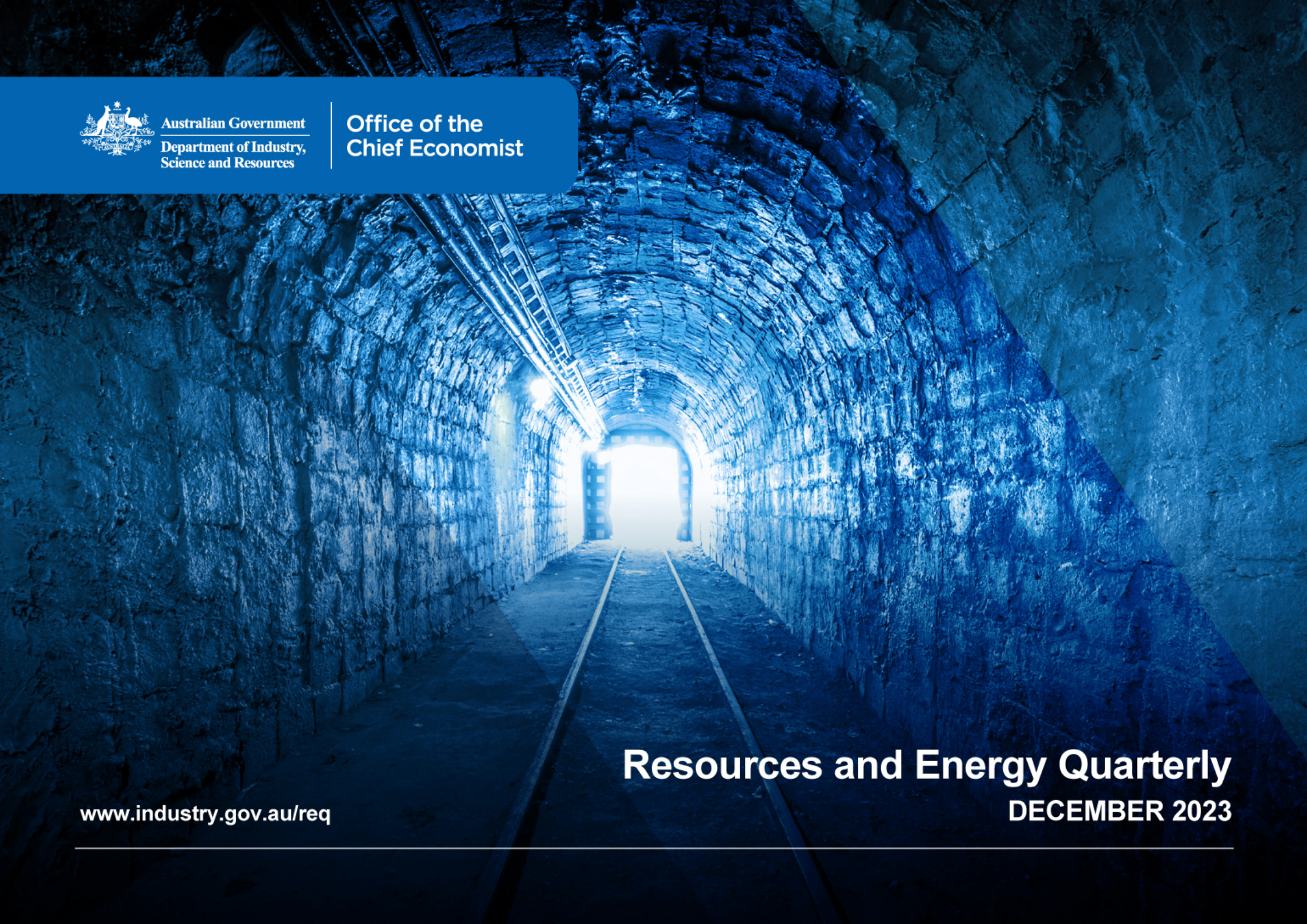

Australian Government
Department of Industry, Science and Resources

Office of the Chief Economist

Resources and Energy Quarterly

DECEMBER 2023

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Editor

David Thurtell

Chapter Authors

Resource and energy overview: David Thurtell

Macroeconomic overview and gold: Chris Mornement

Steel and iron ore: Colin Clark

Metallurgical coal: Ranjini Palle and Sufyan Saleem

Thermal coal: Ranjini Palle

Uranium: Sufyan Saleem

Gas: Mark Gibbons

Oil and zinc: Justin Tang

Aluminium, alumina and bauxite: Andy Lee

Copper: Andrew Nash

Nickel: Kaycee Handley

Lithium: Charlie Qin

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Executive Summary

The profile for Australian resource and energy export earnings is little changed from the September 2023 *Resources and Energy Quarterly* (REQ) report, improving slightly in aggregate. Exports are forecast to be $408 billion in 2023–24, down from a record $466 billion in 2022–23 — when the fallout from the Russian invasion of Ukraine contributed to a major spike in energy prices. Exports are forecast at $348 billion in 2024–25 as prices soften and the AUD/USD lifts.

World economic growth remains relatively soft, weighed down by tighter financial conditions; central banks in the major Western economies continue to clamp down on inflation, and inflation appears to be easing in some nations. The IMF's latest forecasts (October) are largely unchanged. However, concerns around a hard landing in the US have eased considerably and the outlook for China has improved, given stronger than expected economic results and the Government taking further measures to stabilise the nation's residential property sector. Both developments help the outlook for resource and energy commodity demand.

Strong capital expenditure (on infrastructure and in the manufacturing sector) and rising motor vehicle exports have helped sustain Chinese steel production in the face of falling residential construction. Steady world steel output and low Chinese iron ore inventories recently helped push iron ore prices above US$120 a tonne. Other bulk commodity prices also remain high in historical terms. The metallurgical coal market remains tight due to supply problems, including lower Russian exports. Improving supply is expected to see bulk commodity prices to drift down in the outlook period.

To date, there has been very limited impact of the conflict in the Middle East on the global economy and energy prices. After repeated OPEC+ supply cuts, world oil stocks remain relatively low, keeping oil prices more vulnerable to supply shocks. Worries that the Hamas-Israel conflict could cause a disruption to Middle East oil and LNG supplies sparked a rise in energy prices early in the December quarter. But weak world demand and the absence of any fallout on Middle East oil supply has helped move oil and LNG prices back close to pre-conflict levels.

Nonetheless, reduced global supply of energy commodities following the implementation of Russian sanctions has raised the vulnerability of gas/LNG/coal prices to supply outages and demand spikes. As such, there is more uncertainty than in the past around how energy prices may develop through the Northern Hemisphere winter and summer demand peaks. Stockpiles of gas in Europe are high heading into winter. Likewise, high stocks of thermal coal in China and Europe have seen thermal coal prices come down.

There has been a surge in uranium prices in recent months. New supply problems have added to the impact of hoarding and, on the demand side, some nations continue to favourably reconsider the role nuclear power can make in meeting their 'net zero' targets and ensuring their energy security.

Bond yields recently hit decade highs, as the fixed interest market reassessed how high the US Fed Funds rate would need to go and for how long. High bond yields would normally have hurt the gold price, but geopolitical tensions have helped sustain gold at close to US$2,000 an ounce.

There are high chances of drier than normal conditions in eastern Australia over the next 3-6 months. This lowers the risk of wet weather and flooding that have adversely impacted mines and transport routes since 2020. However, the El Niño-driven drought in Indonesia is lowering river levels, making it increasingly difficult to barge thermal coal to export ports.

Lithium prices have fallen further from the record peak in late 2022. Driving the fall has been concerns about short term demand for electric vehicles and ongoing increases in lithium supply. Export volumes of Australian lithium ores and chemicals are still expected to grow strongly over the outlook period, with lithium hydroxide set to account for a rising share of those exports. The long-term outlook for lithium demand remains strong, as does Australian lithium producers' ability to compete.

Overview

Australia's mining sector

Contributes to around **13.4% of GDP**

Makes up more than **two-thirds** of Australia's total merchandise exports

The resources sector directly employs **around 300,000** people

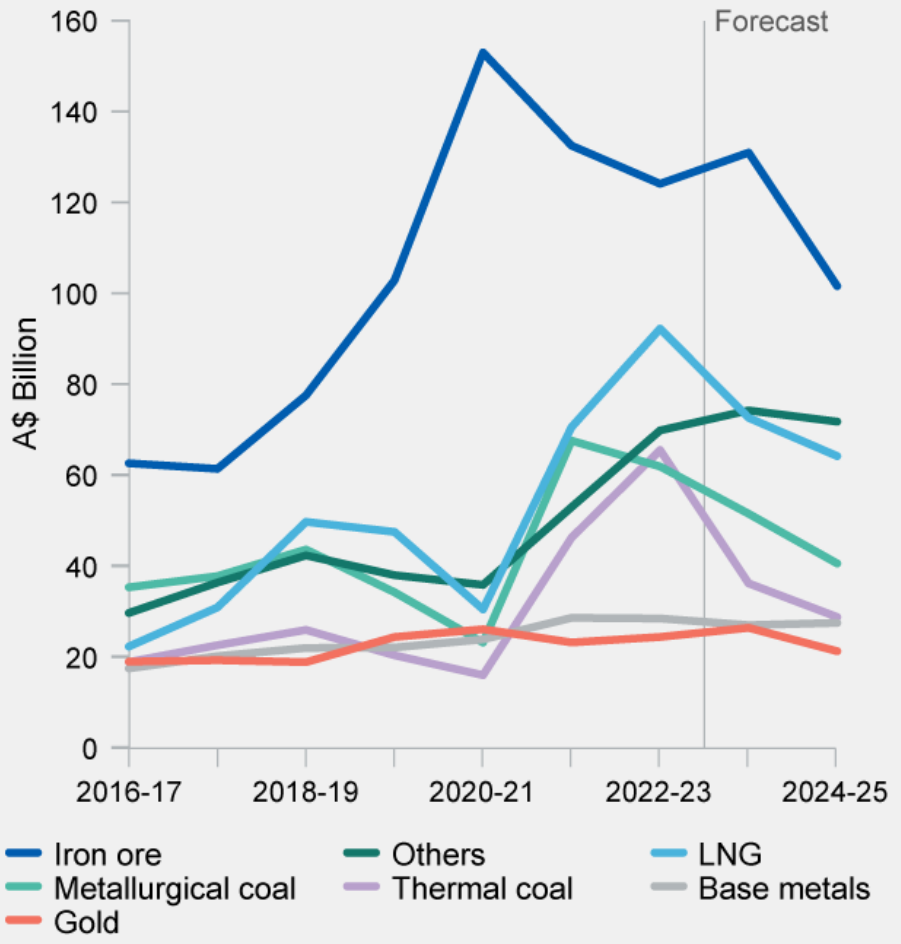
Outlook

The forecast for **commodity earnings** has been **revised up** slightly

Investment in **new deposits and mines** remains solid

Commodity **prices** and **earnings** are expected to **ease** over the outlook period, from a record level in 2022–23

Australia's resource and energy exports



SOURCE: ABS; DISR; OCE

1.1 Summary

- In net terms, the outlook for Australian resource and energy commodity exports has improved slightly since the September edition of the REQ. The world economy has not slowed as sharply as feared a few months ago and the Chinese Government has taken further measures to stabilise the nation's residential property sector, maintaining demand for a range of resource and energy commodities.
- The latest forecast is for weaker growth in world demand and improving world commodity supply to cut Australia's resource and energy export earnings from a record $466 billion in 2022–23 to $408 billion in 2023–24. Another fall seems likely in 2024–25, as commodity prices soften further and monetary policy expectations imply a stronger AUD/USD.
- Key September-quarter price developments include: higher iron ore prices as firm Chinese demand persists, higher uranium prices on supply problems and as countries re-evaluate nuclear power, and lower lithium prices due to rising stockpiles and concerns about near-term EV production/demand.

