022–23 (Figure 12.5). This is expected to be achieved through some volume growth and by the retention of some of the price surge recorded in late 2021.

### Copper export volumes to remain stable over outlook period

Copper export volumes are recovering from a brief fall brought about by planned maintenance at BHP's Olympic Dam facility. Capacity upgrades under consideration at the site are expected to support a lift in export volumes over the outlook period. Volumes of ores and concentrates exports are expected to rise from 1,711,000 tonnes in 2020–21 to 1,828,000 tonnes by 2022–23.

### Copper production down before new capacity comes online

Mine production has been affected by lower processing rates at a number of sites. However, a recovery is expected over the outlook period, with mine production forecast to grow by 0.7% in 2021-22 and by 2.9% in 2022–23.

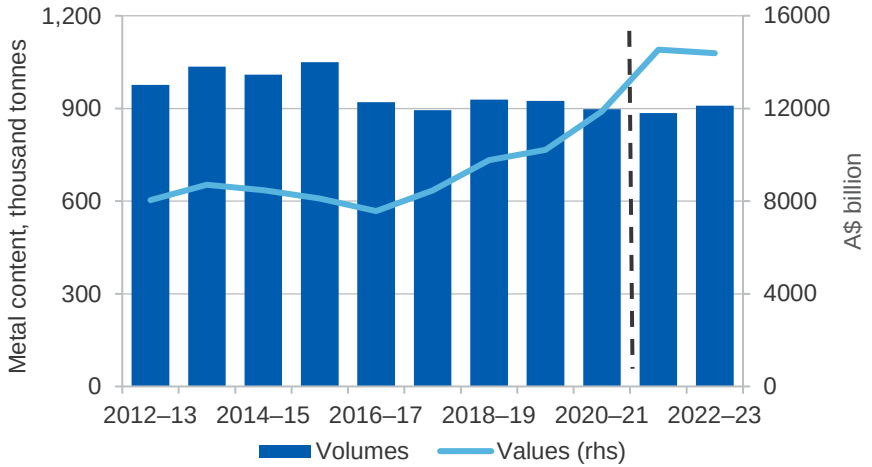
Copper exports are expected to be supported over the next few years by a number of project developments. These include Golden Cross Resources' Copper Hill project, KGL Resources' Jervois project and Havilah Resources' Kalkaroo project, which are all under development.

The Nifty copper mine in Western Australia has been acquired by Cyprium, after being placed on care and maintenance in 2019. The new owners noted in their 2020 Annual Report that the processing method is expected to change to heap leaching to produce copper metal plate. Under this model, annual capacity is 20,000 tonnes, and Cyprium is targeting first production at the end of 2022.

### Consistent refinery production over outlook

Refined copper production is expected to remain largely stable over the outlook period, edging back slightly to 398,000 tonnes to 2022–23. Refinery production at BHP's Olympic Dam facility eased slightly in the June quarter, following strong growth in the March quarter. Refinery production at the site is expected to ease slightly in 2021–22, due to planned maintenance. But further upgrade works are expected to support growth in refinery production at the facility over the longer term.

**Figure 12.5: Australia's copper export volumes and values**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

### Copper exploration picks up in June quarter 2021

Copper exploration reached $120 million in the June 2021 quarter, up 16% quarter-on-quarter and 44% year-on-year. Recent high prices have improved the prospects for most copper projects and encouraged exploration to identify new ones.

### Revisions to the outlook

Export earnings for 2021–22 and 2022–23 have been revised up by around $2 billion since the June *Resource and Energy Quarterly*. This is largely a result of higher than expected growth in copper prices.

## Table 12.1: Copper outlook

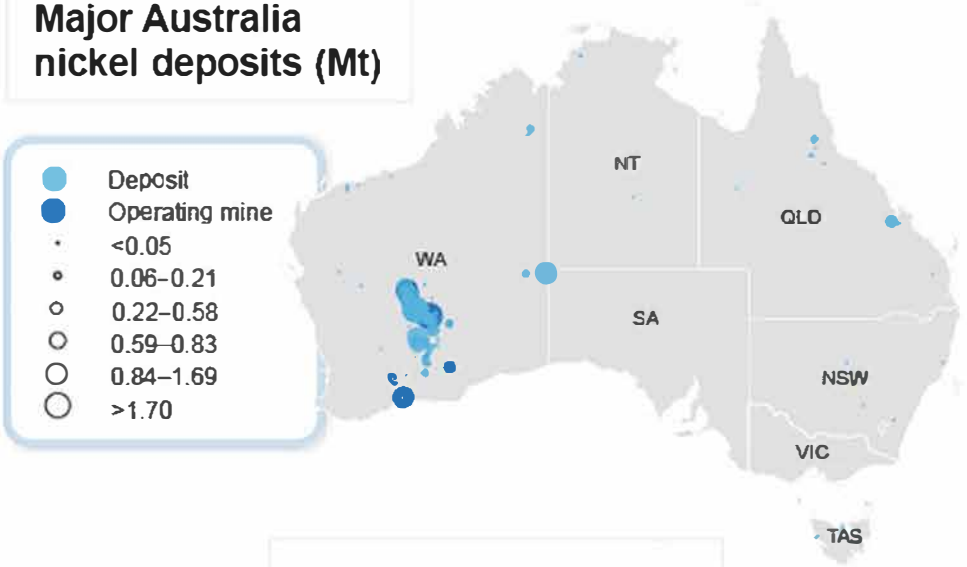
| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| Production | | | | | | | | |
| – mine | kt | 20,670 | 21,694 | 23,128 | 24,192 | 5.0 | 6.6 | 4.6 |
| – refined | kt | 24,122 | 25,183 | 26,228 | 27,041 | 4.4 | 4.1 | 3.1 |
| Consumption | kt | 24,885 | 25,975 | 26,502 | 27,278 | 4.4 | 2.0 | 2.9 |
| Closing stocks | kt | 1 315 | 1 148 | 1 064 | 975 | -12.7 | -7.3 | -8.4 |
| – weeks of consumption | | 2.7 | 2.3 | 2.1 | 1.9 | -16.3 | -9.2 | -11.0 |
| Prices LME | | | | | | | | |
| – nominal | US$/t | 6,169 | 9,122 | 8,846 | 8,650 | 47.9 | -3.0 | -2.2 |
| | USc/lb | 280 | 414 | 401 | 392 | 47.9 | -3.0 | -2.2 |
| – real[b] | US$/t | 6,379 | 9,122 | 8,639 | 8,241 | 43.0 | -5.3 | -4.6 |
| | USc/lb | 289 | 414 | 392 | 374 | 43.0 | -5.3 | -4.6 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Mine output | kt | 905 | 878 | 884 | 910 | -3.1 | 0.7 | 2.9 |
| Refined output | kt | 421 | 452 | 441 | 444 | 7.6 | -2.6 | 0.7 |
| Exports | | | | | | | | |
| – ores and cons[c] | kt | 1,899 | 1,711 | 1,738 | 1,828 | -9.9 | 1.6 | 5.2 |
| – refined | kt | 392 | 420 | 395 | 398 | 7.2 | -5.9 | 0.6 |
| – total metallic content | kt | 924 | 905 | 885 | 909 | -2.1 | -2.3 | 2.8 |
| Export value | | | | | | | | |
| – nominal | A$m | 10,208 | 11,406 | 14,537 | 14,389 | 11.7 | 27.4 | -1.0 |
| – real[d] | A$m | 10,570 | 11,621 | 14,537 | 14,143 | 9.9 | 25.1 | -2.7 |

Notes: **b** In 2021 calendar year US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2020–21 financial year Australian dollars; **f** Forecast;

Source: ABS (2021) International Trade, 5465.0; LME (2021) spot price; World Bureau of Metal Statistics (2021) World Metal Statistics; Department of Industry, Science, Energy and Resources (2021)

# 28 Ni 58.693 Nickel

## Major Australia nickel deposits (Mt)




## Nickel facts

- Nickel is used in the **US, UK and Euro coins**
- Nickel has a growing role in **electric vehicle batteries**
- Nickel is **magnetic** at room temperature and is **fully recyclable**
- Nickel is the **second most abundant element** in the Earth's core after iron

## World consumption

- **70%** Stainless steel
- **8%** Alloys
- **8%** Plating
- **8%** Casting
- **5%** Batteries
- **1%** Other

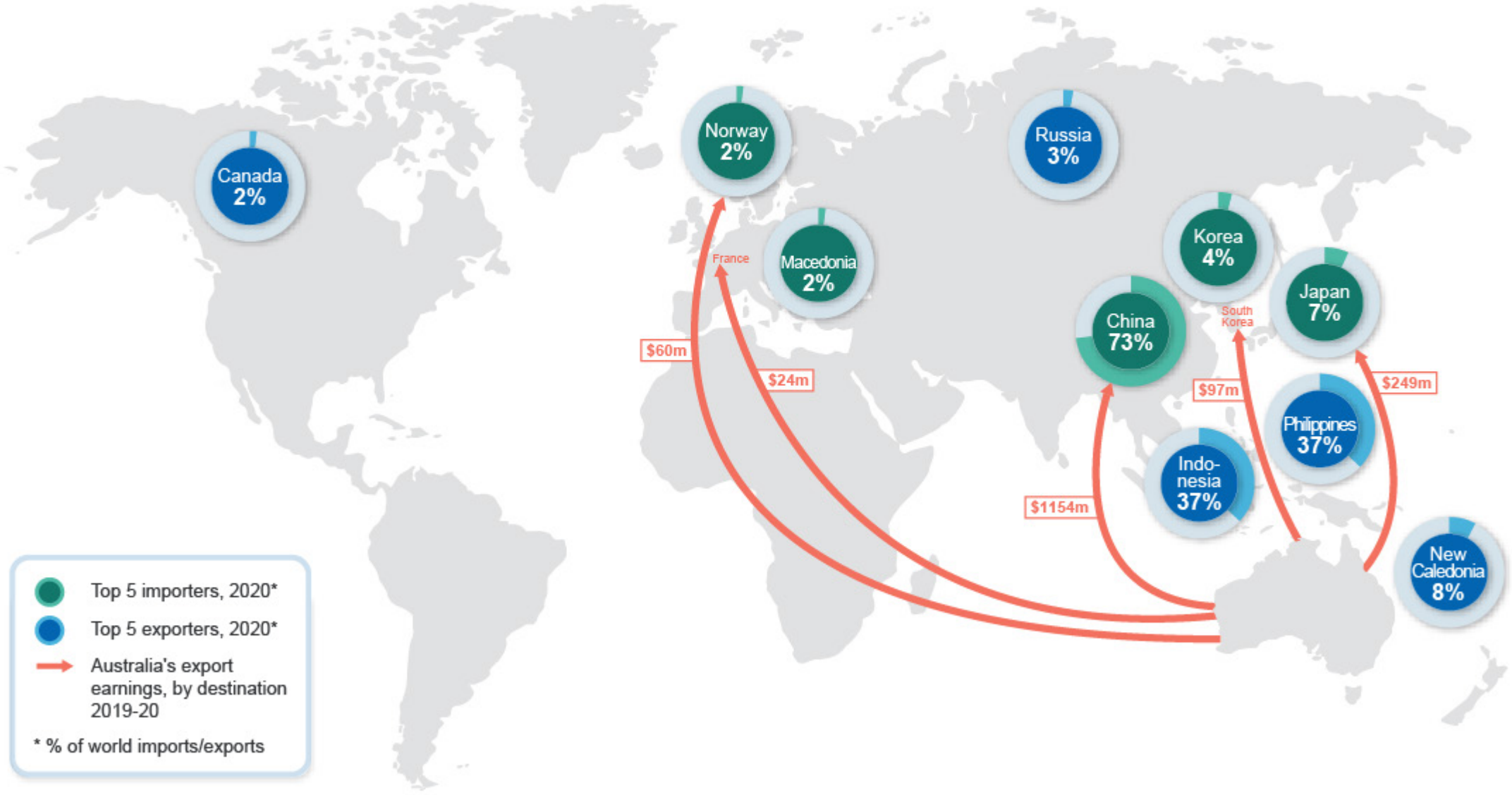
## Australia's nickel

- Australia has **26%** of world **nickel resources**
- **Typically produces over 200,000 tonnes** a year
- **Contributes more than $3b** to the economy

# Nickel

28 Ni 58.693

## Trade map | September 2021



## 13.1 Summary

- The nickel price is forecast to average US$18,035 a tonne in 2021, 31% higher than in 2020, driven by strong demand from stainless steel producers and upward revisions to demand for electric vehicle batteries.
- New projects and expansions are expected to lift Australia's export volumes from an estimated 181,000 tonnes in 2020–21 to about 260,000 tonnes in 2022–23 (*see Australia section)*.
- Australia's nickel export earnings are forecast to rise on the back of growing export volumes and higher prices, reaching $5.1 billion in 2021–22 and $4.6 billion in 2022–23, up from $3.8 billion in 2020–21.

## 13.2 World consumption

### Nickel consumption to increase

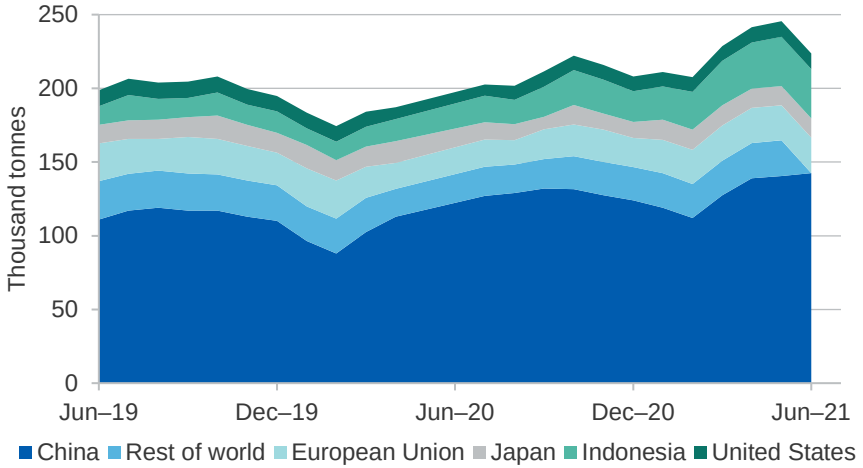
In the June quarter 2021, global consumption of nickel rose by 20% year-on-year, continuing the industry rebound from the fallout from the COVID-19 pandemic, assisted by both strong demand from both stainless steel consumption and the electric vehicle (EV) battery market (Figure 13.1). Global finished nickel demand is forecast to grow 15% in 2021 to reach 2.7 million tonnes. Demand is expected to continue to grow, hitting 2.9 million tonnes in 2022, and 3.0 million tonnes in 2023.

### Rebound in stainless steel driving nickel's recovery in 2021

Stainless steel still constitutes the majority of global demand for nickel, despite the burgeoning EV sector. Stainless steel production is estimated to increase by 15% year-on-year for 2021, supported by government stimulus spending. However, it is likely to taper towards around 5% a year in 2022 and 2023 (Figure 13.2). Around 66% of stainless steel production comes from China and Indonesia, with significant expansions planned for stainless steel production in Indonesia by Delong and by Tsingshan from China. India's stainless steel production is comparable to Indonesia's, despite largely depending on Indonesian ferro-nickel imports. Growth in these key markets is generally around 5% a year, compared to declining stainless steel production in the US, Europe, Japan, and Taiwan.

The surplus of class 1 nickel due to its replacement by nickel pig iron (NPI) in stainless steel has largely reached its limits. Shortages of class 1 nickel are likely, as demand continues from both electric vehicles as well as stainless steel. Eventually, NPI to matte conversion and the refining of nickel sulphate will ease the situation.

**Figure 13.1: Refined nickel consumption by major country**



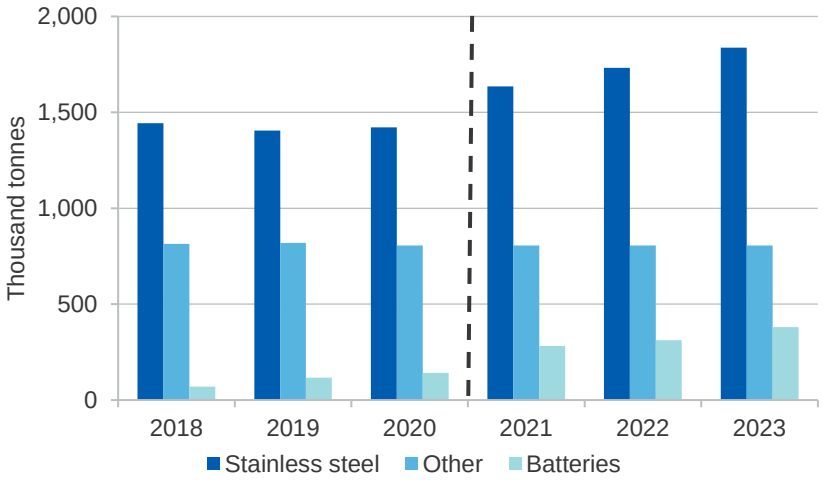

Source: International Nickel Study Group (2021), Department of Industry, Science, Energy and Resources (2021)

### Expectations of future consumption growth driven by the battery sector

Accelerating demand for electric vehicles, as part of government stimulus measures to offset the impact of the COVID-19 pandemic, combined with ongoing moves in decarbonisation, is driving increased demand for nickel. The demand for EVs is such that both nickel-based chemistries and nickel-free chemistries are in growing demand. China had been the home of nickel-free chemistries in the form of lithium iron phosphate batteries, but they may make inroads into Europe and other markets over coming years. However, large imports of both nickel and lithium carbonate for nickel-free batteries into China suggest both types of battery are growing rapidly. Demand for nickel for batteries is forecast to double over the outlook period, as battery factories come online both inside and outside of China.