1.2 Macroeconomic, geopolitical and policy factors

The world economy is growing at a relatively slow rate

The world economy remains relatively subdued, mainly due to tighter monetary conditions adopted by most central banks over the past twenty months. Since the last REQ, most Western central banks have kept a tightening bias to cut inflation and anchor inflation expectations. Services inflation in the West remains high, due to tightness in their labour markets.

Forecasts are for OECD economic growth to slow and labour market tightness to ease, so that services inflation should fall, giving central banks scope to withdraw their current restrictive monetary stance. There are signs that China's economic growth has steadied at relatively low levels as Beijing rolls out more measures to stabilise China's residential property sector.

The relatively slow rate of economic growth in China is causing higher unemployment — especially among young people — and deterring foreign investment: with slow company sales, Chinese equities are weak, and high/rising interest yields in the West are also causing capital flows away from China, where official rates are falling. In the September quarter 2023, China recorded negative foreign direct investment (of US$11.8 billion) for the first time since 1998. Nevertheless, there are pockets of strength: the Chinese steel and auto sectors have proven significant sources of demand for resource commodities in recent months. Chinese steel output has been assisted by higher infrastructure spending in China and strong steel exports. Chinese auto exports have risen six-fold in the past 3 years to 4.2 million a year. China recently overtook Germany as the world's 2nd biggest car exporter.

Geopolitical developments continue to pose risks to the outlook for commodity markets. The Hamas-Israel conflict has caused volatility in energy markets. New sanctions on Russia over its invasion of Ukraine would further harm its ability to produce/export resource and energy commodities. While Europe has sourced new supplies of natural gas, the implications for energy pricing during hot and cold seasons in the Northern Hemisphere are not yet well understood. Government policies to drive net zero and geostrategic interests are also having ongoing impacts on the demand for low emission minerals and energy commodities.

Climate drivers have recently shifted. The current El Niño weather episode has a high chance of lasting through H1 2024, and the Indian Ocean Dipole is very high at present. Both factors suggest miners in Australia are less likely than normal to be affected by wet weather and the flooding of mines and transport routes. But drought in Indonesia is lowering river levels, making it more difficult to barge thermal coal to ports used by large cargo ships in the export trade.

The IMF expects global economic growth of 3.0% in 2023 and 2.9% in 2024, down from 3.5% in 2022. Growth in developed nations is expected to slow from 2.6% in 2022 to 1.5% in 2023 and 1.4% in 2024. Developing and emerging market economies are forecast to grow by 4.0% in 2023 and 2024. China is forecast to grow by 4.6% in 2024, down from 5.4% in 2023.

AUD finding support

The AUD/USD has steadied in recent months. Influences include market optimism over Chinese government efforts to stabilise China's property sector, and currency market expectations that the Australian-US interest rate differential is likely to narrow. The consensus forecast adopted is for the AUD/USD to lift over the outlook period.

Risks are evenly balanced

Risks to the aggregate revenue forecasts appear evenly balanced. While the outlook for the world economy is for relatively modest growth in the forecast period, unemployment remains low in historical terms, helping to sustain household consumption and corporate profitability. Inflation has eased in a number of nations Unemployment may rise as the more recent official interest rate hikes impact fully. A widening of the Hamas–Israel conflict poses a significant risk to energy commodity and financial markets.

1.3 Export values

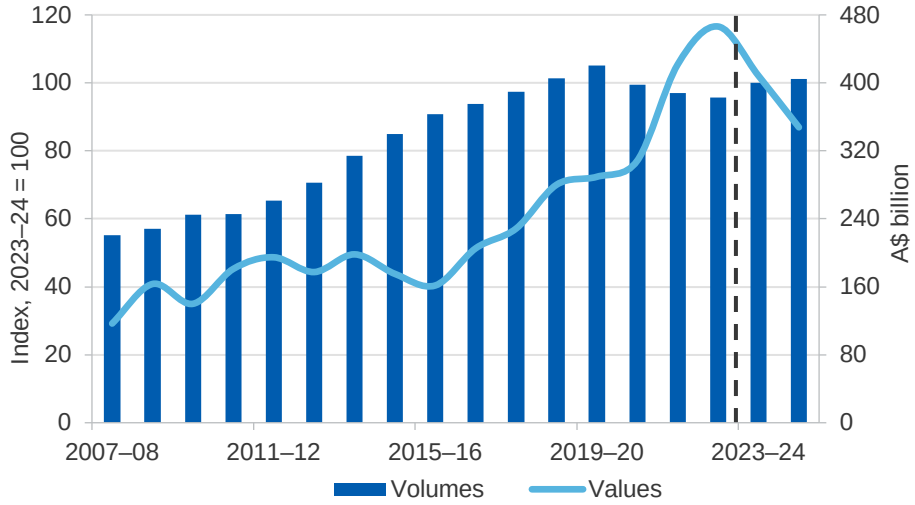
Australia's export values are forecast to be $408 billion in 2023–24

The world economic slowdown and fewer supply disruptions generally reduced commodity prices over the past quarter. The Resources and Energy Export Values Index fell 20% from the September quarter 2022: a small rise in volumes partly offset the impact of a sharp fall in prices.

There is only modest change in the aggregate forecasts since September. Resource and energy exports are forecast to be $408 billion in 2023–24, down from a record $466 billion in 2022–23 (Figure 1.1). Weak demand and improved global commodity supply imply a fall prices, more than offsetting the impact of a forecast small rise in export volumes (Figure 1.2). Export values are forecast to fall by 15% to $348 billion in 2024–25: prices will fall but volumes will be flat.

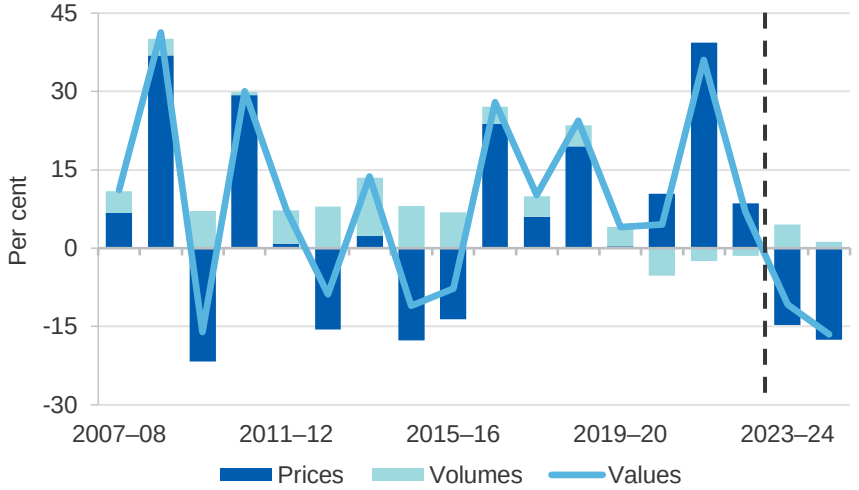
Within the totals, energy export earnings are set to fall sharply. LNG earnings are forecast to fall by $20 billion to $73 billion in 2023–24, as prices settle well below 2022 levels. A further fall of $8 billion is forecast in 2024–25. Thermal coal exports are forecast to fall even more sharply, from $66 billion in 2022–23 to $36 billion in 2023–24 and $28 billion in 2024–25.

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



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

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



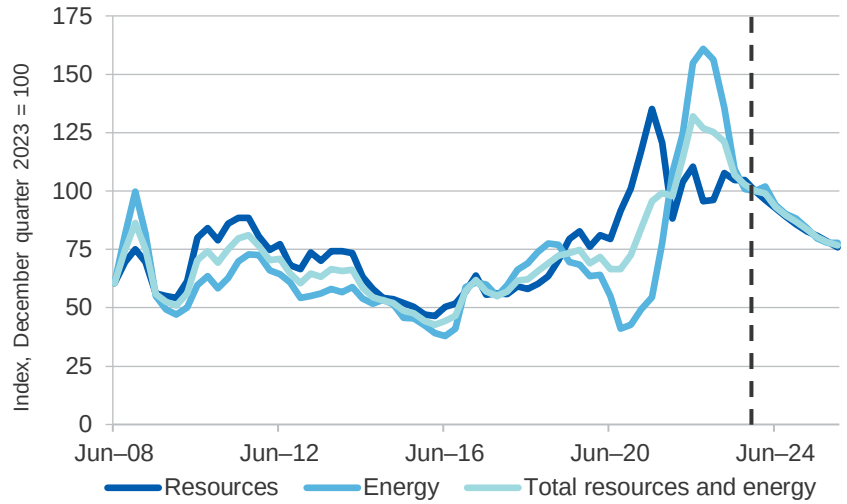
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Among resource commodities, iron ore remains the largest earner by far, forecast to earn about $131 billion in 2023–24, but fall to $102 billion in 2024–25. The sharp retracement in lithium prices is expected to see lithium exports fall from $20 billion in 2022–23 to $14 billion in 2023–24. Export values should stabilise at around $15 billion in 2024–25.

1.4 Prices

Since the September 2023 *Resources and Energy Quarterly*, resource and energy prices have generally declined in US$ terms (Figure 1.3). Slower world economic growth has overwhelmed the impact of new efforts by the Chinese government to boost growth. Prices are likely to fall further but remain above pre-pandemic levels as markets expect a recovery in demand — with inflation falling towards target levels overseas, central banks (particularly the US) are expected to move away from their current restrictive monetary policy stance.