Currently, batteries account for about 6% of primary nickel consumption. However, rising EV penetration rates, combined with increased use of nickel in batteries, is projected to see this reach 14% within three to five years. This will likely be driven by European Union demand, as well as in China and the US. Additionally, local EV value chains in populous nations such as India and Indonesia, are likely to drive consumption beyond the forecast period.

**Figure 13.2: Forecast nickel consumption by use**




Source: International Nickel Study Group (2021), Department of Industry, Science, Energy and Resources (2021), BloombergNEF (2021)

## 13.3 World Production

### Global nickel production set to increase in 2021

Global mined nickel production in 2021 is forecast to rise 10% year-on-year to 2.7 million tonnes, as production ramps up in Indonesia and returns to pre-COVID-19 levels in other regions. Mine production increased by 24% year-on-year in the June quarter 2021, while refined production increased by 10% year-on-year. In 2021, refined nickel is expected to increase by 10% to 2.6 million tonnes. Burgeoning production of NPI in Indonesia and other parts of the world has meant that, for the first time, more than half of nickel production was in the form of NPI during the June quarter 2021, with the top three producers being Chinese. For production inside China, nickel is being increasingly sourced from the Philippines and New Caledonia.

Indonesian nickel mining has largely returned to pre-COVID-19 pandemic levels, and continues to grow. In the June quarter 2021, Indonesian production was up 9% quarter-on-quarter and 45% year-on-year. Production in the Philippines returned to pre-COVID-19 pandemic levels, rising 57% year-on-year for the June quarter 2021. However production levels are not yet consistent and may fluctuate. Norilsk Nickel is making progress in getting operations back online in Russia. However, this has yet to be expressed in the production figures, with production in the June quarter down 30% from the March quarter 2021. It has, however, been value-adding with the production of its first batch of carbon neutral nickel.

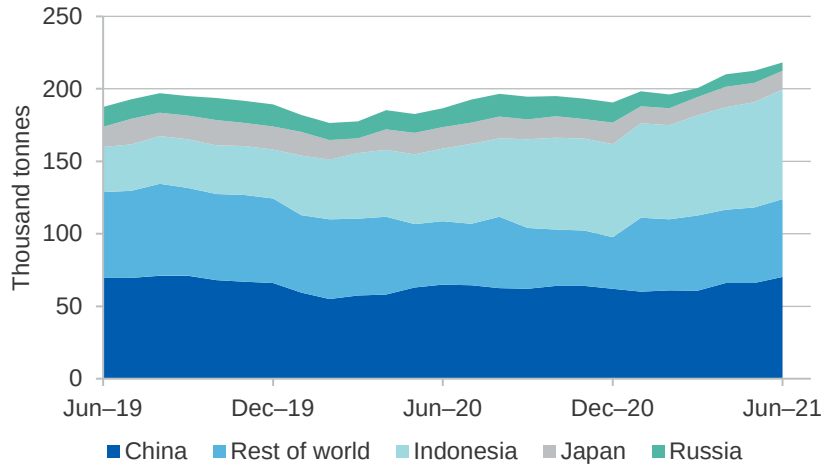
Prony Resources recommenced operations in New Caledonia in the June quarter 2021. The mine is now owned 51% by provincial authorities, with Tesla included as a technical advisor. New Caledonian output rose by 67% year-on-year, back at normal levels for the June quarter 2021.

### Refined nickel production increasing in Indonesia

Indonesia's refined nickel production rose by 10% quarter-on-quarter in the June quarter 2021, and is now travelling at over 800,000 tonnes a year. Production is coming from NPI and high pressure acid leach (HPAL) operations, as well as value-adding to stainless steel (Figure 13.3). Lygend, a Chinese company, is adding to NPI production, with 20 production lines planned and first production in early 2022.

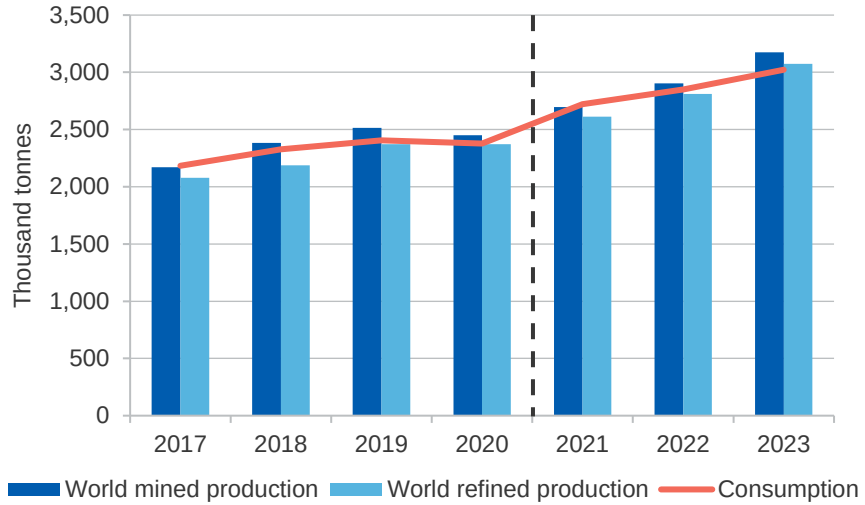
The announcement of increases in HPAL output in Indonesia is adding to refined capacity for the battery sector. Approximately 80,000 tonnes of capacity was added in early 2021, with an extra 60,000 tonnes possible in 2022 and 120,000 tonnes in 2023. NPI output is also due to grow significantly by around 200,000 tonnes a year, leading to NPI to matte conversion, with possible nickel sulphate production as the NPI price motivates refiners to consider value-adding options.

**Figure 13.3: Refined nickel production by major country**




Source: International Nickel Study Group (2021), Department of Industry, Science, Energy and Resources (2021)

**Figure 13.4: World nickel production and consumption**




Source: International Nickel Study Group (2021), Department of Industry, Science, Energy and Resources (2021)

Although Tsinghan's plans for the conversion of NPI to matte initially led to price declines, prices have subsequently recovered. Despite the potential for matte from NPI to be further processed into nickel sulphate, the sulphate price will still need to incentivise any potential conversion costs. Additionally, conversion from NPI to sulphate will need to take into account both monetary and environmetal costs. To offset environmental considerations, Tsingshan announced that it will also build 2GW of 'clean electricity facilities' to source energy for its operations. Production of nickel sulphate from NPI also assumes insufficient suitable feed for HPAL.

Lygend has commissioned its first HPAL operation in Indonesia, producing at a rate of 18,000 tonnes a year of nickel in April 2021, with another due in September. Overall, Lygend plans to add 350,000 tonnes a year in nickel production.

### Philippines has lifted mining moratorium but open cut ban remains

The lifting of the moratorium on new mining projects in the Philippines continues to have little impact on new projects for nickel, since new open cut mines are still banned. However, if the ban on open cut mining is lifted then supply may increase. The Philippines is currently the largest supplier of nickel ore to China, after increasing supply due to the Indonesian ban on exporting raw materials. Increasing supply to China will pivot on increasingly large volumes of Indonesian value-added nickel as well as ore from the Philippines. Mined supply from Indonesia is forecast to grow by 50% to 2023 and from the Philippines to grow by 80% to 2023.

## 13.4 Prices

### Prices have been volatile in the September quarter

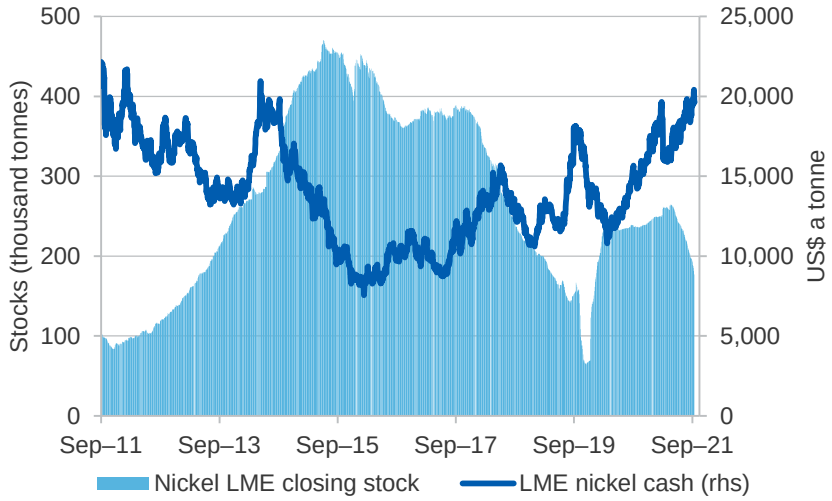
Nickel continues its volatile behaviour, which saw prices peak at almost US$20,000 a tonne in mid-February 2021, fall to $17,320 in the June quarter 2021 and then largely recover to peak at over US$19,500 a tonne in late July 2021 (Figure 13.5). Prices for the September quarter 2021 were around US$ 19,000 a tonne. This was up around 9% quarter-on-quarter, but up 55% compared to the recent low of the June quarter 2020.

The current elevated prices are supported by increased demand from stainless steel (mostly from 300 series instead of 400 series which is used in automotive manufacturing) as well as increasing demand from the battery sector for EVs. Nickel supply — especially for EVs in the form of nickel chemicals — is in tight supply, with some market participants finding supplies difficult to source in the second half of 2021. This shortage makes the commissioning of BHP's nickel sulphate plant in the September quarter 2021 a matter of priority.

Prices are being supported by the outlook for EV sales, with many analysts raising their forecasts for EV sales in 2021 significantly. Although trading in lithium carbonate suggests increasing production of nickel-free lithium iron phosphate batteries, it is more likely that there is significant growth in both nickel-based and nickel-free batteries — as evidenced by increasing imports of nickel into China, up 32% quarter-on-quarter in the June quarter, or 67% year-on-year (see *lithium* chapter).

If matte production from NPI ramps up well in 2021 and 2022, prices may moderate. However, the timeline and costs are still uncertain for the full journey from NPI through matte to nickel sulphate. Thus, demand in certain areas may still outstrip supply in the short term, especially as demand from the EV sector gains momentum. It is expected that there will be an ongoing deficit in battery-grade (Class 1) refined nickel if the NPI/matte path does not ramp up quickly enough. Nickel prices are forecast to be sustained at about US$18,600 a tonne in the second half of 2021, before trending lower to average US$16,690 a tonne in 2022 and US$16,170 a tonne in 2023. Prices decline as supply increases, but the market is heading towards deficit in certain areas.

**Figure 13.5: Nickel price and stock levels**




Source: Bloomberg (2021); Department of Industry, Science, Energy and Resources (2021)

## 13.5 Australia

### Export earnings to grow

In 2020–21, nickel export earnings were $3.8 billion, 0.2% higher year-on-year (Figure 13.6). Over the outlook period, export earnings are forecast to reach $5.1 billion in 2021–22 and $4.6 billion in 2022–23. Export earnings growth is based on rising output — as operations restart and new capacity comes online — spurred by strong nickel prices, as the battery sector expands. Export volumes are forecast to total 252,000 tonnes in 2021–22, up 26 per cent year-on-year, and to climb to 260,000 tonnes in 2022–23.

### Expectations of market growth support openings and restarts

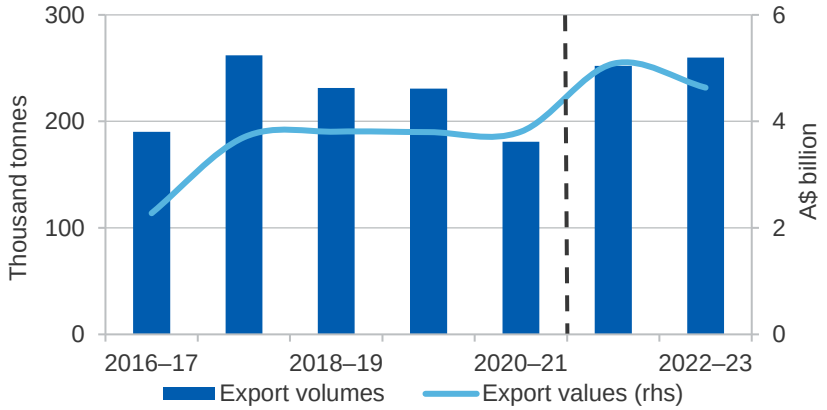
The battery sector continues to grow, with forecasts for EV sales in 2021 at 4.7 million vehicles (see *lithium* chapter). This has resulted in higher prices, and led to some companies announcing restarts or new projects. Panoramic Resources has begun mining and developing the Savannah nickel project in Western Australia (WA). Processing of ore is expected to start in November, with possible shipments in December 2021; average annual output of 9,100 tonnes of nickel is planned.

Poseidon (ASX Listed) has stated it may make a financial investment decision on Golden Swan by the end of 2021, following high grade drilling results (3 metres at 11% nickel) with production possible by mid-2022. According to ASX Listed Mincor, production at its Kambalda Nickel Operations (KNO) in WA may recommence in the March quarter 2022,

with ongoing development of the Cassini mine. Production at Nova rose by 16% quarter-on-quarter to 7,887 tonnes in the June quarter 2021, due to higher than expected grades and, consequently, higher recoveries. Nickel output at Glencore's Murrin Murrin operation in WA declined by 27% quarter-on-quarter in the June quarter 2021, due to scheduled maintenance. Output at Forrestania in WA was 4,622 tonnes, up 7.5% quarter-on-quarter in the June quarter 2021, with production guidance of 16,000–17,000 tonnes of nickel for 2022–23 and production at nearby Odysseus to start shortly.

Australia's mine production is forecast to lift from 161,000 tonnes in 2019–20 to 222,000 tonnes in 2022–23. Output during the 2019–20 to 2021–22 period has been impacted by Ravensthorpe's entry, exit and re-entry.

**Figure 13.6: Australia's nickel export volumes and values**




Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## Significant potential exists in battery chemicals capacity

Australia's refinery output is forecast to rise from 140,000 tonnes in 2020–21 to 170,000 tonnes in 2022–23. First Quantum has lowered its guidance for 2021: from 23,000–27,000 tonnes of nickel to 20,000–24,000 tonnes of nickel, due to equipment delays for its Ravensthorpe operation in WA.

### Box 13.1: Greenfields project development and value-adding

#### Greenfields project development

Oz Minerals has indicated that they may make a financial investment decision on its West Musgrave project in WA in 2022. This would be the first base metals deposit to be developed in this region, and would unlock significant potential for both copper and nickel development.

Development of the Musgrave block faced delays due to its remote location near the borders between Western Australia, South Australia and the Northern Territory. Oz Minerals propose to draw 70-80% of their power needs from renewable energy via solar, wind with battery back-up.

#### Potential value-adding for mixed nickel cobalt deposits

Australian Mines Limited is examining development options for its Sconi deposit in Queensland. The deposit contains both nickel and cobalt. In particular, it is examining the potential production of cathode precursor materials, as a value-added option to a proposed mixed nickel-cobalt hydroxide product. Studies for the production of nickel cobalt cathode precursor materials for batteries for electric vehicles have been positive. This has prompted the commencement of construction of a pilot plant to produce cathode precursors for initial testing with potential customers — taking the product from mine to battery maker in one step.

Other mixed nickel cobalt deposits occur in Australia, potentially opening up other value-adding options for Australian miners. LG recently signed an offtake agreement with Australian Mines Limited for 71,000 tonnes of nickel and 7,000 tonnes of cobalt in a mixed hydroxide product each year, subject to financing for construction by 30 June 2022.

High demand for power from renewable energy combined with tight supply markets for battery metals is spawning technological developments in zinc, lithium, nickel and cobalt (see *lithium* chapter, Box 15.2, *zinc* chapter, Box 14.1).

Source: Company reports

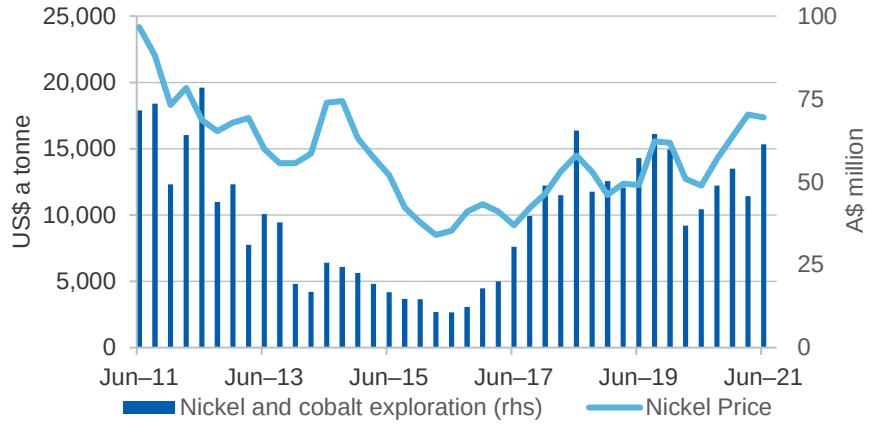
Production for the June quarter 2021 was 4,500 tonnes of nickel. First Quantum have completed an agreement for POSCO to secure 7,500 tonnes of nickel in a mixed nickel-cobalt hydroxide precipitate from 2024; enough for 180,000 electric cars a year.