Figure 1.3: Resource and energy export prices, A$ terms



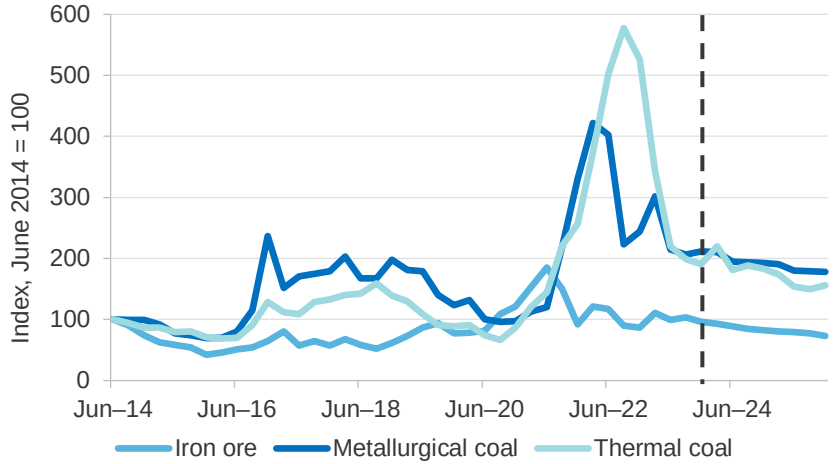
Notes: The export price index is based on Australian dollar export unit values (EUVs, export values divided by volumes); the export price index is a Fisher price Index, which weights each commodity's EUV by its share of total export values.

Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

In Australian dollar terms, the Resources and Energy Commodity Price Index fell by 3% (preliminary estimate) in the December quarter 2023, to be down 20% on a year ago. In US dollar terms, the index fell by 4% in the quarter, to be down 22% on a year ago. Resource export prices (in A$ terms) rose by 4% in the year to the December quarter 2023, while energy prices fell by 36%.

Iron ore prices have lifted in recent months driven by improved market sentiment following a series of Chinese government measures to support growth (Figure 1.4). Chinese stockpiles are on the low side. **Metallurgical coal** prices have edged up due to concerns over tight supply. Prices remain above pre-war levels, as some Russian supply remains stranded from world markets.

Figure 1.4: Bulk commodity prices



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

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

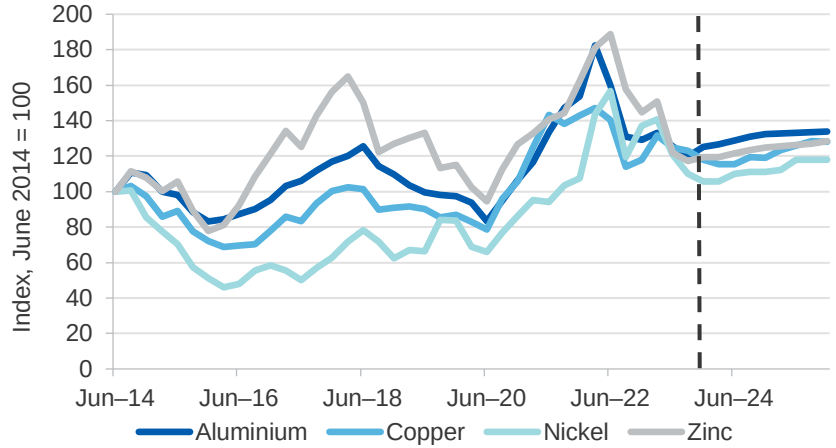
Energy prices remain elevated in historical terms but are continuing to ease. **Thermal coal** prices have experienced some recent weakness due to high inventory levels in China and Europe but are still holding well above pre-pandemic levels. **LNG** prices are expected to lift slightly as the Northern Hemisphere winter peaks. Prices should subsequently edge

back, with a more rapid decline when new supply from the US and Qatar comes online in 2025. Gas/LNG markets remain more vulnerable to supply shocks following the stranding of significant quantities of Russian output, but strong European inventories should provide a degree of insulation.

Oil prices have declined substantially after peaking at US$98 a barrel in late September. Strong supply from the US, Brazil and Iran is offsetting output cuts by Saudi Arabia. Chinese imports of industrial fuels have been strong but this has been offset by falls in OECD demand. Lower prices have prompted the US Administration to make plans to refill Strategic Reserves in early 2024.

Base metal prices remain relatively soft, due to a poor near term outlook for construction and manufacturing in major markets such as Europe and Advanced Asia (Figure 1.5). Nickel has been particularly weak as Indonesian production continues to surge. Prices are expected to be relatively soft over 2024, though low inventories of most metals and increased infrastructure-related (particular for energy) demand are expected to constrain price falls. Prices may pick up if signs of a rebound in the world economy become evident.

Figure 1.5: Base metal prices



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

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

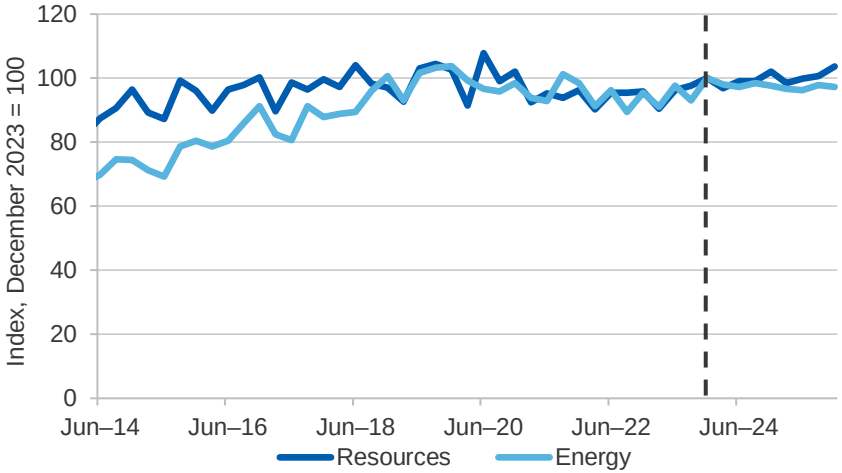
Since the last REQ, **lithium prices** (spodumene and lithium hydroxide) have given up some more of the sharp gains of recent years. Lithium is entering a period of market surplus, and some producers have announced production cuts in response to the weakness in the market and prices. Finally, the **gold** price has risen since the last REQ on the back of rising geopolitical tensions in the Middle East. In the short term, worries over the Chinese property market could boost Chinese demand for gold.

1.5 Export volumes

December quarter export volumes rose

The Resources and Energy Export Volumes Index (preliminary estimate) rose 5% in the December quarter 2023 from the September quarter, to be up 5% on a year ago. Resource commodity volumes rose by 5% in the year to the December quarter 2023 and energy export volumes recorded similar gains (Figure 1.6). Better weather conditions and easing workforce problems have driven the improvement. In volume terms, most resource exports are likely to show only modest growth in 2024 but pick up with improved world economic growth in 2025. High prices and the global energy transition may hurt energy production and exports.

Figure 1.6: Resource and energy export volumes



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

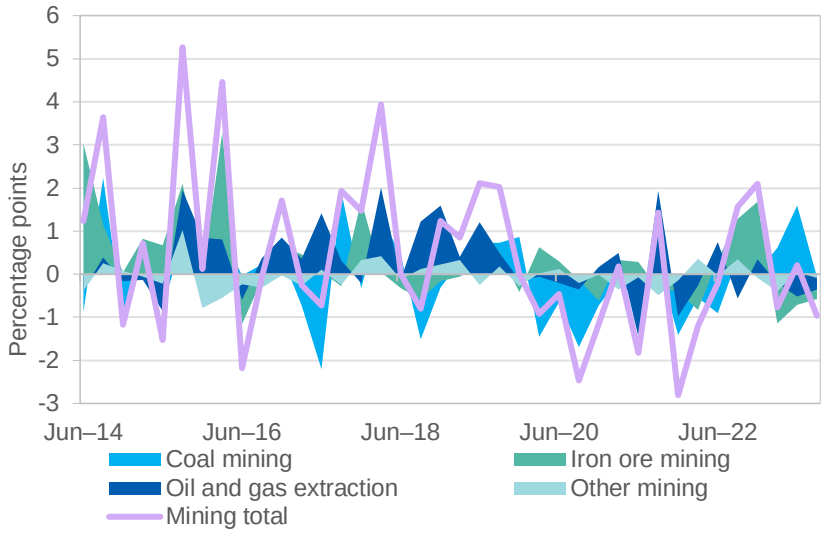
Energy exports will level out in 2024, as the sharp price falls of the past year temper production and encourage delayed maintenance to occur. An El Niño climate episode is under way, and the Indian Ocean Dipole is strongly positive. Both phenomena dramatically lower the chances of the type of wet weather disruptions that hampered the production and transportation of Australian mining products in the two years before 2023.

1.6 Contribution to growth and investment

In real terms, mining output fell while the overall economy grew modestly

Australia's real GDP rose by 0.2% in the September quarter 2023, to be up 2.1% from a year before. Mining value-added fell by 1.0% in the September quarter but was still 0.5% higher than in June 2022 (Figure 1.7). The quarterly fall was driven by weaker Iron Ore Mining (down by 1.6% (partly due to maintenance issues), Oil and Gas Extraction (down 1.5%) and Other Mining (down by 1.2%). Coal Mining (down by 0.2%) continues to recover from the impact on production of the La Niña weather episode. Exploration rose by 3.5% to be up 11.8% over the year.

Figure 1.7: Contribution to quarterly growth, by sector

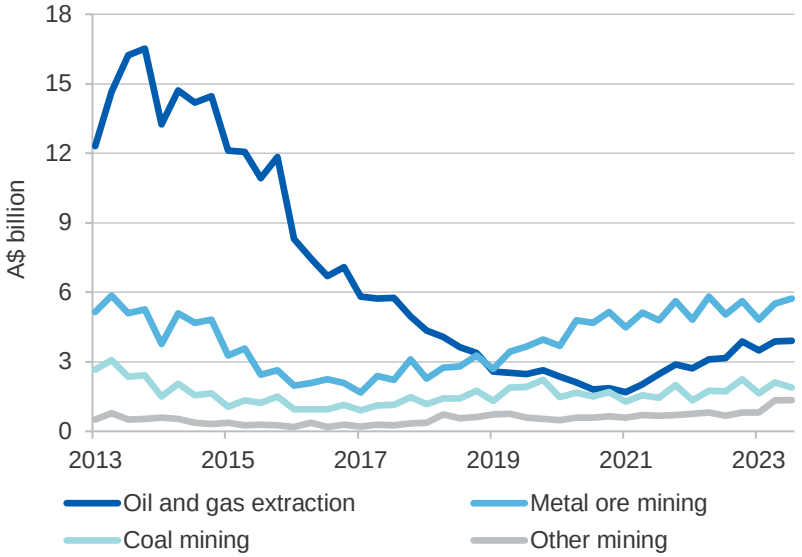


Source: ABS (2023) Australian National Accounts, 5206.0

Mining investment is picking up year-on-year

The latest ABS Private New Capital Expenditure and Expected Expenditure survey shows that Australia's resources industry invested $12.9 billion in the September quarter 2023, up 22% from the September quarter 2022. In quarterly terms, investment grew for oil & gas mining and 'other mining', which includes lithium and some other critical minerals (Figure 1.8).