Quarterly output at BHP's Nickel West operations in WA was steady at about 14,200 tonnes of nickel. June quarter 2021 guidance suggests first nickel sulphate output will be in the September quarter 2021. The facility is expected to produce about 100,000 tonnes of nickel sulphate per year.

## Exploration expenditure

In the June quarter 2021, nickel and cobalt exploration rose to $61 million, up 34% on the previous quarter, and 47% year-on-year (Figure 13.7).

**Figure 13.7: Australia's nickel and cobalt exploration expenditure**




Source: ABS (2021) Mineral and Petroleum Exploration, Australia, 8412.0

## Revisions to the outlook

The forecasts for Australia's nickel export earnings have been revised up since the June 2021 *Resources and Energy Quarterly,* most notably by 16% in 2021–22 to $5.1 billion. This is largely due to favourable movements in exchange rates as well as some minor upward revisions to the nickel price.

## Table 13.1: Nickel outlook

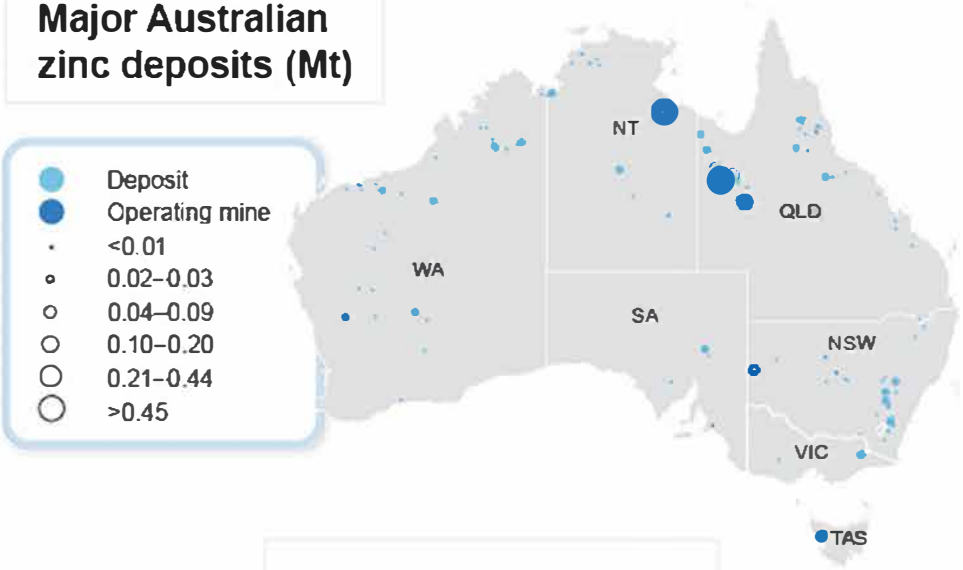
| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| Production | | | | | | | | |
| – mine | kt | 2,450 | 2,697 | 2,904 | 3,175 | 10.1 | 7.7 | 9.3 |
| – refined | kt | 2,372 | 2,611 | 2,812 | 3,074 | 10.1 | 7.7 | 9.3 |
| Consumption | kt | 2,377 | 2,722 | 2,850 | 3,022 | 14.5 | 4.7 | 6.1 |
| Closing stocks | kt | 655 | 544 | 507 | 558 | -17.0 | -6.9 | 10.2 |
| – weeks of consumption | | 14.3 | 10.4 | 9.3 | 9.6 | -27 | -11.0 | 3.9 |
| Prices LME | | | | | | | | |
| – nominal | US$/t | 13,769 | 18,037 | 16,690 | 16,169 | 31 | -7.5 | -3.1 |
| | USc/lb | 625 | 818 | 757 | 733 | 31 | -7.5 | -3.1 |
| – real [b] | US$/t | 14,239 | 18,037 | 16,299 | 15,404 | 27 | -9.6 | -5.5 |
| | USc/lb | 646 | 818 | 739 | 699 | 27 | -9.6 | -5.5 |
| **Australia** | **Unit** | **2019–20** | **2020–21** | **2021–22[f]** | **2022–23[f]** | **2020–21** | **2021–22[f]** | **2022–23[f]** |
| Production | | | | | | | | |
| – mine [c] | kt | 161 | 162 | 201 | 222 | 0.6 | 24 | 10.4 |
| – refined | kt | 108 | 105 | 139 | 140 | -2.5 | 32 | 0.7 |
| – intermediate | | 15 | 29 | 32 | 32 | 89 | 9.6 | -1.7 |
| Export volume [d] | kt | 231 | 181 | 252 | 260 | -22 | 39 | 3.2 |
| Export value | | | | | | | | |
| – nominal value | A$m | 3,798 | 3,804 | 5,083 | 4,634 | 0.1 | 34 | -8.8 |
| – real value [e] | A$m | 3,933 | 3,876 | 5,083 | 4,554 | -1.5 | 31 | -10.4 |

Notes: **b** In 2021 calendar year US dollars; **c** Nickel content of domestic mine production; **d** Includes metal content of ores and concentrates, intermediate products and nickel metal; **e** In 2021–22 financial year Australian dollars; **f** Forecast .

Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Science, Resources and Energy (2021); International Nickel Study Group (2021); LME (2021); World Bureau of Metal Statistics (2021)

# 30 Zn 65.38 Zinc

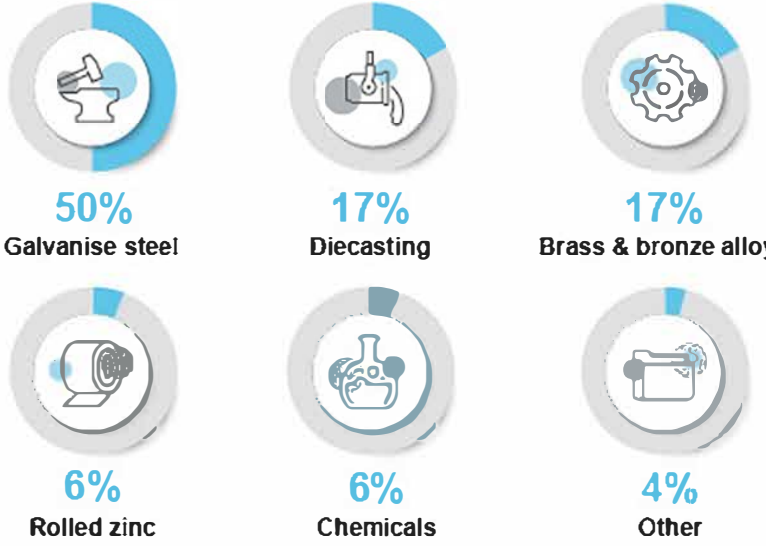
## Major Australian zinc deposits (Mt)




## Zinc facts

- **Zinc ore** was used in ancient Greece to produce brass
- Zinc is used by the human body to **fight infection**
- **Zinc is used** in wound-care and sunscreen
- Zinc is an **emerging battery mineral**

## World consumption



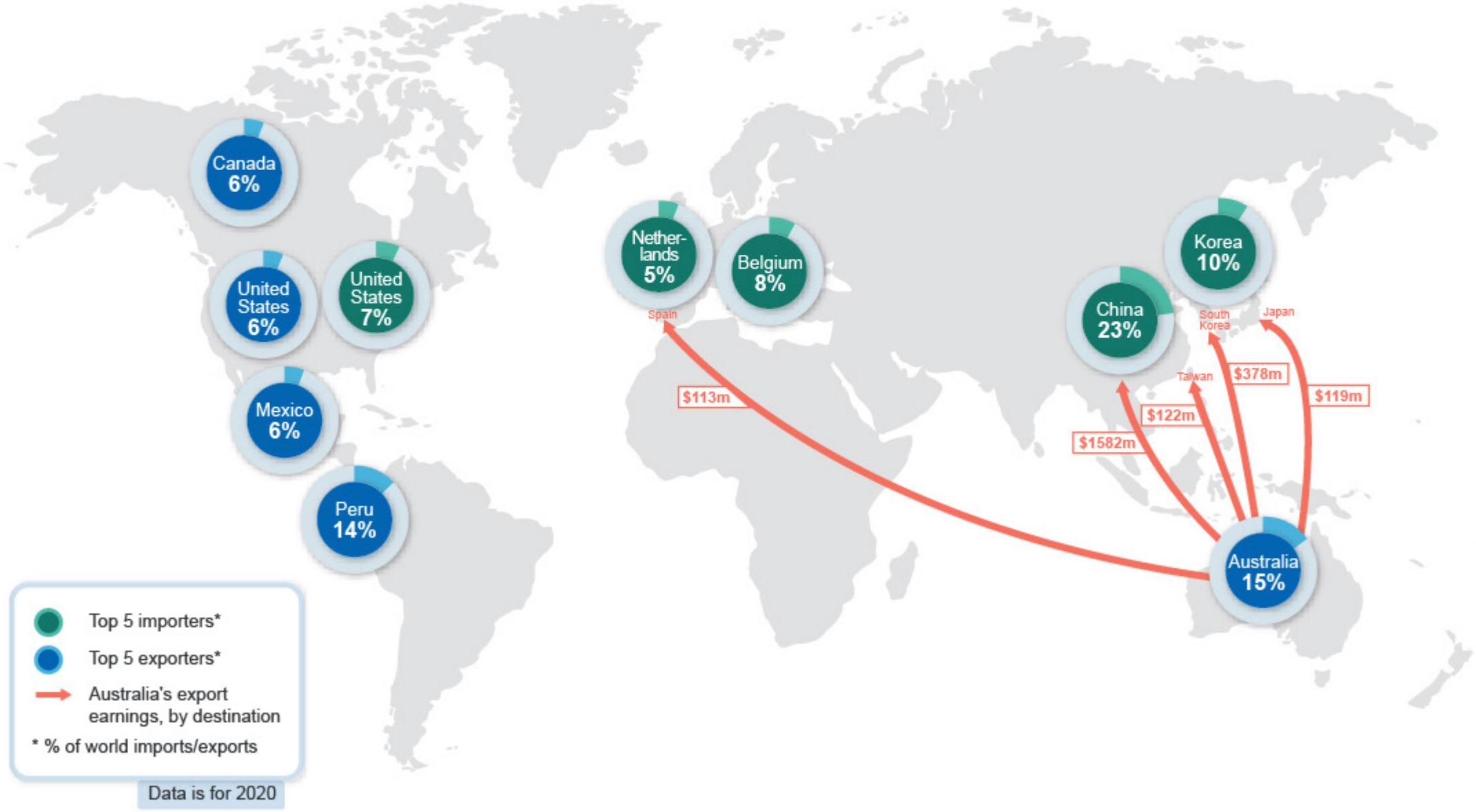

## Australia's zinc

- **3rd highest producer of zinc** in the world in 2020
- **World's no.1 zinc exporter** in 2020
- Holds **29%** **of world zinc resources**

# Zinc

30 Zn 65.38

## Trade map | September 2021



## 14.1 Summary

- The LME zinc spot price is forecast to average US$2,930 a tonne in 2021, with government infrastructure programs helping to support prices. Prices are expected to fall to around US$2,450 a tonne in 2023 as production increases, and consumption normalises.
- Australia's zinc production is forecast to increase from an estimated 1.3 million tonnes (in metallic content terms) in 2020–21 to 1.6 million tonnes in 2022–23 (see *Australia section*).
- Australia's zinc export earnings are forecast to increase from $3.3 billion in 2020–21 to around $4.1 billion in 2021–22 and $3.9 billion in 2022–23. Rising refined production is expected to offset prices.

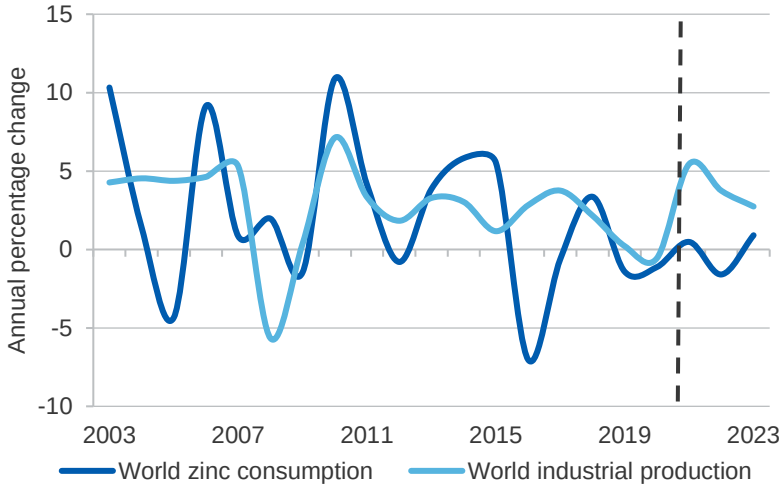
## 14.2 World consumption

### After zinc consumption fell in 2020, modest increases expected

Growth in zinc consumption correlates reasonably well with the world industrial production (IP) cycle (Figure 14.1), and with steel production because of its primary role in galvanising steel (Figure 14.2). World refined zinc consumption increased by 10% year-on-year in the June quarter 2021 as steel and industrial production surged. Over this period, China's consumption increased by 2.3%, with world consumption excluding China increasing by 19%, recovering from the COVID-19 pandemic.

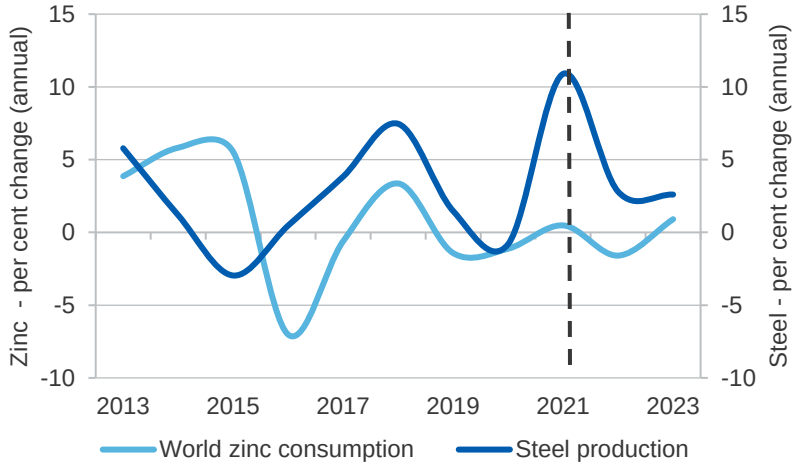
GDP forecasts for the second half of 2021 are strong, and ongoing infrastructure spending is positive for zinc. However, a two-stepped recovery is in process, with advanced economies leading emerging economies (see *macroeconomic outlook* chapter). Recent strong Chinese zinc consumption from its COVID-19 stimulus spending on infrastructure is being slightly curtailed by decreases in steel production. World zinc consumption is expected to rise modestly over the outlook period, growing from 13.9 million tonnes in 2021 to 14.2 million tonnes in 2023, up an average 1.2% a year (Table 14.1). Automotive sales for the June quarter 2021 increased 2.7% quarter-on-quarter and 28% year-on-year, as markets continued recovering from the impacts of the COVID-19 pandemic and electric vehicle sales continued to rise (see *lithium* chapter).

**Figure 14.1: World zinc consumption vs industrial production**




Source: International Iron and Steel Institute (2021); CPB Netherlands Bureau for Economic Policy Analysis (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 14.2: Steel production vs world zinc consumption**




Source: International Iron and Steel Institute (2021); Department of Industry, Science, Energy and Resources (2021)

### Box 14.1: Zinc batteries for power storage

Interest in zinc batteries for stationary storage continues to increase in Australia, Canada and the US. Compared with lithium ones, zinc batteries have a longer service life, a non-flammable electrolyte, and a more stable charge/discharge cycle.

ASX-listed Redflow doubled cash receipts for the June quarter 2021 and has a record number of confirmed orders for delivery in the pipeline for its zinc bromine flow battery. It has also raised $14.7 million to assist in the development of its Gen3 battery — aimed at utility-scale storage, with a potential 30% reduction in the cost of manufacturing. Gelion Technologies in Sydney, is also pursuing its version of a zinc bromine battery.

Part of the funding was raised via US based New Technology Capital Group LLC. It is also receiving requests for information for large scale installation, some of which are US based. Redflow are based in Brisbane, along with NASDAQ-listed Tritium — who supply electric vehicle fast charging components. Israel-based ICL Group Limited is exploring options for its bromine and phosphate products in the zinc-bromine and lithium-iron-phosphate battery markets. Hence, the 'renewable minerals market' is morphing into specialty chemicals.

Zinc-air batteries (by Canadian-based Zinc8) received a technology innovation award at the WE3 Summit. The WE3 summit focuses clean technology innovation. Compared with lithium, these batteries offer cost/scalability advantages for eight-hour-plus energy storage. Eos Energy in the US, recently listed on the NASDAQ, has been active in the zinc energy storage space too, focusing on 3-12 hour energy storage.