Figure 1.8: Mining capex by commodity, not seasonally adjusted



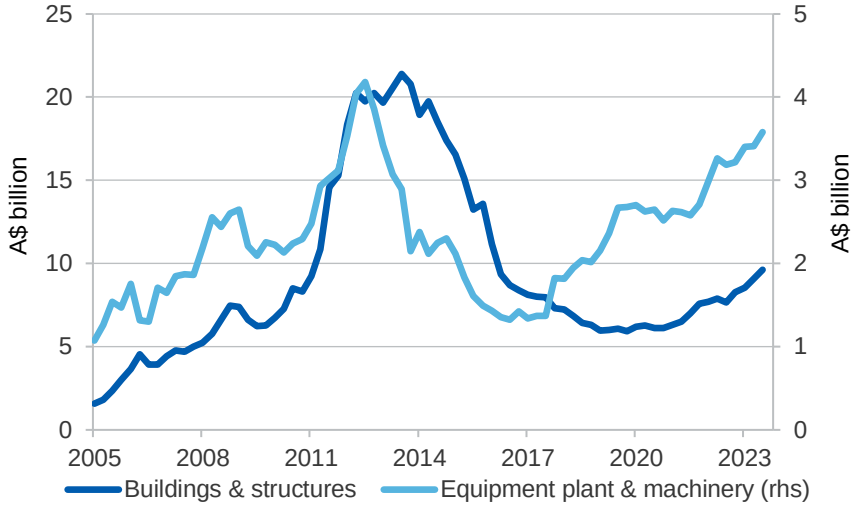
Notes: Other mining includes non-metallic mineral mining and quarrying and exploration and other mining support services; chart data is in nominal, original terms

Source: ABS (2023) Private New Capital Expenditure and Expected Expenditure, 5625.0

Expenditure for buildings and structures rose by 6% in the September quarter, while investment in equipment, plant and machinery rose by 5%, capping off two years of strong growth (Figure 1.9).

Spending on plant and machinery has accounted for a steadily rising share of total investment spending since 2017, but spending on buildings and structures is now growing steadily.

Figure 1.9: Mining industry capital expenditure by type, quarterly



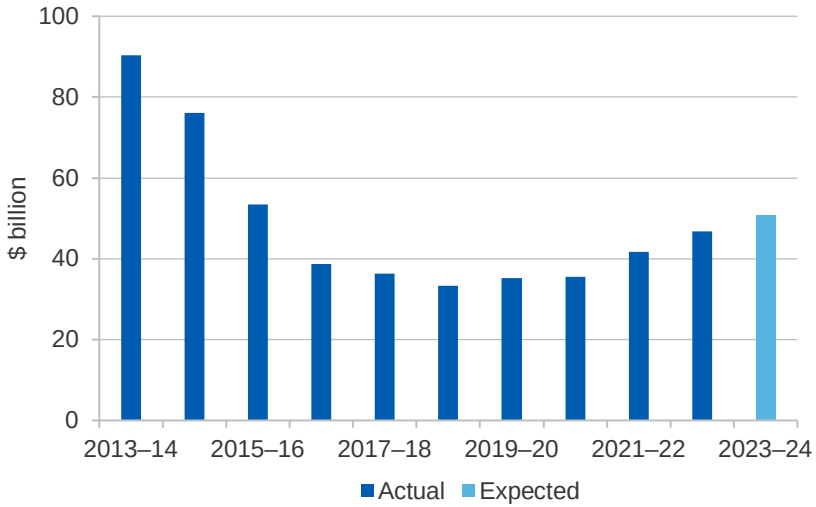
Notes: Chart data is in nominal terms, seasonally adjusted.

Source: ABS (2023) Private New Capital Expenditure and Expected Expenditure, 5625.0

Forward expectations suggest that total mining industry investment in 2023–24 is set to rise in the near-term (Figure 1.10). The fourth estimate for 2023–24 suggests the mining industry will invest $51 billion during the financial year. This is around 9% higher than the third estimate in the survey and more than 15% higher than the second estimate for 2023–24.

The latest data on investment among individual commodities shows 'other mining' (including lithium) has been sustained at relatively high levels, and this may be driving the recent upward revisions to future spending estimates across the mining sector.

Figure 1.10: Mining industry capital expenditure, fiscal year



Notes: Chart data is in nominal terms

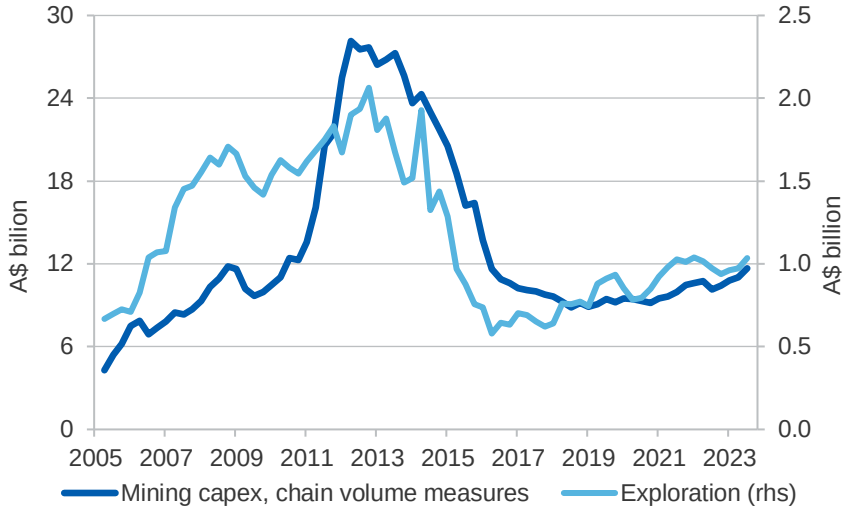
Source: ABS (2023) Private New Capital Expenditure and Expected Expenditure, 5625.0

Exploration expenditure (adjusted for inflation) rose by 6% to $1.04 billion in the September quarter 2023. In trend terms, exploration is rising, encouraged by relatively high commodity prices and the need for minerals vital to the global energy transition (Figure 1.11).

Industries recording significant growth in exploration expenditure include petroleum (up by 42% in the September quarter), coal (up by 45%), and iron ore (up by 24%). 'Other minerals', which includes lithium, grew at a slower rate in the quarter (up by 9%). However, this follows several quarters of very strong growth. Exploration overall rose solidly in the September quarter, with growth across a wide range of commodities (Figure 1.12).

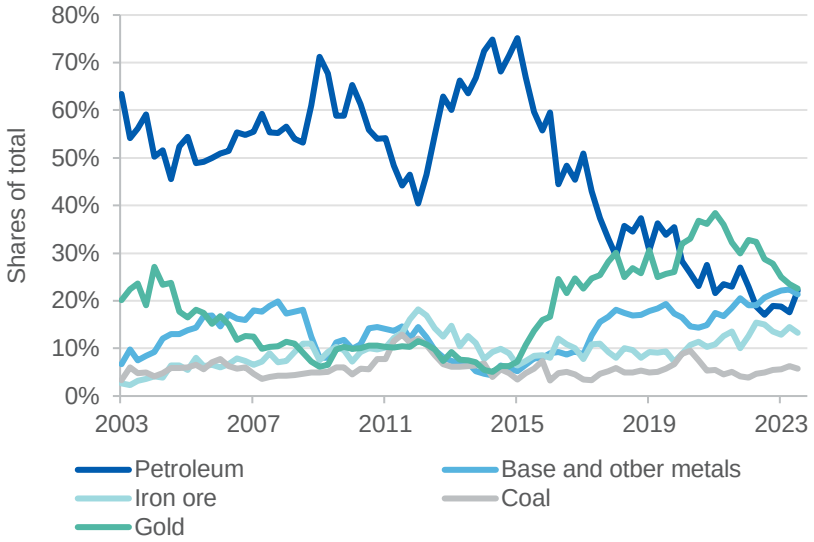
Exploration spending is a leading indicator of broader capital investment, and recent growth suggests interest is rising in base metals and critical minerals following recent strong price outcomes. Given the typical lags involved, we could expect capital spending by resource and energy companies to continue to lift over the next few years.

Figure 1.11: Mining capital expenditure vs exploration (real, quarterly)



Source: ABS (2023) Private Capital Expenditure Survey, Chain Volume measure, 5625.0