Zinc8 estimates a "total addressable market' for remote micro-grids at US$42 billion, US$350 billion for commercial and industrial applications in the US, and US$11.4 trillion for utilities globally by 2050.

Utilities and large corporate entities have been among those showing increasing interest in technologies beyond lithium batteries.

Source: Company reports; https://www.zinc8energy.com/investors; Department of Industry, Science, Energy and Resources (2021)

## 14.3 World production

### Mine production continues to recover from the COVID-19 pandemic

In the June quarter 2021, world zinc mine production increased by 7.9% quarter-on-quarter and by 20% year-on-year, as production recovered from the COVID-19 global pandemic. China's mine production increased by 23% from the March quarter to the June quarter.

The election of a new government in Peru has added uncertainty to the mining outlook and project development timelines, with the potential for higher mining taxes (though initially proposed levels appear to have been moderated). Production from Peru decreased by 0.4% quarter-on-quarter but increased by 135% year-on-year, with production at 389,000 tonnes (metallic content), after the COVID-19 pandemic-affected low of 166,000 tonnes recorded in the June 2020 quarter.

In the June quarter 2021, Australia's mined zinc production increased by 1.7% quarter-on-quarter, but decreased 0.8% year-on-year.

Although world mine production increased, metal usage in the June quarter 2021 was up 10% year-on-year, with China up 2.3% year-on-year or 8.9% quarter-on-quarter. This saw the world refined metal balance decrease to a barely positive position in the June quarter 2021. Although mine production is increasing, increased metal consumption continues to support the zinc price.

### Mine production is expected to rise over the outlook period

World mine output is estimated at 12.8 million tonnes for 2021, and is forecast to rise by 0.9% per year to 13.0 million tonnes by 2023, based on increasing output from new mine capacity (Figure 14.3).

Production ramp up from Glencore's Zhairem in Kazakhstan has taken time but may help ease the tightness in the concentrate market over the next 12 months. Aripuana in Brazil, operated by Nexa Resources, will increase zinc supply once construction is completed, with production expected in 2022. The operation plans to produce around 120,000 tonnes of zinc a year from 2024. The Juanicipio project in Mexico, operated by

Fresnillo Plc, is continuing its development, with possible zinc production in 2022. The mine's main products are silver and gold, with development ore already being mined but the company reporting that commissioning of the processing plant take may take until the end 2021. The mine may produce around 25,000 tonnes of zinc initially, ramping up to 40,000 tonnes a year after 2025.

### China's mine production supplying more of its consumption

China's zinc production supplied 62% of its needs in June quarter 2021, up from 55% in the March quarter 2021 despite consumption increasing. China's concentrate imports were 19% lower quarter-on-quarter in the June quarter 2021 at 399,000 tonnes, due to power shortages. In Chinese provinces where zinc is refined, power rationing continues to be a concern.

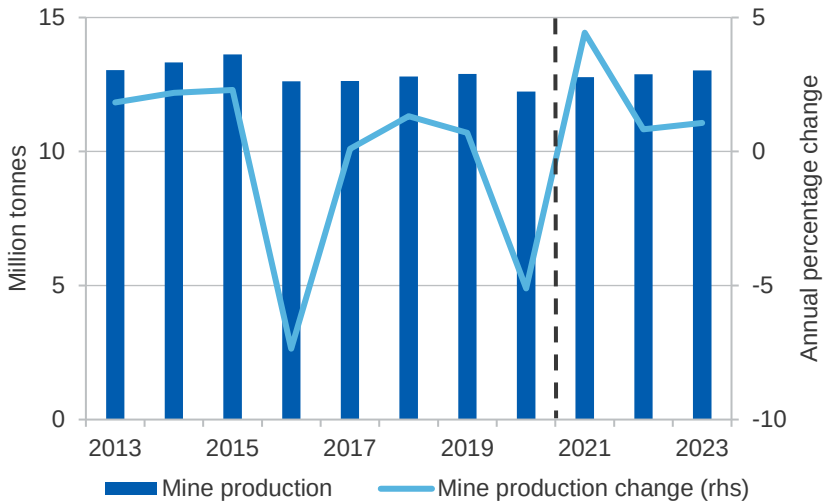
### World refinery production dominated by stimulus spending

World zinc refined production decreased by 0.2% quarter-on-quarter in the June quarter 2021 but increased 6.5% year-on-year, as production rose to meet infrastructure requirements from stimulus spending. While China's refined metal production increased 4.4% year-on-year for the June quarter 2021, it too decreased by 0.7% quarter-on-quarter, due to the ongoing power issues.

Refined production from primary and secondary sources is expected to increase by an average 0.9% a year over the outlook period, reaching 14.2 million tonnes in 2023.

US infrastructure spending is stimulating demand for refined zinc. Additionally, infrastructure spending in India is mooted to grow at 10% over the next 5 - 6 years, as the government invests in railways, bridges and highways. Based on this demand, Vedanta plans to scale up production capacity by 25% over the next 10-15 years. Vedanta's subsidiary, Hindustan Zinc, is targeting net zero emissions by 2050. It is aiming to do this via battery powered underground electric vehicles, as well as a shift from coal fired power to renewable power.

**Figure 14.3: World zinc mine production, metallic content**




Source: International Lead Zinc Study Group (2021); AME Mineral Economics (2021); Department of Industry, Science, Energy and Resources (2021)

## 14.4 Prices

### Price increases reflect tightness in concentrate supply

Zinc prices averaged US$2,916 a tonne during the June quarter 2021, up 6.1% quarter-on-quarter and 49% year-on-year. Concentrate imports to China in the June quarter 2021 were down 19% quarter-on-quarter and down 18% year-on-year for the June quarter 2021. However, rising metal consumption due to increased spending on infrastructure is creating concentrate shortages, placing upward pressure on prices. Pressure in the concentrate market has continued after the elections in Peru; the market has been impacted by uncertainty over recently proposed mining taxes and operational problems due to the COVID-19 pandemic.

Spot treatment and refining charges continue to remain low, with contract treatment and refining charges settled at US$159 a tonne in early 2021, down 47% from US$300 a tonne in 2020.

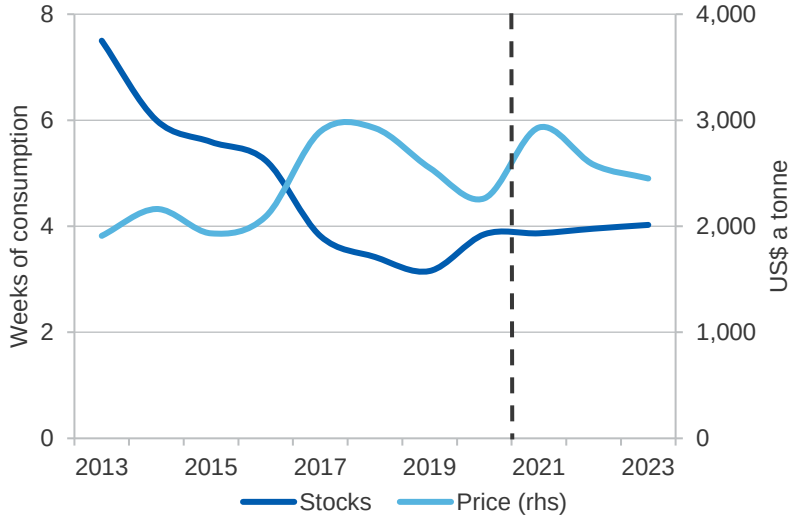
London Metals Exchange (LME) and Shanghai Futures Exchange zinc stocks are around 281,000 tonnes, down from 345,000 tonnes in the March quarter 2021, with the SHFE reaching a low of 30,000 tonnes in mid-July 2021.

China released 30,000 tonnes from its reserves at auction in early July and then another 50,000 tonnes in late July.

The LME zinc spot price is estimated to average US$2,930 a tonne in 2021, decreasing to around US$2,580 a tonne in 2022 and US$2,450 a tonne in 2023, as world production increases (Figure 14.5).

Any short term supply disruptions — such as power shortages at zinc smelters in China, or shipping disruptions from South America — would likely support prices. Additionally, any increase in COVID-19 variants or delays in vaccine rollout are likely to increase market anxiety.

**Figure 14.4: Zinc prices and stocks**




Source: London Metal Exchange (2021); Department of Industry, Science, Energy and Resources (2021)

## 14.5 Australia

### Export earnings expected to increase modestly

In 2020–21, Australia's exports of zinc decreased by 9.2% year-on-year to 1.4 million tonnes (in metal content terms), but decreased by 8.4% in value to $3.3 billion.

Australia's zinc export earnings (for both concentrate and refined metal) are forecast to increase from $3.3 billion in 2020–21 to around $4.1 billion in 2021–22 and $3.9 billion in 2022–23, as rising production (including for refined metal) offsets the impact of lower prices.

### Australia's production decreased slightly in June 2021

In the June quarter 2021, Australia's mined zinc production decreased by 0.8% year-on-year, but increased 1.7% quarter-on-quarter, as production returned to normal levels after production disruption in northern Australia over summer.

Glencore's Australia production increased by 1.6% year-on-year in the June quarter 2021, with output rising from the Mt Isa and McArthur River operations in Queensland and the Northern Territory. Production returned to normal levels at McArthur River, after the lower grades early in the year. Production was steady at Mt Isa with 86,400 tonnes of zinc in concentrate.

Production at Century tailings reprocessing in Queensland decreased by 7.6% year-on-year in the June quarter 2021, but increased 4.3% quarter-on-quarter after a wet season downturn in the March quarter. Jameson cell commissioning to improve recoveries has been progressing, with finalisation expected in September quarter 2021.

Production at South32's Cannington operation increased by 16% year-on-year in the June quarter 2021, with further high grades being extracted from underground operations. Pre-feasibility studies are ongoing to streamline underground extraction using truck haulage instead of truck and shaft, which may lift high grade output in 2023. Output from MMG's Dugald River in Queensland declined by 8.3% year-on-year in the June quarter 2021, due to technical issues and planned maintenance.

Production at Broken Hill in NSW decreased by 19% year-on-year, but production from Rasp-Broken Hill in NSW increased by 11% year-on-year. At Rosebery in Tasmania, output increased by 11% year-on-year, while at Golden Grove in WA production decreased by 0.9% year-on-year.

### Refinery exports up while concentrate exports declined

Australia's zinc concentrate exports increased by 14% quarter-on-quarter to 564,000 tonnes in the June quarter 2021, down 16% year-on-year. Australia's concentrate exports to China increased by 12% quarter-on-quarter but were down 42% year-on-year, with rising concentrate imports from Peru to China taking their place.

Australia's exports of refined zinc declined by 37% year-on-year and 25% quarter-on-quarter to 73,300 tonnes in the June quarter 2021. Expansion upon Sun Metals zinc refinery in Townsville is underway.

### Australia's mine production is expected to increase

Australia's production is expected to continue growing over 2021–22, with more subdued growth in 2022–23 (Figures 14.6 and 14.7). Australia's zinc mine output is expected to increase from 1.4 million tonnes in 2020–21 to 1.6 million tonnes in 2022–23, driven by Century and McArthur River in Queensland and the Northern Territory.

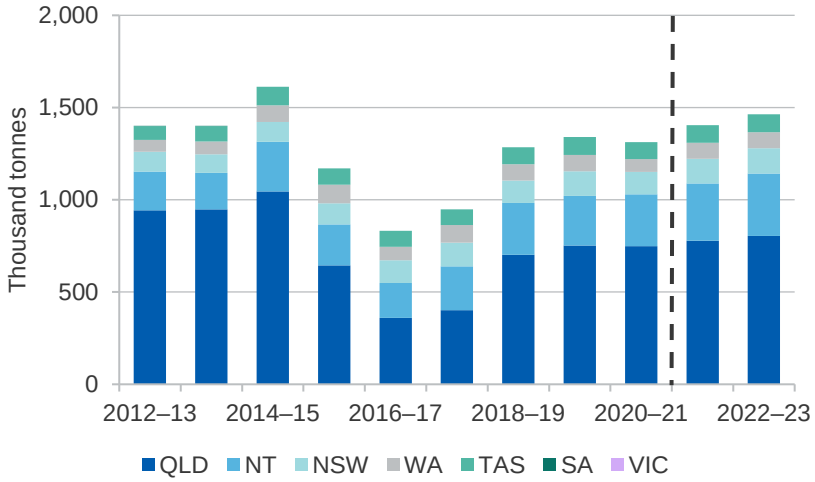
### Refined production

The expansion of Korean-owned Sun Metals' smelter in Townsville is continuing, with the operation committed to be the first refinery in the world to produce 'green' zinc from 100% renewable energy by 2040. The expansion will add 50,000 tonnes per year once fully ramped up. Australia's refined production is forecast to be steady after 2022.

### Project development

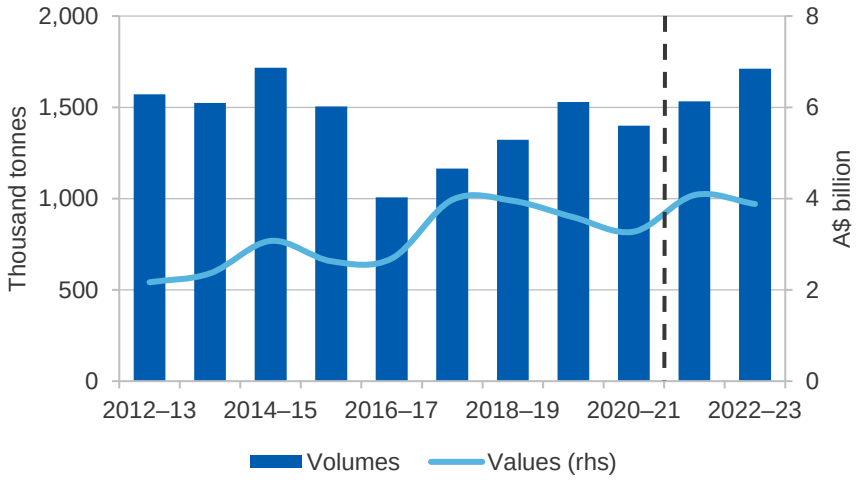
New Century Zinc announced positive results to their feasibility study of potential operations at Silver King and East Fault Block. The company is targeting a financial investment decision in the first quarter of 2022 and possible first production in the first quarter of 2023. They estimate additional zinc production of 22,000 tonnes a year.

**Figure 14.5: Australia's zinc mine output by state, metallic content**




Source: Company reports; Department of Industry, Science, Energy and Resources (2021)

**Figure 14.6: Australia's zinc exports, metallic content**

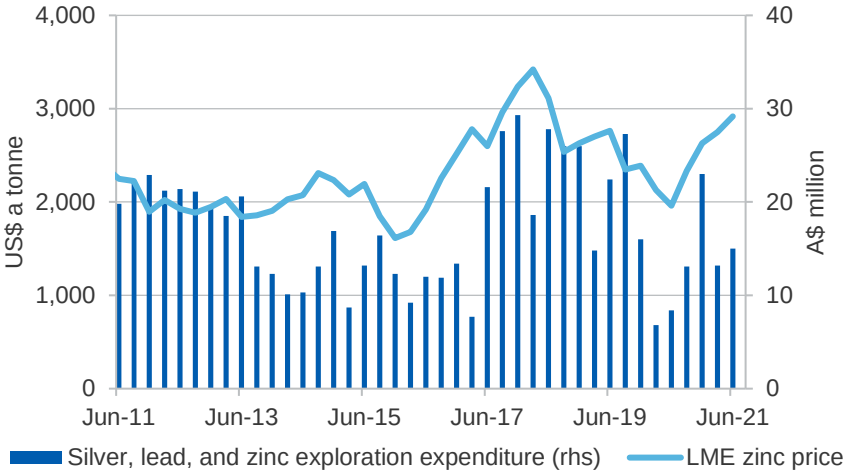



Source: Source: ABS (2021) International Trade in Goods and Services, 5368.0; Department of Industry, Science, Energy and Resources (2021)

## Exploration expenditure decreased in the June quarter 2021

Exploration expenditure for silver, lead and zinc increased by 14% quarter-on-quarter for the June quarter 2021. Over the same period the zinc price appreciated by 6.1% quarter-on-quarter (Figure 14.8). This increase in exploration is likely related to ongoing zinc price appreciation. When comparing year-on-year, exploration increased 89% for the June quarter 2021, while the zinc price appreciated 49% over the corresponding period, thus demonstrating the more traditional relationship between commodity prices and exploration.

**Figure 14.7: Quarterly exploration expenditure**




Source: ABS (2021) Mineral and Petroleum Exploration, Australia, 8412.0; Company reports; Department of Industry, Science, Energy and Resources (2021)

## Revisions to the outlook

Compared with the June 2021 *Resources and Energy Quarterly*, forecasts for export revenue are up 13% for 2021–22 to $4.1 billion, and up 10% to $3.9 billion in 2022–23. The revisions are due to higher than anticipated prices, slightly higher forecast mined volume, slightly increased refined output and favourable movements in the AUD/USD.