Figure 1.12: Shares of exploration expenditure by commodity type

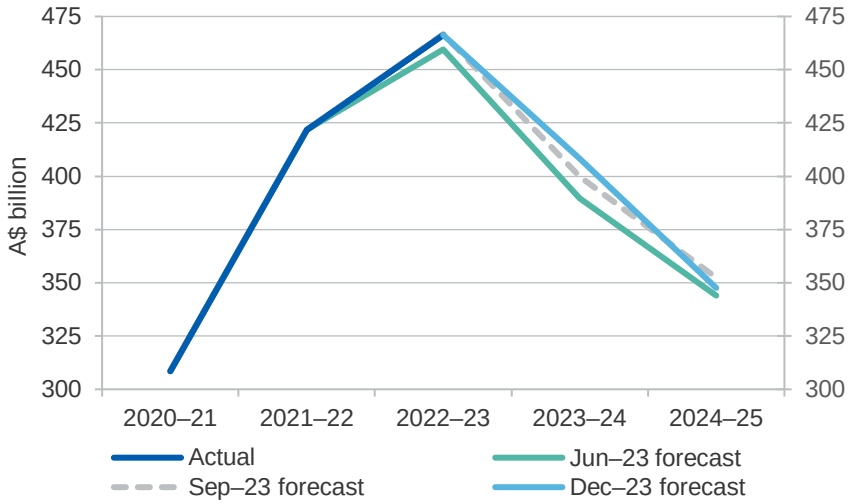


Source: ABS (2023) Private Mineral and Petroleum Exploration, 8412.0

1.7 Revisions to the outlook

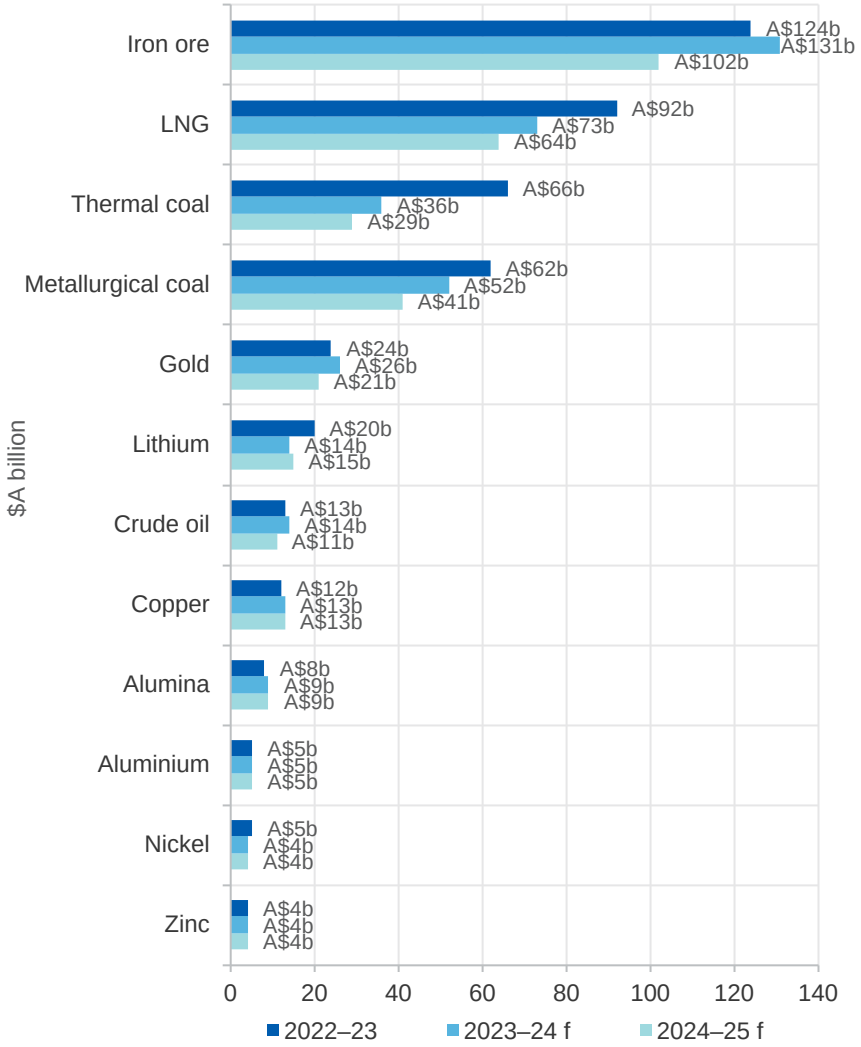
The forecast for Australia's resources and energy exports in 2023–24 is $8 billion higher than the forecast contained in the September 2023 *Resources and Energy Quarterly*. The forecast for 2024–25 (nominal prices) is $5 billion lower than the same report (Figure 1.13). The 2023–24 revisions have largely been driven by an upward revision to the iron ore price and the impact of a weaker than expected exchange rate against the US dollar (AUD/USD). The 2024–25 revisions have been driven by the impact of a stronger forecast exchange rate.

Figure 1.13: Resource and energy exports, by forecast publication



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

Figure 1.14: Australia's major resources and energy commodity exports, nominal



Annual per cent change

2023–24 f			2024–25 f		
volume	EUV	value	volume	EUV	value
▲ 2	▲ 4	▲ 6	▲ 2	▼ -24	▼ -22
▼ -2	▼ -19	▼ -21	▼ -1	▼ -10	▼ -12
▲ 11	▼ -50	▼ -45	→ 0	▼ -21	▼ -20
▲ 6	▼ -22	▼ -17	▲ 5	▼ -25	▼ -21
▲ 15	▼ -6	▲ 8	▼ -5	▼ -15	▼ -19
▲ 3	▼ -33	▼ -31	▲ 18	▼ -7	▲ 10
▲ 1	▲ 4	▲ 5	▼ -6	▼ -12	▼ -17
▲ 3	▲ 1	▲ 4	▲ 8	▼ -3	▲ 5
▲ 3	▲ 3	▲ 7	▲ 4	▼ -2	▲ 2
▼ -1	▼ -6	▼ -6	▲ 1	▼ -2	▼ -1
▲ 7	▼ -27	▼ -22	▲ 14	▼ -3	▲ 11
▲ 12	▼ -18	▼ -8	▼ -2	→ 0	▼ -1

Notes: f forecast; s estimate. EUV is export unit value.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

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

					Percentage change			
Exports (A$m)	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Resources and energy	421,691	466,310	408,380	347,717	36.7	10.6	–12.4	–14.9
– real[b]	471,246	486,898	408,380	336,112	30.9	3.3	–16.1	–17.7
Energy	204,056	238,727	180,336	151,092	151.2	17.0	–24.5	–16.2
– real[b]	228,035	249,267	180,336	146,049	140.5	9.3	–27.7	–19.0
Resources	217,635	227,583	228,044	196,625	–4.2	4.6	0.2	–13.8
– real[b]	243,211	237,631	228,044	190,063	–8.3	–2.3	–4.0	–16.7

Notes: **b** In 2023–24 Australian dollars; **f** forecast; **g** growth rate on 2022-23 levels.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

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

		Prices				Export volumes			Export values, A$b		
	Unit	**2022–23**	**2023–24[f]**	**2024–25[f]**	**Unit**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Iron ore	US$/t	95	99	80	Mt	895	910	931	124	131	102
LNG	A$/GJ	21.4	17.3	15.5	Mt	82	80	78	92	73	64
Thermal coal	US$/t	302	143	126	Mt	182	202	203	66	36	29
Metallurgical	US$/t	277	259	210	Mt	156	166	174	62	52	41
Gold	US$/oz	1,831	1,933	1,851	t	228	263	250	24	26	21
Lithium	US$/t	5,174	2,535	2,250	Kt	3,311	3,408	4,031	20	14	15
Crude oil [a]	US$/bbl	87	86	79	Kb/d	282	284	267	13	14	11
Copper	US$/t	8,289	8,144	8,227	Kt	854	882	951	12	13	13
Alumina	US$/t	343	343	345	Kt	16,566	17,094	17,788	8.3	8.9	9.0
Aluminium	US$/t	2,333	2,248	2,381	Kt	1,440	1,429	1,444	5.3	4.9	4.9
Nickel	US$/t	23,911	18,217	18,375	Kt	161	172	195	5.0	3.9	4.3
Zinc	US$/t	2,981	2,511	2,622	Kt	1,247	1,392	1,370	4.3	4.0	3.9
Uranium	US$/lb	51	77	87	t	4,809	5,441	6,167	0.8	1.2	1.5

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 (2023) 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 and Resources (2023)

Macroeconomic Outlook

Global GDP and economic change in 2022

Country	China	US	EU	India	ASEAN	Japan	S Korea	Taiwan	**Australia**
Per cent share of global GDP (PPP)	**18**	**16**	**15**	**7**	**5**	**4**	**2**	**1**	**1**
Yearly change	▲ 3.0%	▲ 2.1%	▲ 3.7%	▲ 7.2%	▲ 5.3%	▲ 1.0%	▲ 2.6%	▲ 2.5%	▲ **3.7%**
Share of Australia's two-way trade	30%	6%	9%	4%	10%	12%	7%	4%	–

Global overview

- In 2022, global economic activity increased by **3.5%**. Growth is expected to slow to **3.0%** in 2023 and **2.9%** in 2024.
- **Tight fiscal and monetary conditions** in most major economies are expected to **slow global economic growth** in late 2023 and early 2024.

Global risks

- **Tight monetary policy for longer** if inflation pressures, particularly in services, persist or rebound.
- Continuation of **China's property sector downturn** could dampen its economic recovery
- **Geoeconomic** risks and **energy security**

SOURCE: IMF; ABS; OCE

2.1 Summary

- Global industrial production and manufacturing activity have continued to soften in H2 2023, due to falling goods demand in major economies.
- The core outlook for global growth in 2024 has weakened slightly, with the balance of risks surrounding the outlook remaining tilted to the downside. As inflation returns to target levels, central banks will be able to adopt less restrictive stances, allowing growth to pick up in 2025.
- Despite better-than-expected growth in the September quarter 2023, key downside risks challenge China's growth outlook, including ongoing issues in the real estate sector.

2.2 World economic outlook

Tighter fiscal and monetary conditions weighing on global growth

The International Monetary Fund (IMF) forecasts the world economy to grow by 3.0% in 2023 and 2.9% in 2024, with growth then rising to 3.2% in 2025 (Figure 2.1). Compared to the July 2023 World Economic Outlook, this represents a downgrade of 0.1 percentage points for 2024 but no change for 2023 and 2025.

Over the next couple of years, the IMF continues to expect a notable divergence to emerge between the performance of Advanced and Emerging economies. The US economy has surprised on the upside with resilient consumption and investment this year, however European economies appear to have slowed substantially in 2023 under the weight of tighter monetary policy.

Weaker consumer demand for goods relative to services over the past year in the US and Europe has weighed on the economic growth of manufacturing exporters — including China, Japan and Korea. Demand for services now also looks to be also weakening, with manufacturing in a prolonged slowdown, suggesting a slowing of global growth over the remainder of the year and into 2024.

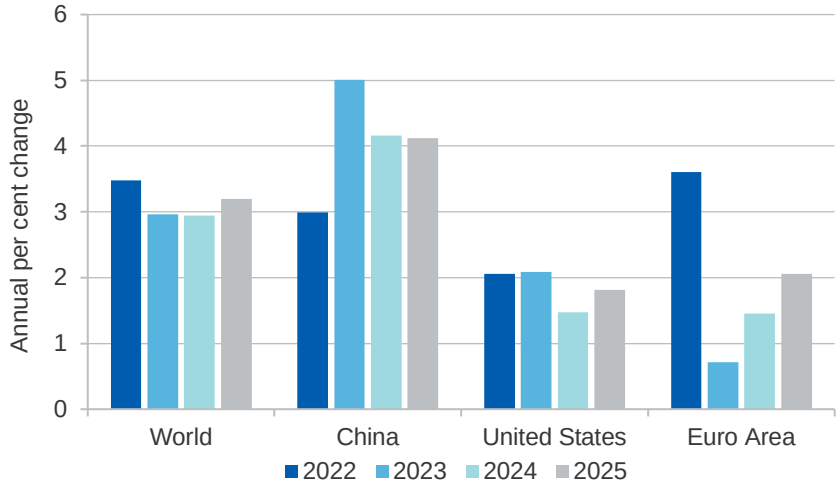
After recording growth below the global average in 2022, the IMF expects China's economy to grow by 5.4% in 2023. Due to stronger-than-expected growth in the September quarter 2023 and recent policy announcements, the IMF issued a 0.4 percentage point upgrade to China's growth outlook in November to 4.6% in 2024.