## Table 14.1: Zinc outlook

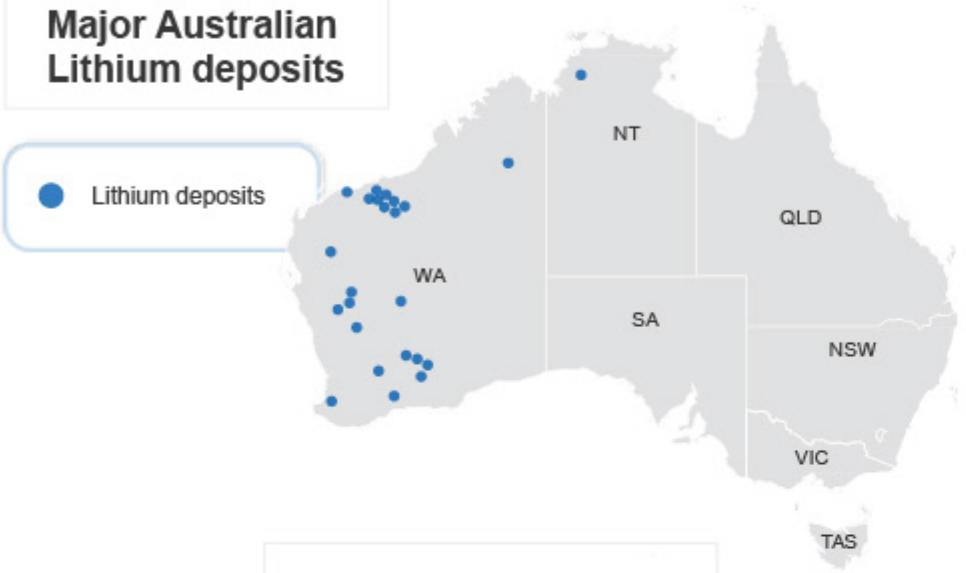
| World | Unit | 2020 | 2021[f] | 2022[f] | 2023[f] | Annual percentage change 2021[f] | 2022[f] | 2023[f] |
|---|---|---|---|---|---|---|---|---|
| Production | | | | | | | | |
| – mine | kt | 12,235 | 12,777 | 12,883 | 13,021 | 4.4 | 0.8 | 1.1 |
| – refined [a] | kt | 13,690 | 13,903 | 14,011 | 14,156 | 1.6 | 0.8 | 1.0 |
| Consumption | kt | 13,212 | 13,863 | 14,064 | 14,195 | 4.9 | 1.5 | 0.9 |
| Closing stocks | kt | 975 | 1,028 | 1,067 | 1,096 | 5.5 | 3.7 | 2.7 |
| – weeks of consumption | | 3.8 | 3.9 | 3.9 | 4.0 | 0.5 | 2.3 | 1.8 |
| Price | | | | | | | | |
| – nominal | US$/t | 2,263 | 2,931 | 2,581 | 2,450 | 30 | -12.0 | -5.0 |
| | USc/lb | 103 | 133 | 117 | 111 | 30 | -12.0 | -5.0 |
| – real [b] | US$/t | 2,340 | 2,931 | 2,520 | 2,335 | 25 | -14.0 | -7.4 |
| | USc/lb | 106 | 133 | 114 | 106 | 25 | -14.0 | -7.4 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Mine output | kt | 1,340 | 1,313 | 1,405 | 1,576 | -2.0 | 7.0 | 12.2 |
| Refined output | kt | 418 | 461 | 493 | 505 | 10.3 | 7.0 | 2.5 |
| Export volume | | | | | | | | |
| – ore and concentrate [c] | kt | 2,556 | 2,113 | 2,498 | 2,858 | -17.2 | 18.2 | 14.4 |
| – refined | kt | 390 | 408 | 364 | 376 | 4.8 | -10.9 | 3.4 |
| – total metallic content | kt | 1,530 | 1,390 | 1,532 | 1,712 | -9.2 | 9.7 | 11.8 |
| Export value | | | | | | | | |
| – nominal | A$m | 3,592 | 3,291 | 4,077 | 3,882 | -8.4 | 23.9 | -4.0 |
| – real [d] | A$m | 3,719 | 3,353 | 4,077 | 3,816 | -9.8 | 21.6 | -5.6 |

Notes: **a** includes secondary refined zinc; **b** in 2021 US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2021–22 Australian dollars; **f** Forecast; **s** Estimate

Source: ABS (2021) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Science, Energy and Resources (2021); International Lead Zinc Study Group (2021); LME (2021)

# Lithium

## Major Australian Lithium deposits




## Lithium facts

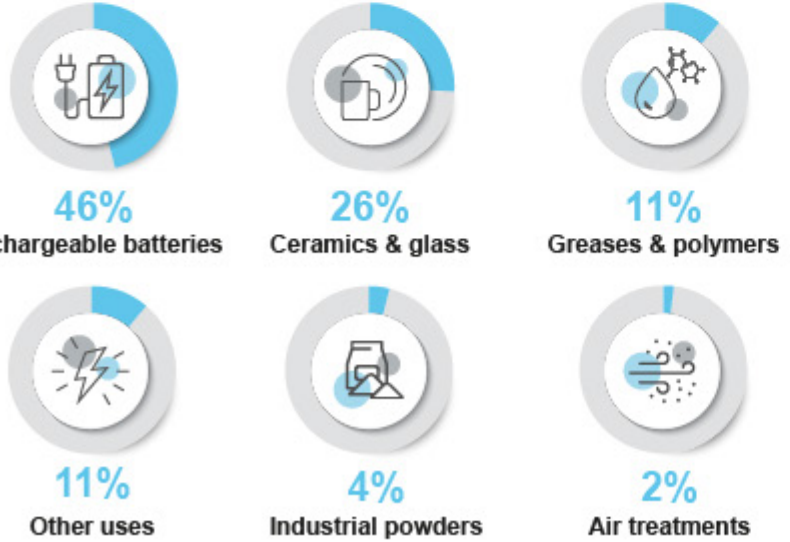
**Electric vehicle sales** areexpected to increase from **3m to 30m** by 2030

**Lithium exports** were **A$1.1b** in 2020-21

Australian lithium exports are tipped to rise to **3.9m tonnes** in 2025-26

Australia's production of lithium is **recovering strongly**

## World consumption




## Australia's lithium

**Biggest exporter** in the world

Produced 49% of the **world's lithium** in 2020

**2nd refinery** is **under construction**

## 15.1 Summary

- Spot spodumene prices (delivered to China) rose to US$2,240 a tonne in September 2021. Spodumene prices are forecast to rise from an average of US$435 a tonne in 2020 up to an average US$900 a tonne in 2021, US$1,190 a tonne in 2022 and US$930 a tonne in 2023, with contract pricing under negotiation. Lithium hydroxide prices are forecast to rise from US$9,890 a tonne in 2020 to US$15,160 a tonne in 2023.
- Australia's lithium production is forecast to rise from 217,000 tonnes lithium carbonate equivalent (LCE) in 2020–21 to 374,000 tonnes LCE in 2022–23 (see *Australia section*).
- Australia's lithium export earnings are forecast to increase from $1.1 billion in 2020–21 to $3.8 billion in 2022–23 with increasing lithium hydroxide production, after first production occurred in August 2021.

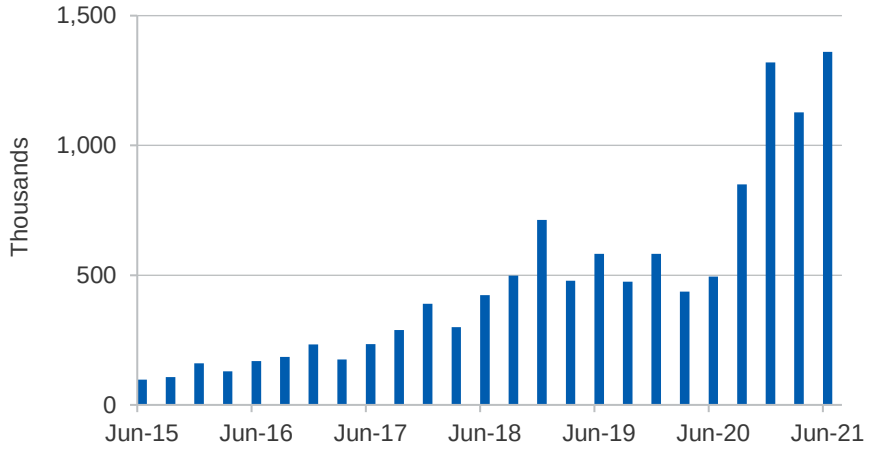
## 15.2 World consumption

### Increase in June quarter 2021 electric vehicle sales

Electric vehicle sales rose almost 21% quarter-on-quarter in the June quarter 2021, with sales dominated by China and Europe (Figure 15.1). Global electric vehicle sales exceeded 3 million units in 2020, and growth is likely to continue over the rest of 2021 — with sales forecast at about 5 million units, up from the last forecast of 4.4 million units. There is more than usual uncertainty in the forecast, due to a semi-conductor shortage in the auto industry, but auto-makers are expected to prioritise electric vehicles over combustion engines. Longer term, demand is projected to rise to about 30% of vehicle sales annually by 2030, given manufacturers' declarations of capacity hikes and recent strong sales trends (Figure 15.2).

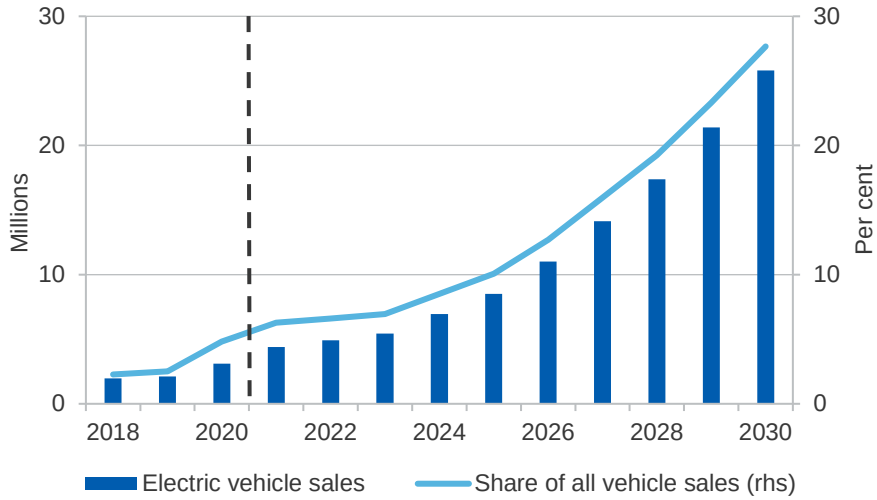
The European Commission released a proposal for stronger emissions standards on vehicles which would require average emissions of new cars to come down by 55% on 2021 levels by 2030 and 100% by 2035. The US administration approved targets of a 50-52% reduction in emissions by 2030 from 2005 levels. These targets mean security of supply for battery grade chemicals may become a big issue for customers, with a shortfall in battery grade products projected towards the end of the outlook period.

**Figure 15.1: World quarterly electric vehicle sales**




Source: Source: Department of Industry, Science, Energy and Resources (2021); BloombergNEF (2021)

**Figure 15.2: Long term sales projections**



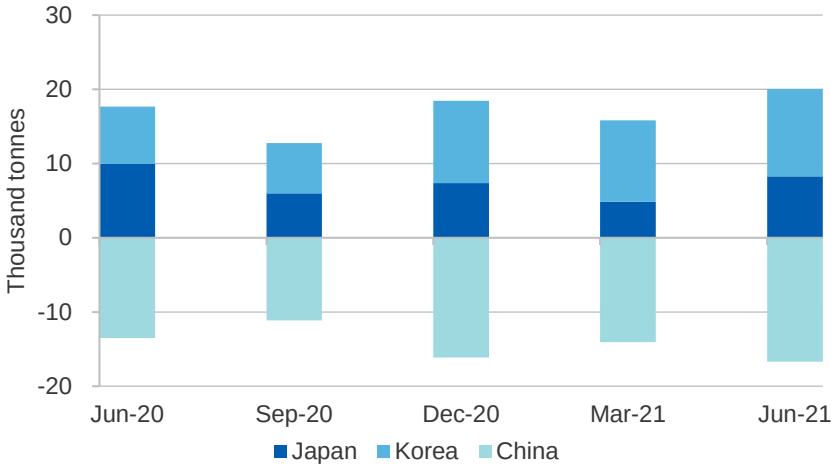

Source: Source: Department of Industry, Science, Energy and Resources (2021); BloombergNEF (2021)

## Lithium trade increased in the June quarter 2021

Over the June quarter 2021, China's lithium hydroxide exports increased by 19% quarter-on-quarter and 23% year-on-year, while lithium carbonate imports increased by 24% compared to the March quarter, and by 80% year-on-year. South Korea's lithium hydroxide imports for the June quarter 2021 rose by 7.1% quarter-on-quarter, while lithium carbonate imports rose by 35% quarter-on-quarter. Japan's lithium hydroxide imports rose 70% quarter-on-quarter for the June quarter 2021, but fell 17% year-on-year, while imports of carbonate increased 63% quarter-on-quarter.

Trade in lithium hydroxide between these nations tends to reflect refining patterns in China, whilst lithium carbonate is imported by these nations already processed (Figures 15.3 & 15.4). Australia's growing exports of spodumene makes up the largest share of global supply in lithium (Figure 15.5). This then is typically processed into lithium hydroxide in China. However, in August 2021, Australia produced its first lithium hydroxide.

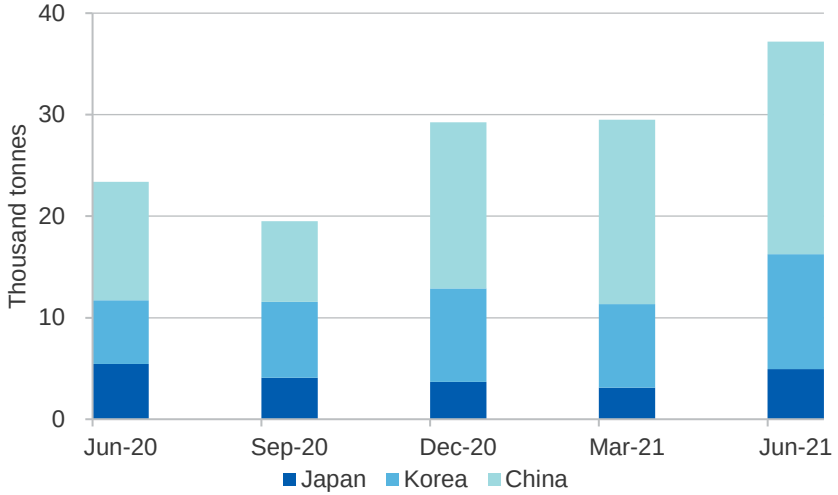
### Figure 15.3: Lithium hydroxide imports and exports




Notes: Positive numbers = imports, negative numbers = exports

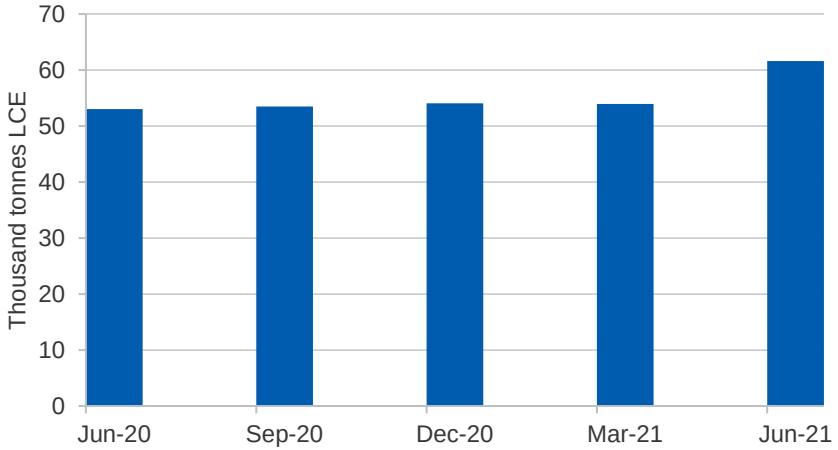
Source: BloombergNEF (2021); Department of Industry, Science, Energy and Resources (2021)

### Figure 15.4: Lithium carbonate imports




Source: BloombergNEF (2021); Department of Industry, Science, Energy and Resources (2021)

### Figure 15.5: Australian spodumene sales




Notes: ABS started collecting spodumene data as of 1 July 2021. Units in terms of lithium carbonate equivalent (LCE)

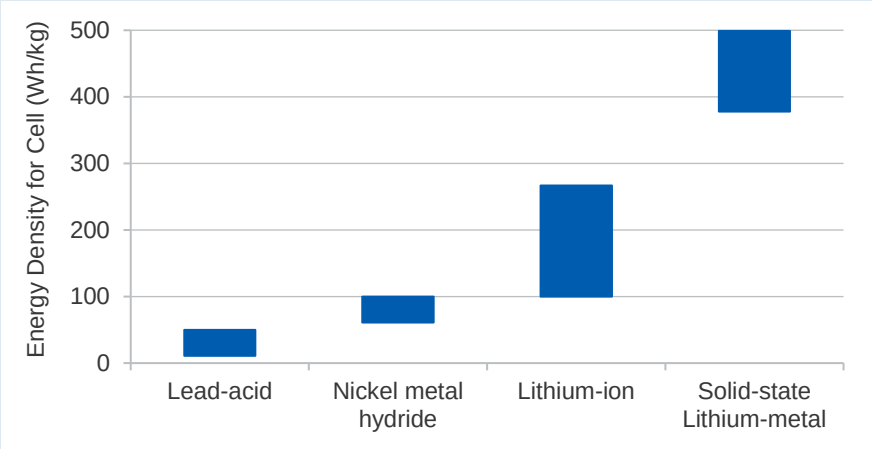
Source: Company reports; Department of Industry, Science, Energy and Resources (2021)

### Box 15.1: Solid state batteries

Solid state batteries have the potential to be a game changer in electric vehicles, offering longer driving range from double the energy density and much faster charging times. However the path to mass production is taking time, with most parties expecting this development in the later part of this decade. Solid state batteries are likely to increase demand for lithium, due to lithium metal use for anodes instead of graphite.