While global growth forecasts were only revised marginally from the July update, the IMF stated the balance of risks is less negative than it was in April, however it is still tilted to the downside.

Headline and core inflation measures have continued to moderate in most economies in recent months, but they remain above central bank targets, as do near-term inflation expectations. There is a risk that ongoing labour market tightness and further drawdown of excess savings in some nations could see inflation fail to return to central bank targets, or even rebound. This would lead to monetary policy staying restrictive, constraining economic growth.

An additional risk to global growth the IMF has emphasised is the potential for China's economic recovery to disappoint, or its financial stability to worsen if the property downturn continues.

Figure 2.1: GDP growth forecasts



Source: IMF (2023)

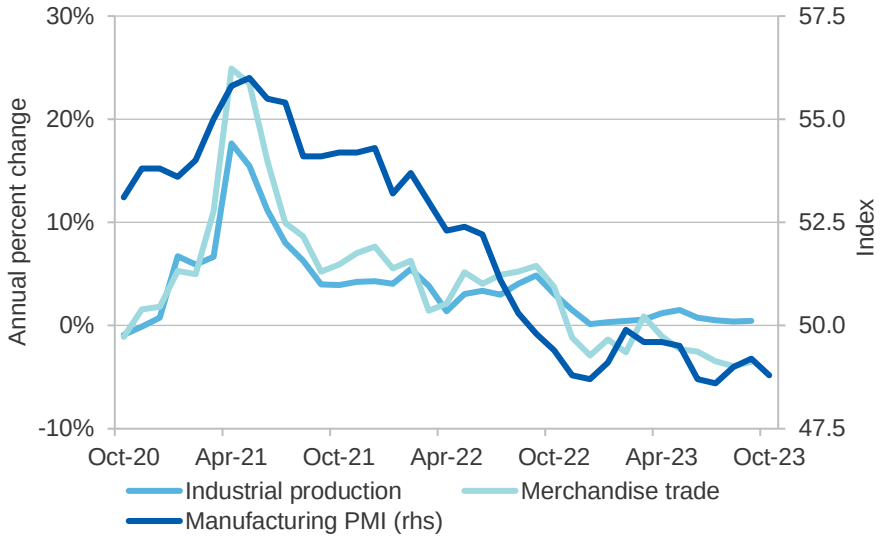
Additional sources of global economic vulnerability include possible escalations of the wars in Ukraine and the Middle East, geopolitical fragmentation and increasing trade restrictions.

Global industrial production and trade weaken as demand remains low

Global industrial production (IP) increased in the September quarter 2023 by 0.4% year-on-year (Figure 2.2). Positive annual growth largely reflects China's economic rebound following COVID-related declines through the middle of 2022. Growth remained weak overall due to continued contraction in the industrial sectors of Europe and Advanced Asia. High energy prices and tighter monetary policy contributed here.

Global merchandise trade volumes declined in the September quarter 2023 to be 3.6% lower year-on-year (Figure 2.2). Weaker demand for goods in advanced economies, especially electronic equipment, has driven exports from Japan, Republic of Korea and emerging Asia lower year-on-year.

Figure 2.2: World industrial production, trade and PMI



Notes: PMI data is up to October 2023; IP and trade data only available to September 2023.
Source: Bloomberg (2023); CPB Netherlands Bureau for Economic Policy Analysis (2023)

Forward indicators of manufacturing activity continue to indicate a prolonged contraction. The JP Morgan Global Manufacturing Purchasing Managers Index (PMI) was 48.8 in October 2023, and has remained in contractionary territory (less than 50) since September 2022.

Global manufacturing activity has continued to decline through H2 2023 due to weakening activity in Asia and a sharp downturn in the European manufacturing sector. Global manufacturing orders declined in October, signalling a further deterioration in the demand for goods — linked to pressures from inflation and monetary policy — as well as a post-pandemic preference for services consumption. Optimism among manufacturers dropped to an 11-month low in October, with weak demand leading to cutbacks in employment, purchasing and inventory indices.

Inflation pressures gradually easing while new risks emerge

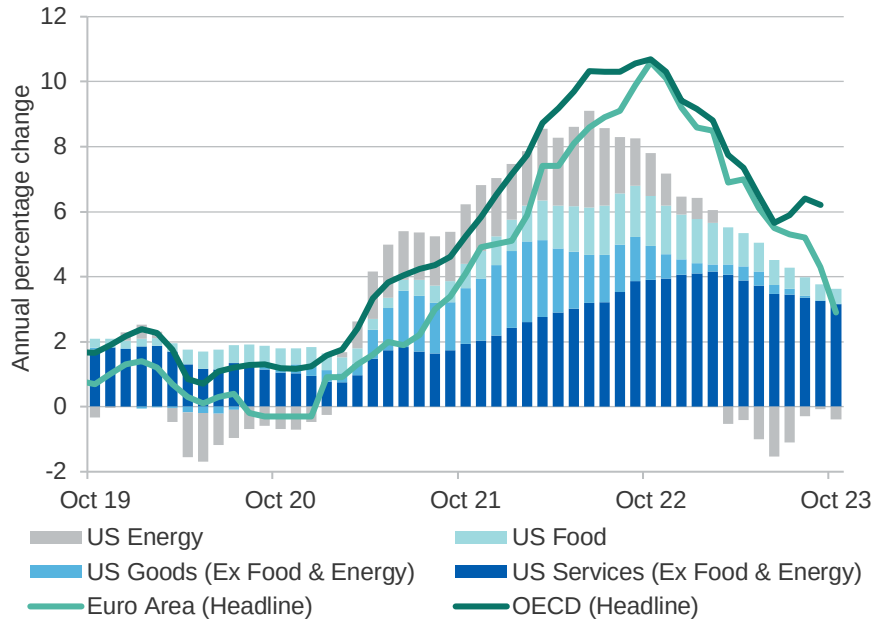
Headline inflation measures have continued to decline over recent months in many major economies; however, progress to return inflation to target levels has been slowed by persistence in core inflation measures and recent strength in energy commodity prices.

US headline inflation measured 3.2% in October 2023, falling from a recent spike of 3.7% due to lower energy prices and slowing growth in food and services (Figure 2.3). US core inflation — which excludes food and energy — declined to a 2-year low of 4.0% in October 2023, with monthly price growth of only 0.2% supporting hopes of further disinflation.

Eurozone inflation declined notably in October 2023 to 2.9%, its lowest since July 2021. Headline inflation has declined consistently throughout 2023 due largely to falling energy prices, with energy price deflation reaching 11% in October 2023. Recent decreases in headline inflation have also come from slowing core inflation. Eurozone core inflation declined to 4.2% in October 2023, having persistently held above 5% from October 2022 to August 2023.

The Israel–Hamas conflict and the potential for escalated geopolitical tensions in the Middle East present future upside risks to inflation through energy commodity prices. Disruption to shipping routes in the region (such

Figure 2.3: Consumer Price Indices — US, Europe and OECD



Source: Bloomberg (2023); Board of Governors of the Federal Reserve System (2023); U.S. Bureau of Economic Analysis (2023); OECD (2023)

as the Suez canal) also presents a risk to global shipping prices and by extension, global goods price inflation. This would compound current backlogs building up around the Panama Canal, where shipping throughput is being reduced by low water levels.

In October 2023, the IMF forecast global inflation would fall from 8.7% in 2022 to 6.9% in 2023 and 5.8% in 2024. Compared to the July 2023 outlook, the forecast for 2023 was revised up marginally, while the forecast for 2024 was revised up by 0.6 percentage points, higher-than-expected core inflation.

Inflation is expected to decline more quickly in advanced economies due to tighter monetary policy and the lower exposure of these economies to commodity price and exchange rate shocks.

2.3 Major trading partners' economic outlook

The outlook for Australia's major trading partners remains weak, with their GDP growth in 2024 and 2025 forecast by the RBA to be around 3.1%, well below its pre-pandemic decade average and lower than the August 2023 forecast. Slower growth in Australia's major trading partners is expected to reduce demand for Australia's exports. With that said, the IMF expects a recovery in China's economy and ongoing development in India to contribute about half of global economic growth this year. Growth from these key markets should support growth in their trade partners' economies, underpinning Australian resource and energy export earnings over the outlook period.

China's recent growth exceeded expectations, but risks remain

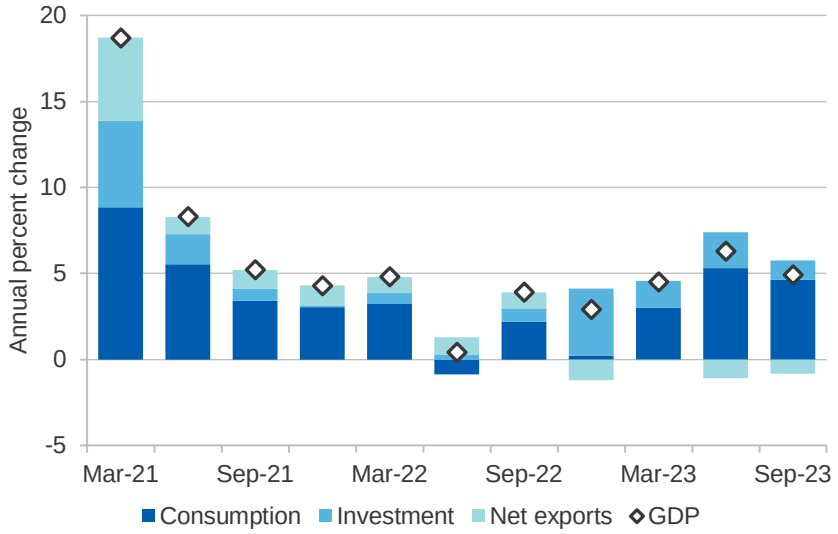
China's economy grew by 1.3% in the September quarter 2023, with GDP 4.9% higher year-on-year (Figure 2.4). Strong consumption growth was the key driver of China's economic growth over the quarter, supported to a lesser extent by continued investment in infrastructure and manufacturing.

While the rebound in consumption demand appeared to fade through the middle of 2023, recent indicators point to a strengthening in consumption, particularly in services. The official index of services production increased by 7.7% year-on-year in October 2023, led by growth in accommodation and food services (21%), transport (13%) and wholesale or retail trade (10%). Retail sales rose in October 2023 by 7.6% year-on-year, exceeding market expectations.

China's consumer price inflation once again fell below zero in October 2023, with year-on-year declines in energy and food prices, outweighing price growth in services, where consumer demand has been directed. China's core inflation — which excludes food and energy prices — was still below policy targets at 0.6% year-on-year in October.

Year-to-date fixed asset investment increased by 2.9% year-on-year in October 2023, underpinned by 5.9% growth in infrastructure and 6.2% growth in manufacturing investment. Particularly strong growth was reported for investment in high-tech manufacturing (such as aerospace)

Figure 2.4: China – contributions to quarterly real GDP



Notes: Consumption is made up of both household and government sectors.
Source: Bloomberg (2023); National Bureau of Statistics of China (2023)

and high-tech services (such as science and technology R&D). Overall investment growth continues to be weighed down by weakness in the property sector, with year-to-date residential investment declining by 9.3% year-on-year.

China's industrial production increased by 4.6% year-on-year in October 2023, the strongest rate since April 2023. Growth was driven by year-on-year increases in manufacturing output (5.1%), mining output (2.9%) and utility output (1.5%) such as energy and water. Output growth was significant for key strategic products such as solar cells (63%), service robots (59%) and integrated circuits (35%).

The Caixin Manufacturing Purchasing Managers' Index (PMI) fell to 49.5 in October, signalling the sector's return to contraction following two months of expansion. Weak conditions were reported, with declining output being driven by reduced foreign demand and falling growth in overall sales. Business sentiment fell to its lowest since September 2022, due to concerns about the global outlook.

The property sector downturn has continued to act as a drag on China's economic activity, with conditions remaining weak through H2 2023. New property starts (by floor space) were on average 25% lower year-on-year from July-October 2023. Sales in large cities have recovered slightly — in line with monetary and fiscal policy easing — however this has not passed through to investment in smaller cities where most new home sales occur.

Continued weakness in the property sector is compounded by ongoing financial stability concerns. According to the RBA[1], more than half of large private developers in China have defaulted and many others are likely to find it difficult to meet upcoming debt repayments, given stringent financial conditions. Country Garden — one of the largest private property developers in China — is seeking debt restructuring after defaulting on a US dollar bond in October.

Chinese authorities have further loosened policy to stabilise the property sector and support the announced 2023 GDP growth target of 5%. In addition to continued monetary easing (such as reductions in mortgage lending rates and reserve requirement ratios), the People's Bank of China (PBoC) introduced lower mortgage down payment requirements in August. Targeted interest rate reductions on outstanding first-home mortgages (estimated to account for half of all housing loans) are likely supporting household consumption.

In October, authorities announced CNY1 trillion in central government bond issuance to be transferred to local governments and spent in 2023 and 2024 —likely targeted towards infrastructure. Concerns have also been raised regarding local government debt levels, with financing limits and refinancing quotas allocated by authorities to aid repayments of local government financing vehicles.

[1] RBA Statement on Monetary Policy November 2023

The IMF released updated projections for the Chinese economy in November, revising up their growth forecasts by 0.4 percentage points on account of recent policy announcements and stronger-than-expected GDP growth in the September quarter. The IMF forecasts Chinese GDP growth of 5.4% in 2023, reflecting rebounding consumption compared with COVID-related disruptions in 2022, as well as continued investment in infrastructure and manufacturing. The IMF forecasts growth to decline to 4.6% in 2024 due to continued weakness in the property sector and weak external demand. Growth is then forecast to slow further to 4.1% in 2025, in line with a long-term trend towards structurally lower growth.

Japan and Republic of Korea slowing due to weaker external demand

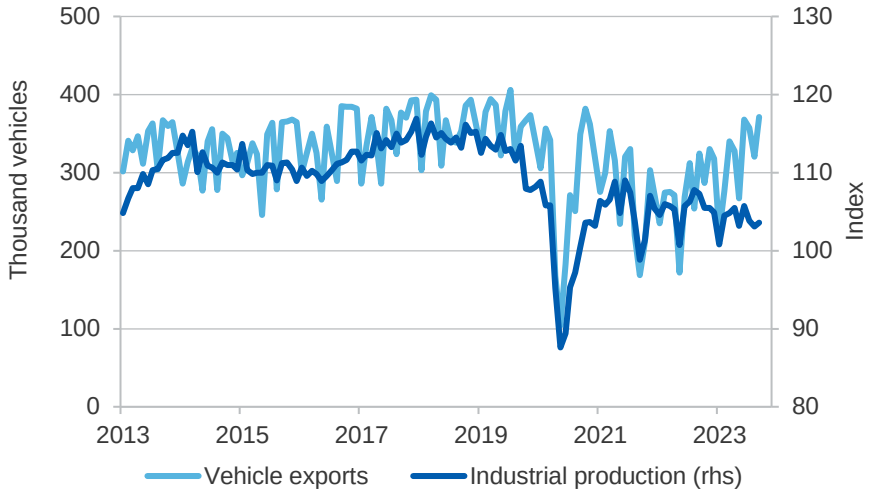
Japan's GDP fell by 0.5% in the September quarter 2023, although it was still 1.4% higher year-on-year due to base effects in the September quarter 2022. Depreciation of the Yen in the September quarter 2023 contributed to a 10% quarter-on-quarter decrease in net exports.

Private consumption — which accounts for 53% of GDP — fell year-on-year and tracked flat on the previous quarter, as cost of living pressures have weakened consumers' real wages and consumer confidence has weakened over the second half of the year.

Slowing growth in Japan's major trading partners is a key issue for its economy, particularly its industrial sector. Japanese industrial production was down by 3.4% year-on-year in September 2023 (Figure 2.5). Machinery orders have, on average, decreased at an annual rate of 6.4% since October 2022. The Jibun Bank Japanese Manufacturing PMI improved, but remained in contraction at 48.7 in October, marking 9 months of contraction so far in 2023. Weakening demand both domestically and externally also led to declines in new orders and output.

Japan's core inflation — which excludes fresh food but includes fuel costs — was 2.8% in September 2023, still exceeding the Bank of Japan (BoJ) inflation target of 2%, but down sharply from 4.2% in January. Supporting expectations for cost pressures to ease further, Japan's wholesale inflation fell to 0.8% in October 2023, having peaked at around 11% in December 2022. The BoJ has maintained its accommodative monetary policy and

Figure 2.5: Japan industrial production and vehicle exports



Source: Bloomberg (2023)

continues to target the 10-year Japanese Government Bond yield at 0%.

The IMF expects Japan's economic growth to rise to 2.0% in 2023, a 0.6 percentage point upgrade from July, driven by pent-up demand, a surge in inbound tourism, and accommodative fiscal and monetary policy. Japan's growth in 2023 has also been supported by a strong rebound in vehicle exports as supply chain issues have eased (Figure 2.5). As the effects of past stimulus efforts fade, Japan's economic growth is expected to slow to 1.0% in 2024, before slowing further to 0.7% in 2025.

The Republic of Korea's GDP grew by 1.2% year-on-year in the September quarter 2023. Annual growth was primarily driven by 3.1% year-on-year growth in exports which, combined with imports tracking flat, led to a 26% expansion in the country's trade balance.

Korea's industrial production increased in September 2023 to be 3.0% higher year-on-year, the first annual growth recorded since September 2022 (Figure 2.6). Monthly growth of 1.8% exceeded market expectations (of a 0.9% decline) and was driven by an unexpected

turnaround in semiconductor output. Exports of semiconductors declined by only 3.1% year-on-year in October 2023, following a prolonged decline which commenced in August 2022 (Figure 2.6).

Korea's manufacturing PMI declined slightly in October to 49.8, remaining in contraction territory for a 16th consecutive month. The negative result was due to small declines in output and new orders, continuing to be driven by subdued economic conditions (domestically and internationally). Input price inflation increased to its strongest since December 2022 due to raw material prices and currency weakness. Despite this, expectations for the year-ahead production outlook improved over the month due to slowing declines in output and new orders.

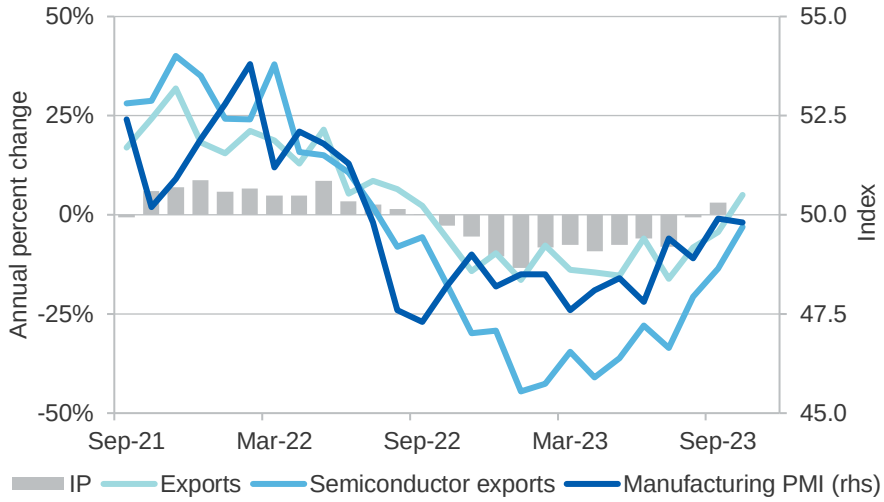
In October, the IMF forecast the Republic of Korea's economic growth to weaken from 2.6% in 2022 to 1.4% in 2023, driven by muted external goods demand, particularly for semiconductors. Beyond this, growth is forecast to increase to 2.2% in 2024 and 2.3% in 2025. The IMF noted that the downturn in the technology cycle and global goods demand is expected to act as a drag on Korea's growth momentum in the short-term.

Resilient US labour market and strong investment supporting growth

The US economy grew by 2.9% year-on-year in the September quarter 2023, driven by stronger-than-expected quarterly growth of 1.2%. This growth was driven by personal consumption of goods and services. While goods consumption growth has remained weak in real terms since early 2022 (countered by strong growth in services activity), it began to strengthen again in the September quarter 2023 (Figure 2.7).