To date, Daimler has produced a bus with a solid state battery — the eCitaro G bus. Daimler is gradually rolling the model out with consultation to optimise performance. Despite the long lead time for solid state, Toyota started testing a proto-type vehicle in late 2020. Quantum-scape in California is also a strong contender, with current testing of prototype batteries. Issues to be overcome before commercial production include significant cost reductions as well as suitable charging infrastructure. However, with Japan committing to net-zero emissions by 2050, development impetus is strong. A team at the Monash Energy Institute is researching lithium-sulphur batteries with similar energy density to solid state batteries that may provide an alternative Australian solution.

**Figure 15.6: Energy densities of different battery types**




Source: https://www.quantumscape.com/

### Box 15.2: Lithium processing developments — cathode precursors?

Lithium Australia (ASX-listed) is undertaking work in the development of proprietary extraction processes for the conversion of all lithium silicates, whether from waste or tailings, including fine grained spodumene that is generally lost in conventional processing. The end product would be lithium phosphate. Converting directly to lithium phosphate shortens the processing pathway into cathode precursor production of lithium manganese iron phosphate; for which the company currently owns the patents. The company's recycling and battery operations are also geared towards lithium iron phosphate chemistry, having recently demerged its lithium exploration arm in order to concentrate on 'specialty chemicals'.

ASX Listed, Pilbara Minerals is also undertaking a scoping study into the production of 'lithium salts' — a 'mid-stream product', allowing for further refining before sale — as opposed to a normal 6% lithium oxide ($Li_2O$) spodumene concentrate. The lithium mid-stream product would grade 35% $Li_2O$, a six-fold increase on the spodumene concentrate, but it is extracted from the fine grained portion of spodumene. By potentially recovering the fine grained portion of the spodumene, the company may add value as well as potentially decreasing its carbon emissions. The scoping study is being conducted on a vertical kiln. This compares with the traditional 'rotary kiln' of the Kwinana and Kemerton refineries for traditional coarser grained spodumene. A final market for this specialty chemical has not yet been established — although rapid changes in the market, supported by strong demand — are likely to facilitate development.

The Talison Joint Venture is commissioning a tailings retreatment plant for Greenbushes in Western Australia in 2022, with output at about 300,000 tonnes a year of spodumene concentrate. Challenges in the 'renewables minerals market' are spawning processing developments for a number of minerals; morphing into specialty chemicals (see *zinc* chapter, Box 14.2, *nickel* chapter, Box 13.1).

Notes: 6% and 35% refer the concentration of lithium oxide – i.e. $Li_2O$.

Source: Company reports

### Lithium demand increasing strongly

World demand for lithium is forecast to increase from 305,000 tonnes lithium carbonate equivalent (LCE) in 2020 to 486,000 tonnes in 2021 (Table 15.1). Demand is then forecast to reach 724,000 tonnes by 2023, as global electric vehicle uptake rises.

The very strong increase in demand from 2021 to 2023 is based on increasing electric vehicle uptake — driven by government measures, lower vehicle prices and increasing model choice. Consequently, there is a short term supply pinch in spodumene, with auctions now available for the small amount of uncontracted tonnes that are available.

Asia is still dominating lithium product demand, despite battery factories diversifying into Europe and the US. In further developments, battery manufacturer, LG, is set to increase cathode production in Korea and potentially reduce reliance on China for supplies of precursor materials (see *nickel* chapter — Box 13.1). There is also potential for a joint venture in mining to secure supply chains.

## 15.3 World production

### Security of supply a priority, as world demand lifts

Output is forecast at 485,000 tonnes LCE in 2021, while production is forecast at 615,000 tonnes LCE in 2022, and 821,000 tonnes by 2023. At this stage, supply may fall short of demand if mine and brine operations meet headwinds in construction due to the COVID-19 pandemic. However, offtake agreements and equity raisings are making it easier to rapidly finance mine developments. Growing use of offtake agreements suggests security of supply is a significant issue.

### Project development is accelerating

Project development is accelerating, and at times is being placed under strain. Not only is construction being hampered by the COVID-19 pandemic, but producers must also meet increasingly strict requirements from battery manufacturers for product purity, as well as other materials specifications.

### The Americas

Galaxy Resources and Orocobre have finalised merger arrangements, with the new entity to be known as Allkem Limited. Its key development sites are in Argentina for lithium carbonate production. Allkem's Sal de Vida project in Argentina is planned to start at 10,700 tonnes a year lithium carbonate. Five out of eight wells have been drilled and engineering for the process plant is underway. The company has indicated first output of lithium carbonate from the project is possible in 2022. Additional stages that would raise production to more than 30,000 tonnes a year are also planned.

Meanwhile, production from the Olaroz operation in Argentina was 3,300 tonnes lithium carbonate in the June quarter 2021, up 2.1% quarter-on-quarter, with expansions plans underway to enable the production of 22,000 tonnes in 2022. Scoping studies are also underway for an additional 25,000 to 50,000 tonnes a year of lithium carbonate from Olaroz and Cauchari. A revised environmental social impact assessment has been submitted for James Bay in Canada, for development of spodumene resources, with refining to lithium hydroxide also being considered.

Chile's Sociedad Quimica y Minera de Chile (SQM) is continuing its strong development path, and plans to reach a nameplate capacity of 150,000 tonnes a year of lithium carbonate by the end of 2021. The company plans on accelerating development towards 180,000 tonnes a year of lithium carbonate, as well as 30,000 tonnes a year of lithium hydroxide, by the end of 2022.

Livent is increasing construction activity to meet target dates for production increases in Argentina from 20,000 to 40,000 tonnes LCE by the end of 2024. Additionally, the company is increasing annual lithium hydroxide production from 25,000 to 30,000 tonnes by late 2022 in the US. Albemarle's La Negra III and IV expansion projects in Chile are due to complete their ramp up by the end of 2022, and the operation will be capable of producing 40,000 tonnes a year of lithium carbonate. Lithium from geothermal brines is being developed in the Salton Sea in California by a number of parties with production likely after the outlook period.

### Africa

ASX-listed AVZ Minerals is completing detailed engineering studies on its Manono deposit in the Democratic Republic of Congo, after increasing its resource of contained lithium by 46%. An updated feasibility study and financial investment decision are due in the second half of 2021, with some permitting currently outstanding. A prefeasibility study has also commenced on a lithium hydroxide refinery to capture further value from the deposit, with the study due in the first quarter of 2022. A mining licence application has been lodged.

In Mali, ASX-listed Firefinch signed an offtake with Gangfeng for 436,000 tonnes a year of spodumene concentrate, i.e. 64,700 tonnes a year (LCE).

## 15.4 Prices

### Lithium market evolves with lithium hydroxide LME debut in 2021

In the eight months to end August 2021, the spot lithium hydroxide price (delivered to China) has averaged US$17,330 a tonne, up 136% from end 2020, though price gains have been more subdued in European markets.

LME cash-settled lithium hydroxide futures in mid-September 2021 closed at US$18.50 a kilogram via price assessment from Fast Markets. Lithium LME committee members include Tianqi, Albemarle, Tesla and ASX-listed, Pilbara Minerals. These lithium hydroxide futures contracts will assist in liquidity and transparency as the market matures.

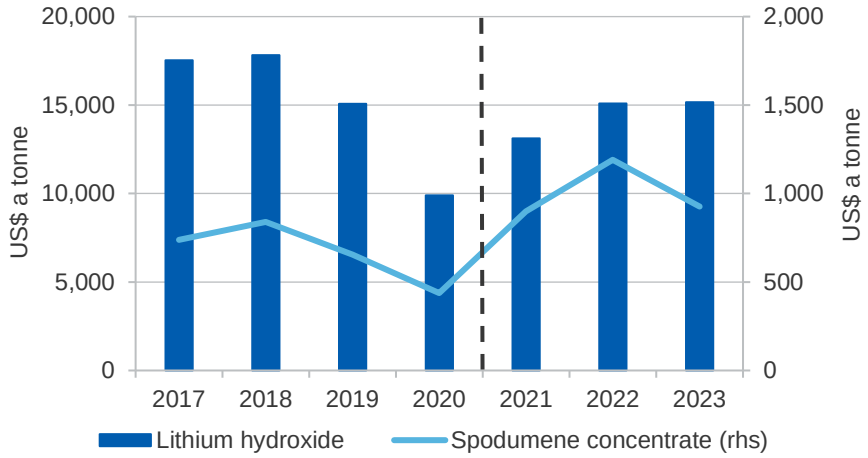
Lithium hydroxide prices are forecast to rise from US$9,890 a tonne in 2020 to US$14,560 a tonne in 2023. The drive upward in prices reflects forecast increased demand for the chemical from electric vehicle makers for cars with a longer driving range. Prices are also high due to an inability to bring on more hydroxide refining capacity in a timely and cost effective manner.

Spot spodumene prices (delivered to China) rose to US$2,240 a tonne in September 2021, up over five-fold since the start of the year. Spodumene prices are forecast to rise from an average of US$435 a tonne in 2020 to over US$1,000 a tonne over 2022 and over US$900 a tonne in 2023, with spot and contract pricing under negotiation.

Some suppliers of spodumene in Australia have historically worked off long term contracts. Contracts can be for one year but Albemarle, the world's largest lithium producer, have contracts often ranging over three to four years. Pricing reset mechanisms are commercial-in-confidence. As prices fell during 2018–2020, the market evolved to a mix of short term and long term contracts, as witnessed by long term producers like Albemarle. Now, with more recent price rises, there is strong disparity between spot and contract sales.

Pilbara Minerals' Battery Metals Exchange trading platform for uncontracted spodumene concentrate commenced in July, with the initial parcel clearing at US$1,250 a tonne. However, at their mid-September auction they achieved US$2,240 a tonne. Contract prices for spodumene are expected to increase strongly in 2021 and 2022, driven by rising electric vehicle production as well as short term supply issues (Figure 15.6).

**Figure 15.7: Spodumene concentrate/lithium hydroxide prices**




Notes: Lithium hydroxide price is for higher priced battery grade product

Source: Roskill (2021); Department of Industry, Science, Energy and Resources (2021)

## 15.5 Australia

### Export values forecast to increase

A strong rise in the spodumene price is forecast to see export revenue increase from $1.1 billion in 2020–21 to $3.4 billion in 2021–22, with production from lithium hydroxide refineries forecast to add to earnings for a total export revenue of $3.8 billion by 2022–23 (Figure 15.7).

### Australian production forecast to rise over the outlook period

Australian production is now expected to rise over the outlook period, from 217,000 tonnes LCE in 2020–21 to 306,000 tonnes LCE in 2021–22 and 374,000 tonnes LCE in 2022–23. Correspondingly, spodumene concentrate exports are forecast to increase from 1.5 million tonnes in 2020–21 to 2.5 million tonnes in 2022–23 (Figure 15.8).

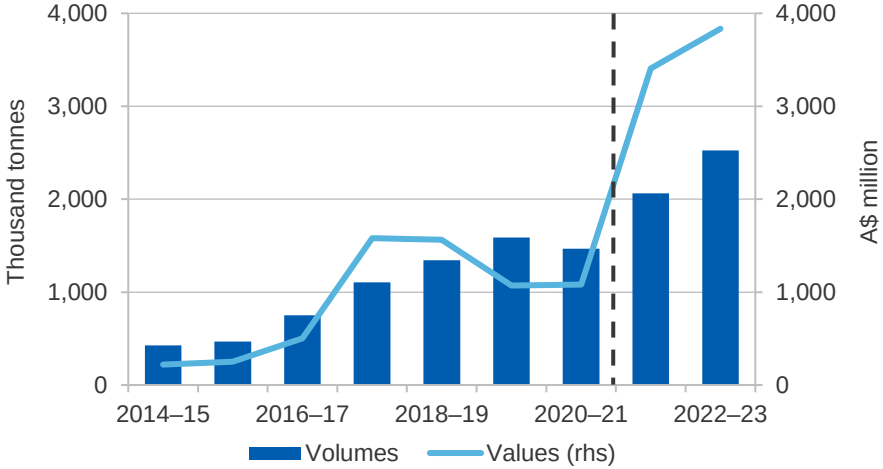
### Price appreciation induced production increases

Australia's production of spodumene concentrate in the June quarter 2021 rose by 8.4% quarter-on-quarter (and 15% year-on-year) to 58,000 tonnes LCE (circa 390,000 tonnes of concentrate). Output is rising in response to surging spot prices, and contract prices can be expected to rise, which should boost production at operations using long term contracts.

Pilbara Minerals production was stable in the June quarter 2021 at 77,000 tonnes of spodumene concentrate, but sales increased by 8.3% to 96,000 tonnes of spodumene concentrate. The board of Pilbara Minerals has approved the staged restart of the Ngungaji plant (the old Altura plant) in December quarter 2021, after successful trial processing of ore.

Production at the combined site is due to ramp up from around 380,000 tonnes a year to around 580,000 tonnes a year by mid-2022. The incremental production to be processed through the Ngungaji plant is not yet committed in contract. The combined resources for the Pilgangoora stand at 308.9 million tonnes at 1.14% $Li_2O$, up an incremental 40.7milion tonnes at 0.57% $Li_2O$. A reserve update is due in October 2021.

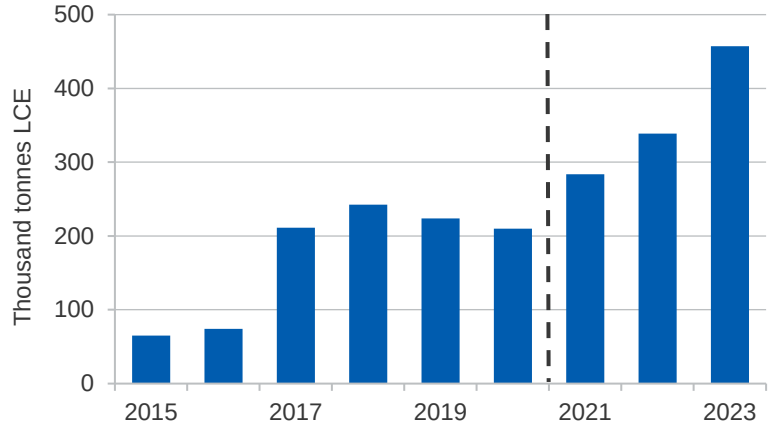
**Figure 15.8: Australia's exports of spodumene concentrate**




Notes: Income figures include lithium hydroxide and spodumene volumes contain hydroxide.

Source: Company reports; Roskill (2021); Department of Industry, Science, Energy and Resources (2021)

**Figure 15.9: Australia's spodumene concentrate production**




Notes: Lithium hydroxide is not included.

Source: Company reports; Roskill (2021); Department of Industry, Science, Energy and Resources (2021)

Production from Mt Marion (owned 50% by Mineral Resources and 50% by Gangfeng Lithium Co. Limited) was 114,000 tonnes of spodumene concentrate in the June quarter 2021, with production exceeding guidance (of 475,000 tonnes) for the financial year to reach 485,000 tonnes of concentrate (or 64,000 tonnes LCE). Production at Allkem's Mt Cattlin mine increased 36% to 63,000 tonnes of spodumene concentrate at a grade of 5.7% $Li_2O$ — whilst still within customer specifications. The slightly lower grade product has again allowed a larger volume to be produced but has also facilitated lower operating costs, down 17% to US$328 a tonne. Cost may rise as early works on the new 2NW pit occur in 2021 and 2022, whilst ore continues to be sourced from the 2NE pit.

The Greenbushes mine had estimated production of 135,000 tonnes of spodumene concentrate in the June quarter 2021, operated by the Talison Joint Venture. Previously, the Talison Joint Venture was with Albemarle (49%) and Tianqi (51%). Tianqi completed the sale of 24.99% of the mining operation to ASX-listed Independence Group on 30 June 2021. Greenbushes is ramping up their second chemical plant to produce 160,000 tonnes a year LCE in total. The sell-down included a 49% interest in the Kwinana lithium refinery.

### Project development in Australia

A feasibility study on Liontown's Kathleen Valley deposit, near Kalgoorlie, is due for completion in late 2021, with the company suggesting production in 2024 at 50,000 tonnes a year (LCE). The company is working on compressing its development timetable. The deposit is similar to Mt Holland.

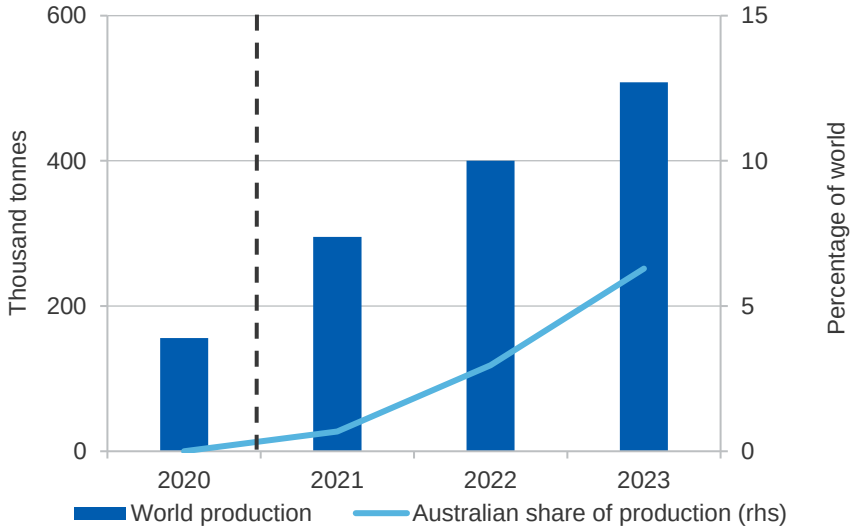
Core Lithium completed a positive feasibility study for its Finniss deposit close to Darwin. A recent equity raising and offtake agreements has the project fully funded to commence construction. Production could commence in late 2022 to early 2023, after a low capital cost start-up of $85 million. Investigations are also underway on potential for an associated lithium hydroxide refinery. Gangfeng and Yahua have offtake agreements for 80% of the first 4 years of production.

### Lithium hydroxide produced in Australia

Production has started at Train I of Tianqi's Kwinana lithium hydroxide refinery (51% Tianqi, 49% ASX listed Independence Group). Battery grade product is expected in the March quarter 2022, with ramp up to 24,000 tonnes a year by the end of 2022. Train 2, also 24,000 tonnes a year, is currently due to start production in 2024.

Finalisation of construction is underway at Kemerton's Stage I for 25,000 tonnes a year of lithium hydroxide (60% US based Albemarle, 40% ASX-listed Mineral Resources). Kemerton's Stage II — for an additional 25,000 tonnes a year — has been delayed 3 months due to COVID-19 restrictions, with completion and ramp up of both stages to name-plate capacity late in 2022. Albemarle plans to have Kemerton use 35% green electricity by 2023. This refinery will initially source spodumene concentrate from Greenbushes. By 2024, Australia may have as much as 10% of global lithium hydroxide refining capacity (Figure 15.9).

**Figure 15.10: World and Australian lithium hydroxide output**




Source: BloombergNEF (2021); Department of Industry, Science, Energy and Resources (2021)

The Wodgina mine (60% Albemarle, 40% Mineral Resources) remains on care and maintenance. Construction of the Kwinana lithium hydroxide refinery (50% ASX-listed Wesfarmers, 50% Chile-based SQM) has commenced. The refinery will source spodumene from the Mt Holland deposit. According to the joint venture partners, the refinery is expected to begin operating in 2024. Construction contracts for Mt Holland have been awarded to Primero for output of 400,000 tonnes a year of spodumene concentrate.

### Lithium battery recycling

Although only in its infancy, substantial recycling of lithium batteries will be required in order to meet global lithium demand to 2030 and beyond. ASX-listed Neometals' joint venture Primobius in Germany, intends to expand a demonstration plant and build up operational capacity to provide a 10 tonnes a day battery disposal recycling service in March quarter 2022, using shredding and hydrometallurgical recovery. A scaled up to 50 tonnes a day plant is also being considered by the company. Volkswagen is contemplating a similar path. Recycling in the US is being scaled up by Redwood Materials, which is led by an ex-Tesla executive. ASX-listed Lithium Australia is also undertaking work in the lithium recycling space. Due to the localised nature of recycling, China is likely remain the largest recycler of lithium-ion batteries.

### Revisions to the outlook

Forecast exports in 2021–22 have been revised up again from $2.0 billion to $3.4 billion, reflecting the very strong gains in the spodumene price, as well as increases in export volumes. Spodumene prices closed at US$405 a tonne at the end of 2020, but have since surged to US$1,300 a tonne in spot terms; well above the June 2021 *Resources and Energy Quarterly* forecast of US$670 a tonne for 2021. Exports in 2022–23 have been revised up from $2.5 billion to $3.8 billion, again reflecting the very strong gains in the spodumene price.

## Table 15.1: Lithium Outlook

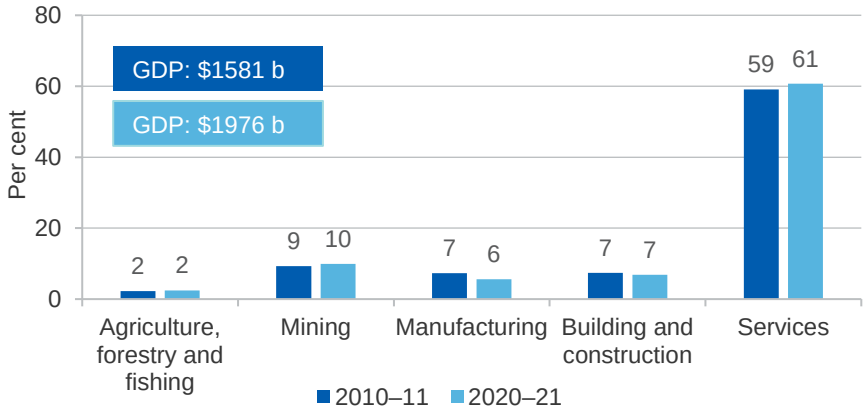
| | | | | | | Annual percentage change | | |
|---|---|---|---|---|---|---|---|---|
| **World** | **Unit** | **2020** | **2021[f]** | **2022[f]** | **2023[f]** | **2021[f]** | **2022[f]** | **2023[f]** |
| Lithium production [a] | kt | 464 | 485 | 615 | 821 | 4.7 | 27 | 33 |
| Demand [b] | kt | 305 | 486 | 573 | 724 | 60 | 17.8 | 26 |
| Stocks [c] | kt | 122 | 114 | 124 | 175 | -6.3 | 9.3 | 41 |
| – weeks of consumption | | 20.7 | 12.2 | 11.3 | 12.6 | -41 | -7.2 | 11.2 |
| Spodumene price | | | | | | | | |
| – nominal | US$/t | 437 | 899 | 1,191 | 927 | 106 | 32 | -22 |
| – real [d] | US$/t | 452 | 899 | 1,163 | 883 | 99 | 29 | -24 |
| Lithium hydroxide price | | | | | | | | |
| – nominal | US$/t | 9,892 | 13,122 | 15,083 | 15,163 | 33 | 14.9 | 0.5 |
| – real [d] | US$/t | 10,230 | 13,122 | 14,729 | 14,445 | 28 | 12.2 | -1.9 |
| **Australia** | **Unit** | **2019–20** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** | **2020–21[s]** | **2021–22[f]** | **2022–23[f]** |
| Mine production [a] | kt | 216 | 217 | 306 | 374 | 0.4 | 41 | 22 |
| Spodumene export volume [e] | kt | 1,588 | 1,466 | 2,063 | 2,526 | -7.7 | 41 | 22 |
| Export value | | | | | | | | |
| – nominal value [g] | A$m | 1,071 | 1,080 | 3,407 | 3,834 | 0.9 | 215 | 12.5 |
| – real value [h] | A$m | 1,109 | 1,101 | 3,407 | 3,769 | -0.8 | 210 | 10.6 |

Notes: **a** Lithium Carbonate Equivalent: This is a measure of the quantity of refined product; **b** Demand is ahead of consumption by approximately 12 months due to the lead time required in battery manufacturing; **c** Stockpile estimates difficult to estimate, calculated after losses from refining and allowing for lead time in battery manufacturing; **d** In 2021 US dollars; **e** Spodumene concentrates: mostly 6 per cent $Li_2O$ concentrate, stockpiles run down in 2019–20; **f** Forecast; **g** revenue from spodumene concentrate as well as lithium hydroxide; **h** In 2021–22 Australian dollars; **s** Estimate.

Source: Company reports; Department of Industry, Science, Energy and Resources (2021); Roskill (2021); BloombergNEF (2021); Government of Western Australia Department of Mines, Industry Regulation and Safety (2021)

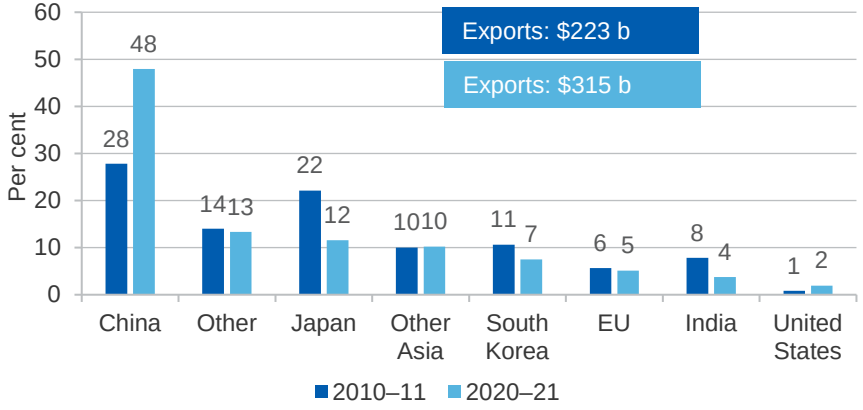
# Trade summary charts and tables

## Figure 16.1: Industry shares of GDP



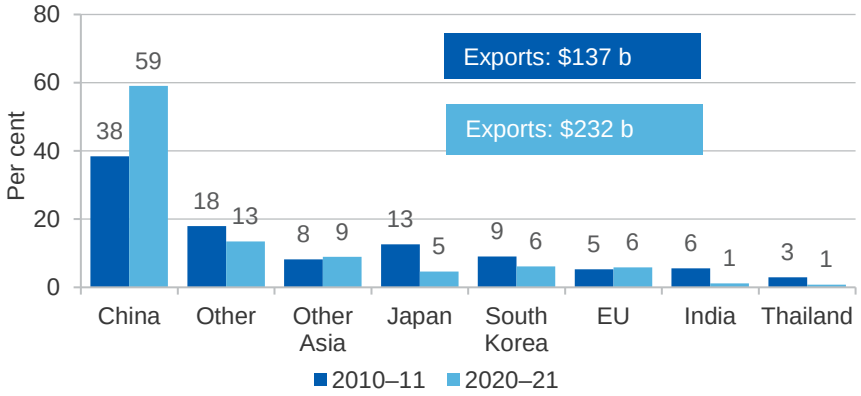

Source: ABS (2021) Australian National Accounts, National Income, Expenditure & Production, 5204.0

## Figure 16.2: Principal markets for Australia's resources and energy exports, 2021–22 dollars



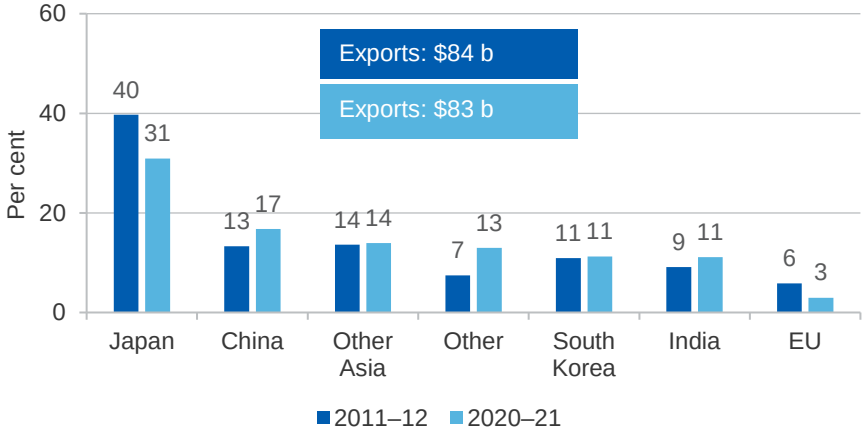

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Figure 16.3: Principal markets for Australia's resources exports, 2021–22 dollars



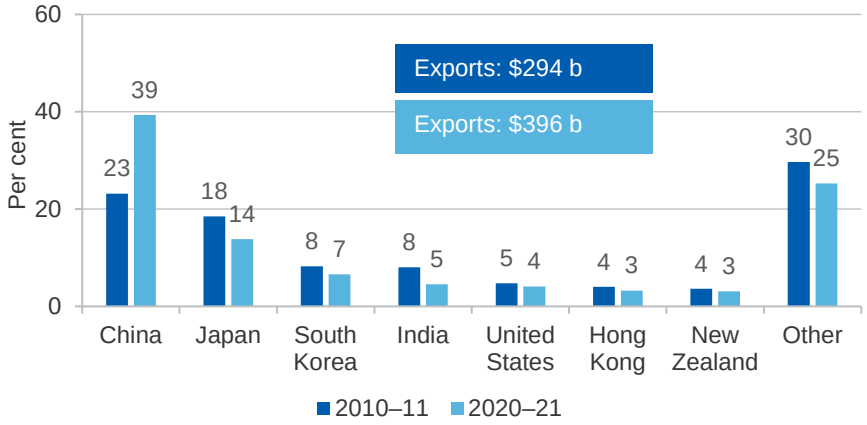

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Figure 16.4: Principal markets for Australia's energy exports, 2021–22 dollars



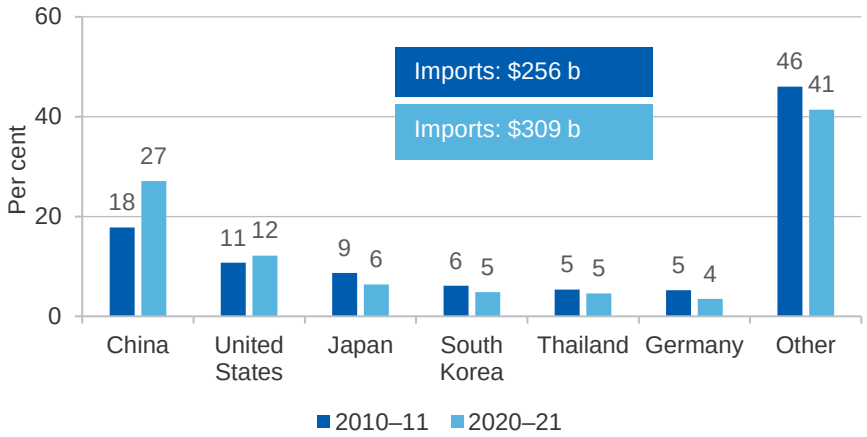

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Figure 16.5: Principal markets for Australia's total exports, 2021–22 dollars



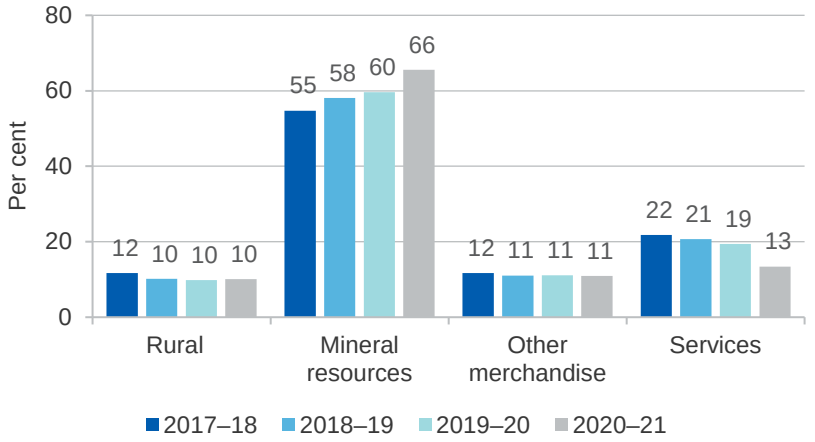

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Figure 16.6: Australia's total imports by country of origin, 2021–22 dollars



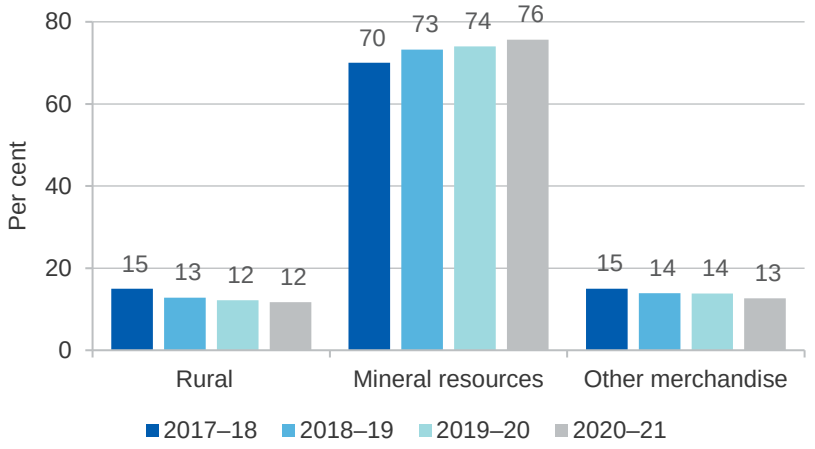

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Figure 16.7: Proportion of goods and services exports by sector




Source: ABS (2021) Balance of Payments and International Investment Position, 5302.0

## Figure 16.8: Proportion of merchandise exports by sector




Source: ABS (2021) Balance of Payments and International Investment Position, 5302.0

## Table 16.1: Principal markets for Australia's thermal coal exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| Japan | $m | 7,438 | 8,783 | 10,322 | 8,643 | 7,121 |
| South Korea | $m | 2,742 | 2,735 | 3,118 | 2,944 | 2,612 |
| Taiwan | $m | 1,713 | 2,410 | 2,697 | 2,470 | 2,107 |
| Vietnam | $m | 108 | 156 | 134 | 1,078 | 725 |
| Malaysia | $m | 534 | 687 | 784 | 553 | 570 |
| Thailand | $m | 341 | 310 | 389 | 447 | 528 |
| **Total** | **$m** | **20,548** | **24,089** | **27,237** | **21,097** | **16,279** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

## Table 16.2: Principal markets for Australia's metallurgical coal exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| India | $m | 5,014 | 8,926 | 9,950 | 7,755 | 7,742 |
| Japan | $m | 4,741 | 7,401 | 7,622 | 6,300 | 4,859 |
| South Korea | $m | 2,269 | 3,934 | 3,848 | 3,141 | 2,776 |
| China | $m | 4,213 | 8,163 | 8,789 | 10,123 | 1,700 |
| Taiwan | $m | 1,056 | 1,943 | 2,028 | 2,064 | 1,359 |
| Netherlands | $m | 994 | 2,012 | 1,880 | 1,285 | 945 |
| **Total** | **$m** | **38,413** | **40,308** | **45,786** | **35,458** | **23,801** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

### Table 16.3: Principal markets for Australia's crude oil and refinery feedstocks exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| Singapore | $m | 684 | 1,080 | 1,232 | 1,408 | 1,696 |
| Malaysia | $m | 157 | 455 | 614 | 1,049 | 670 |
| Indonesia | $m | 385 | 979 | 1,372 | 788 | 627 |
| Thailand | $m | 755 | 601 | 1,210 | 640 | 354 |
| China | $m | 766 | 754 | 661 | 1,069 | 164 |
| Japan | $m | 159 | 380 | 377 | 142 | 93 |
| **Total** | **$m** | **5,953** | **7,421** | **9,518** | **9,328** | **7,560** |

Note: Some country details have been confidentialised by the Australian Bureau of Statistics.

Source: ABS (2021) International Trade in Goods and Services, 5368.0

### Table 16.4: Principal markets for Australia's LNG exports, 2021–22 dollars

| | Unit | 2015–16 | 2016–17 | 2017–18 | 2018–19 | 2019–20 |
|---|---|---|---|---|---|---|
| Japan | $m | 11,449 | 12,065 | 15,226 | 20,634 | 13,483 |
| China | $m | 3,195 | 6,083 | 10,031 | 16,853 | 11,433 |
| South Korea | $m | 1,825 | 2,725 | 3,869 | 5,344 | 3,817 |
| Taiwan | $m | 174 | 271 | 784 | 2,685 | 2,616 |
| Singapore | $m | 432 | 1,525 | 1,192 | 1,076 | 924 |
| Malaysia | $m | 204 | 223 | 381 | 1,507 | 547 |
| **Total** | **$m** | **24,251** | **32,963** | **52,177** | **49,208** | **31,049** |

Notes: Department of Industry, Science, Energy and Resources estimates based on International Trade Centre data, except for 2016–17 where ABS trade data is available.

Source: ABS (2021) International Trade in Goods and Services, 5368.0; International Trade Centre (2021) International Trade Statistics

### Table 16.5: Principal markets for Australia's iron ore exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| China | $m | 42,154 | 54,966 | 52,587 | 87,790 | 126,822 |
| South Korea | $m | 3,319 | 4,168 | 3,784 | 6,442 | 9,219 |
| Japan | $m | 5,090 | 5,745 | 5,594 | 7,287 | 9,211 |
| Taiwan | $m | 1,110 | 1,527 | 1,296 | 1,942 | 3,126 |
| Indonesia | $m | 59 | 46 | 47 | 28 | 41 |
| India | $m | 7 | 6 | 314 | 21 | 10 |
| **Total** | **$m** | **68,073** | **65,477** | **81,373** | **106,505** | **155,475** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

### Table 16.6: Principal markets for Australia's aluminium exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| Japan | $m | 757 | 994 | 1,441 | 1,052 | 965 |
| South Korea | $m | 1,212 | 790 | 885 | 1,179 | 921 |
| Taiwan | $m | 324 | 220 | 343 | 373 | 421 |
| Thailand | $m | 292 | 328 | 392 | 300 | 355 |
| United States | $m | 20 | 136 | 194 | 255 | 261 |
| China | $m | 102 | 54 | 35 | 30 | 119 |
| **Total** | **$m** | **3,443** | **4,280** | **4,371** | **3,823** | **3,818** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

### Table 16.7: Principal markets for Australia's copper exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| China | $m | 3,899 | 2,877 | 3,953 | 3,921 | 2,784 |
| South Korea | $m | 533 | 476 | 305 | 674 | 1,358 |
| Malaysia | $m | 671 | 917 | 913 | 853 | 865 |
| India | $m | 558 | 728 | 879 | 479 | 646 |
| Japan | $m | 1,552 | 1,446 | 1,600 | 2,201 | 17 |
| Philippines | $m | 239 | 423 | 175 | 373 | 0 |
| **Total** | **$m** | **8,228** | **9,013** | **10,251** | **10,570** | **11,645** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

### Table 16.8: Principal markets for Australia's gold exports, 2021–22 dollars

| | Unit | 2016–17 | 2017–18 | 2018–19 | 2019–20 | 2020–21 |
|---|---|---|---|---|---|---|
| United Kingdom | $m | 4,282 | 4,173 | 3,430 | 13,157 | 9,102 |
| United States | $m | 160 | 157 | 77 | 3,188 | 4,012 |
| Singapore | $m | 1,300 | 326 | 1,214 | 1,473 | 2,988 |
| China | $m | 7,117 | 2,474 | 3,083 | 853 | 2,066 |
| Switzerland | $m | 781 | 1,010 | 1,149 | 1,966 | 1,924 |
| India | $m | 745 | 437 | 768 | 69 | 1,502 |
| **Total** | **$m** | **20,632** | **20,576** | **19,796** | **25,258** | **26,601** |

Source: ABS (2021) International Trade in Goods and Services, 5368.0

# Appendices

# Appendix A
# Definitions and classifications

## A.1 Exchange rates

In this report, the AUD/USD exchange rate (Australian dollar relative to the US dollars) is based on the median of economic forecasters at the time that the report is prepared. The source is the Bloomberg survey of economic forecasters.

World commodity prices are typically denominated in US dollars, and exchange rate movements can have a significant effect on the actual outcomes of commodity prices and export earnings. A change in the value of the US dollar against other floating international currencies can influence movements in world resources and energy prices. A change in the Australian dollar against the US dollar will impact on export earnings for domestic commodity exporters and producers. There is substantial uncertainty surrounding any exchange rate forecast, with changes to exchange rates influenced by changes in financial market sentiment, sometimes resulting in strong volatility.

## A.2 Conversion to real dollars

Nominal values and prices are converted to real dollars using Australian and US consumer price indexes (CPI). The Australian and US CPI forecasts are based on the median of economic forecasters at the time that the report was prepared. The source is the Bloomberg survey of economic forecasters.

## A.3 Time periods

The terms 'estimate', 'forecast' and 'projection' refer to different time periods in this report. Estimate refers to a time period that has passed, but for which full historical data is not yet available, while 'forecast' and 'projection' refer to different periods in the future. It is important to distinguish between different future time horizons, as factors affecting production, consumption and prices in the short-term differ from factors affecting these components in the medium to long-term. Forecasts also become increasingly imprecise over longer time horizons, due to increased risk and uncertainty. For these reasons, the Department of Industry, Science, Energy and Resources' Office of the Chief Economist (DISER OCE) uses different terminology to distinguish between short-term forecasts and medium to long-term projections, as outlined in *Table A2*.

**Table A1: OCE terminology for different time periods/horizons**

| Period | Years | Terminology |
|---|---|---|
| Historical | Time period has passed but complete data for the period is not yet available | Estimate |
| Short-term | 1 to 2 years | Forecast |
| Medium-term | 3 to 5 years | Projection |
| Long-term | Beyond 5 years | n/a |

Source: Department of Industry, Science, Energy and Resources (2021)

## A.4 Commodity classifications

The DISER OCE defines exports for each commodity by a selected set of 8-digit Australian Harmonised Export Commodity Classification (AHECC) codes. Where possible, the choice of AHECC codes is based on alignment with international trade data, to ensure that direct comparisons can be made. For example, groupings for various commodities are aligned with classifications used by the International Energy Agency, World Steel Association, International Nickel Study Group, International Lead and Zinc Study Group, International Copper Study Group and World Bureau of Metal Statistics.

In this report, benchmark prices and Australian production and exports are forecast for 21 commodities, as shown in *Table A2*. In estimating a total for Australia's resources and energy exports, the remaining commodities, defined as 'other resources' and 'other energy', are forecast as a group.

**Table A2: Resources and energy commodities groupings and definitions**

| | Resources (non-energy) | Energy |
|---|---|---|
| Definition | Resource commodities are non-energy minerals and semi-manufactured products produced from non-energy minerals | Energy commodities are minerals and petroleum products that are typically used for power generation |
| Australian Harmonised Export Commodity Classification (AHECC) chapters | 25 (part); 26 (part); 28 (part); 31 (part); 73 (part); 74; 75; 76; 78; 79; 80; 81 | 27 (part) |
| Commodities for which data is published, forecasts are made and analysed in detail in this report | Aluminium; alumina; bauxite; copper; gold; iron ore; crude steel; nickel; zinc, lithium | Crude oil and petroleum products; LNG; metallurgical coal; thermal coal; uranium |

Notes: The AHECC chapter is the first two digits of the trade code. Groupings are made at the 8-digit level.

Source: Department of Industry, Science, Energy and Resources (2021)

# Appendix B Glossary

| Term | Description |
|---|---|
| A$ | Australian dollar |
| ABS | Australian Bureau of Statistics |
| AHECC | Australian Harmonized Export Commodity Classification |
| AISC | All-In Sustaining Cost — an extension of existing cash cost metrics and incorporates costs related to sustaining production. |
| Base metals | A common metal that is not considered precious (includes aluminium, copper, lead, nickel, tin, zinc) |
| Bbl | Barrel |
| Bcm | Billion cubic metres |
| Benchmark | A standard specification used to price commodities. |
| BF and BOF | Blast furnace and basic oxygen furnace — used in an integrated steelmaking process that uses iron ore and coal. |
| Bulks | Non-liquid and non-gaseous commodities shipped in mass and loose (iron ore, coal, bauxite) |
| CAGR | Compound annual growth rate |
| Capex | Capital expenditure |
| CFR | Cost and freight — Seller clears exports, and pays freight. |
| CIF | Cost, Insurance, and Freight |
| Coal Seam Gas (CSG) | Natural gas found in coal seams. Also known as Coal Bed Methane (CBM) |
| Coke | Made by heating coal at high temperatures without oxygen, and used to reduce iron ore to molten iron saturated with carbon, called hot metal |

| | |
|---|---|
| Conventional gas | Natural gas that can be produced from reservoirs using traditional techniques. Contrasts with unconventional gas. |
| COVID-19 | 2019 Novel Coronavirus |
| CPB | CPB Netherlands Bureau for Economic Policy Analysis |
| CPI | Consumer Price Index — measures quarterly changes in the price of a basket of goods and services which account for a high proportion of expenditure by the CPI population group (i.e. metropolitan households). |
| Crude steel | Steel in the first solid state after melting, suitable for further processing or for sale. |
| DES | Delivered Ex Ship — price of LNG including shipping and insurance. |
| DISER | Department of Industry, Science, Energy and Resources |
| DMO | Domestic Market Obligation — a policy to reserve energy commodities for domestic usage |
| DRC | Democratic Republic of the Congo |
| ECB | European Central Bank |
| Economic growth | An increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It is measured in nominal or real gross domestic product (GDP). |
| EIA | The United States Energy Information Administration |
| EAF | Electric arc furnace — a furnace that melts steel scrap using the heat generated by a high power electric arc. |
| ETF | Exchange Traded Fund — an exchange traded fund that allows investors to invest in gold on the exchange. |
| EUV | Export unit value — export value/volumes exported |
| EV | Electric vehicle |
| f | Forecast — a two year outlook |
| FEED | Front end engineering design |
| FID | Final investment decision |

| | |
|---|---|
| FOB | Free on board — seller clears export, buyer pays freight. |
| GAD | Gross air dried basis — For measuring coal quality. |
| GAR | Gross as received basis — For measuring coal quality. |
| GBP | Great Britain Pounds |
| GDP | Gross Domestic Product — measures the value of economic activity within a country/group. |
| GFC | Global Financial Crisis — the period of extreme stress in global financial markets and banking systems between mid-2007 and early 2009. |
| GJ | Gigajoule |
| GST | Goods and Services Tax — a value-added tax levied on most goods and services sold for domestic consumption. |
| HCC | Hard coking coal — The best grade of metallurgical coal used in the steel production process. Australian hard coking coal is regarded as the industry benchmark. |
| IEA | International Energy Agency |
| IMF | International Monetary Fund — an international organisation that promotes international financial stability and monetary cooperation. |
| IMO | International Maritime Organisation |
| IP | Industrial Production — measures the output of the industrial sector that comprises mining, manufacturing, utilities and construction. |
| IPO | Initial public offering — a process of offering shares of a private corporation to the public in a new stock issuance. |
| ISM | US Institute for Supply Management |
| ISM | Institute of Supply Management |
| JCC | Japan Customs-cleared Crude (or Japan Crude Cocktail) — average price of crude oil imported by Japan and a common price index in long-term LNG contracts. |
| JFY | Japanese fiscal year |
| kcal/kg | Kilocalories per kilogram |

| | |
|---|---|
| kt | Thousand tonnes |
| ktpa | Kilotonnes per annum |
| LBMA | London Bullion Market Association |
| LCE | Lithium Content Equivalent |
| Li OH | Lithium Hydroxide |
| LME | London Metal Exchange |
| LNG | Liquefied natural gas |
| LNY | Lunar New Year |
| LPG | Liquefied petroleum gas |
| LVPCI | Low volatile pulverised coal injection — a type of  low volatile coal used in the PCI process |
| m | Million |
| MMbtu | Million British thermal units |
| Mt | Million tonnes |
| mtpa | Million tonnes per annum |
| MW | Megawatts |
| Nameplate capacity | The theoretical maximum annual production capacity |
| NAR | Net as received basis — For measuring coal quality |
| NDRC | China's National Development and Reform Commission |
| NEV | New energy vehicle — term used for plug-in electric vehicles eligible for public subsidies (battery electric vehicles and plug-in hybrid vehicles) |

| | |
|---|---|
| OCE | Office of the Chief Economist |
| OECD | Organisation for Economic Co-operation and Development |
| OPEC | Organisation of Petroleum Exporting Countries, a formal alliance of 14 countries to collaborate to manage the world oil market |
| OPEC+ | Informal term for agreements between OPEC and ten other oil-producing countries (which are not members of OPEC) |
| Oz | Ounce |
| PCE | Personal Consumption Expenditure — a measure of the changes in price of consumer services and goods. |
| PCI | Pulverised coal injection — PCI coal is used for its heat value and injected directly into blast furnaces as a supplementary fuel, which reduces the amount of coke required. |
| PCI | Pulverised coal injection — a process used in blast furnace operations |
| PM | The afternoon price of gold set at 3.00pm each business day at the London Bullion Market Association |
| PMI | Purchasing Managers Index — an indicator of economic health for manufacturing and service sectors. |
| PPP | Purchasing Power Parity — a way of measuring economic variables in different countries that equalise the purchasing power of different currencies |
| RoW | Rest of world |
| s | Estimate — Incomplete data or subject to revision |
| Shale gas | Natural gas found in shales |
| SDR | Special drawing right |
| SHFE | Shanghai Futures Exchange |
| SSCC | Semi-soft coking coal — A type of metallurgical coal used in the steel production process alongside hard coking coal, but results in a lower coke quality and more impurities. |
| Tariff | A tax on imports or exports that is used by governments to generate revenue or to protect domestic industries from competition. |
| Tight gas | Natural gas found in low quality reservoirs |

| | |
|---|---|
| TWI | Trade Weighted Index — a measure of the foreign exchange value of the US dollar against a basket of major foreign currencies. |
| U3O8 | Triuranium octoxide — a compound of uranium. |
| UAE | United Arab Emirates |
| UK | United Kingdom |
| Unconventional gas | Natural gas that is more difficult to extract, including coal seam gas, shale gas and tight gas. Contrasts with conventional gas. |
| US | United States |
| US$ | United States dollar |
| WEO | The International Energy Agency's World Energy Outlook |
| WTI | West Texas Intermediate crude oil price |
| z | Projection  a five year outlook |