US labour market resilience and remaining savings buffers[2] have continued to support strong consumption. However, signs have emerged that the labour market is softening. The unemployment rate rose to 3.9% in October 2023, the highest (albeit still low) rate since January 2022. Employment growth has slowed further over H2 2023, with nonfarm payroll employment rising by 150,000 in October 2023 — below the average rise

Figure 2.6: Republic of Korea industrial activity and exports



Source: Bloomberg (2023)

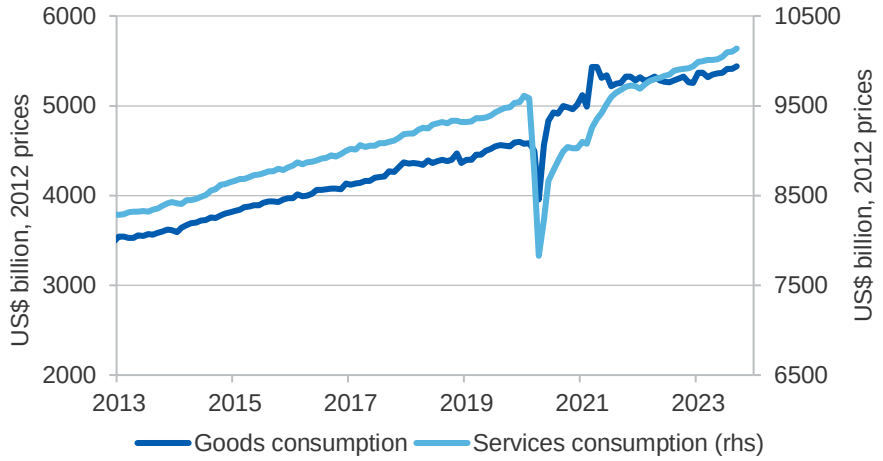
of about 258,000 over the past 12 months. Wage growth has also eased further, down from 7.1% in June 2023 to 2.3% in September 2023.

Combined with declining US inflation (both headline and core) and a sharp rebound in US labour productivity growth in the September quarter 2023 to 2.2% year-on-year, this has reduced expectations that further monetary tightening will be necessary. This recently resulted in lower US Treasury yields and a weaker US dollar, from elevated levels in October 2023.

US industrial production rose by 0.1% year-on-year in September 2023, driven by a 0.4% year-on-year rise in manufacturing output. The US Manufacturing PMI stayed in contractionary territory at 46.7 in October, marking a year of continuous contraction for the sector. The continued deterioration in manufacturers' operating conditions reflects increasingly sharp falls in new orders as both domestic and external demand weaken.

[2] Barbiero & Patki 2023, "Have US households depleted all the excess savings they accumulated during the pandemic?", Federal Reserve Bank of Boston, November 2023.

Figure 2.7: Real US consumption of goods and services



Notes: Consumption data is monthly, reported in annualised terms.

Source: Bloomberg (2023)

A notable source of growth has been private non-residential investment, which rose by 3.7% year-on-year in the September quarter 2023 in real terms. US private investment in manufacturing structures rose in real terms by 66% year-on-year in the same period, driven by sharp growth in computers, electronics and electrical manufacturing. Policies such as the Inflation Reduction Act and the CHIPS & Science Act have provided strong incentives for investment into clean energy and semiconductor manufacturing in the US since their inception in August 2022.

In October 2023, the IMF upgraded its forecast for US economic growth in 2023 by 0.3 percentage points to 2.1% due to resilient consumption and ongoing labour market tightness. Growth is then forecast to ease to 1.5% in 2024 — a 0.5 percentage point upgrade — as tight monetary policy and the elimination of excess savings slow private consumption. This is expected to reduce labour market tightness and moderate wage growth. The IMF expects the US unemployment rate to reach a peak of 4.0% in the December quarter 2024 — a 1.2 percentage point downgrade from April — consistent with a softer landing than previously expected.

Eurozone economies face slower growth, manufacturing downturn

Eurozone GDP growth was -0.1% over the September quarter 2023, bringing annual GDP growth to 0.1% year-on-year. This was the Eurozone's first quarterly contraction since the 2020–21 recession. Among the larger economies Spain grew by 0.3% over the quarter, France grew by 0.1%, while Italy's quarterly growth was approximately zero. Germany's economy contracted over the quarter, to be down 0.3% year-on-year.

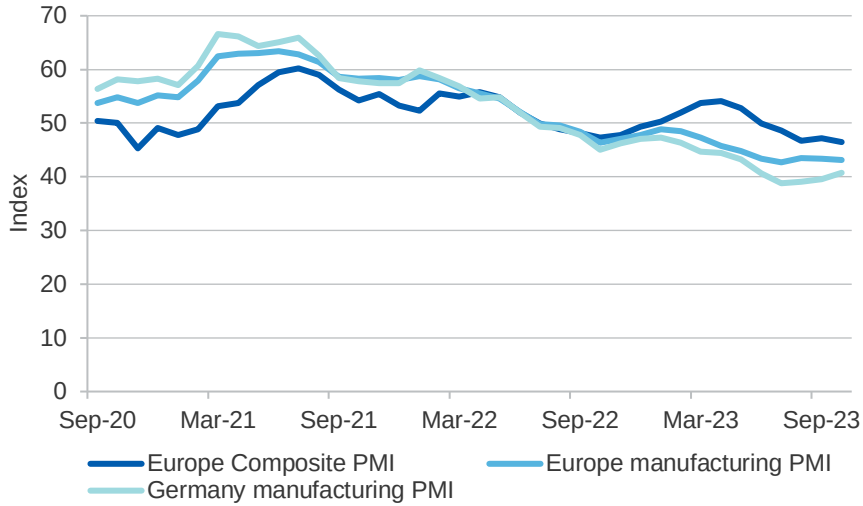
In August 2023, the Eurozone Composite PMI Index decreased to 46.5, signifying the worst slump in private sector activity since November 2020 (Figure 2.8). The fifth consecutive month of decline reflected a further deterioration in manufacturing conditions and the contraction of the services sector for the second time in three months.

Industrial production in the Eurozone declined by 5.1% year-on-year in August 2023, led by a 4.9% year-on-year decline in manufacturing production. Industrial production in major producer Germany was down in September by 3.7% year-on-year. This resulted from a 1.4% decline month-on-month, the fourth contraction in as many months. Significant monthly output declines were reported for Germany's auto sector (-5%) and electrical equipment (-4.4%). The Eurozone manufacturing PMI recorded a reading of 43.1 in October 2023, with declines in output, new orders, employment and purchasing activity. The PMI survey reported the fastest reduction in factory employment levels since August 2020.

Germany's manufacturing sector continued its deep contraction with a PMI reading of 40.8 in October. This reflected a continued deterioration in demand, with customers reportedly destocking and holding back on investments against a backdrop of uncertainty and high interest rates.

In its October update, the IMF forecast Euro Area growth to be lower than previously expected: at 0.7% in 2023 and 1.2% in 2024. With the IMF now projecting a near-completion in the recovery of the region's services sector, growth forecasts in services- and tourism-driven economies (such as France and Spain) were kept steady or revised a touch lower. The weak outlook for manufacturing resulted in a downgrade to growth in Germany (now -0.5% in 2023).

Figure 2.8: Eurozone composite and manufacturing PMIs



Source: Bloomberg (2023)

India's GDP growth to be relatively resilient

India's GDP growth was 7.6% year-on-year in the September quarter 2023, a slight decrease from 7.8% in the June quarter. This annual growth figure was above market expectations, driven by continued strength in fixed capital formation, as well as private consumption expenditure. India's manufacturing PMI remained expansionary in October 2023, but 2 points lower month-on-month at 55.5. Slower growth was reported in output and new orders, with manufacturers reporting the lowest new order growth in over a year. Combined with an acceleration in input price growth, surveyed firms' sentiment fell to a five-month low.

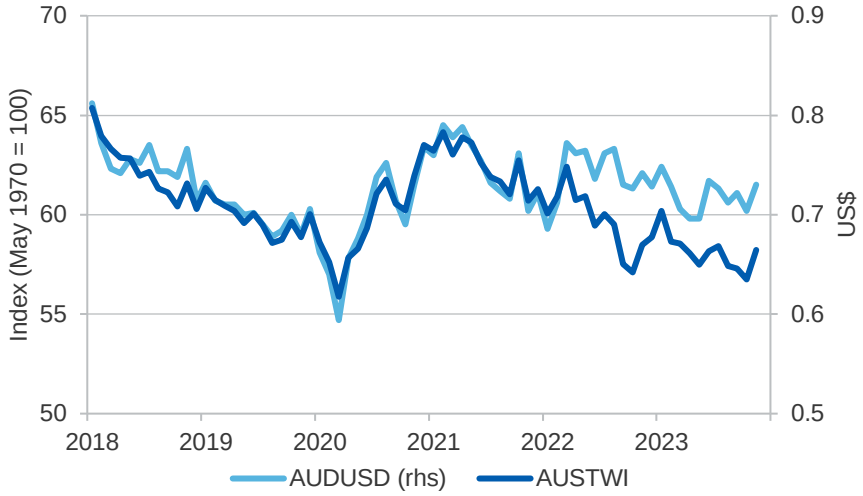
The IMF forecasts India's economic growth to slow to 6.3% in 2023, revised up from 6.1% in July due to stronger-than-expected consumption in the June quarter 2023. Growth is expected to remain steady at 6.3% in 2024. From 2024 onwards, household spending is expected to pick up as pressures from inflation and monetary policy ease.

Exchange rate assumption revised lower

Over the past quarter, the Australian dollar fell both relative to the US dollar and in trade-weighted terms (Figure 2.9). In the December quarter, the Australian dollar has been supported by expectations the US-Australian interest rate spread could narrow, as well as market optimism over Chinese government efforts to stabilise the country's property sector.

The AUD/USD exchange rate assumption has been revised marginally lower; by US$0.03 in 2024 and by US$0.01 in 2025 compared with the September 2023 *Resources and Energy Quarterly*. Assumption adjustments were made in line with changes in market consensus (surveyed by Bloomberg) on the exchange rate outlook. The Australian dollar is expected by markets to appreciate against further the US dollar over the outlook period as interest rates increase further in Australia and interest rate cuts commence in the United States. The median consensus on 5 November 2023 for the AUD/USD exchange rate was an average of US$0.64 during the December quarter 2023, US$0.67 in the first nine months of 2024 and US$0.73 in 2025.

Figure 2.9: Australian trade-weighted index and AUD/USD



Source: RBA (2023)

Table 2.1: IMF annual GDP growth projections for major trading partners

	2022	2023[a]	2024[a]	2025[a]
World [b]	3.5	3.0	2.9	3.2
China [c]	3.0	5.4	4.6	4.1
Japan	1.0	2.0	1.0	0.7
Republic of Korea	2.6	1.4	2.2	2.3
India[d]	7.2	6.3	6.3	6.3
ASEAN-5[e]	5.3	4.9	5.3	5.2
Eurozone	3.6	0.7	1.5	2.1
United States	2.1	2.1	1.5	1.8

Notes: **a** Assumption. **b** Calculated by the IMF using purchasing power parity (PPP) weights for nominal country gross domestic product. **c** Excludes Hong Kong. **d** Based on fiscal years, starting in April; **e** Indonesia, Malaysia, Philippines, Thailand and Vietnam.
Sources: IMF (2023); Bloomberg (2023)

Table 2.2: Exchange rate and inflation assumptions

	2022	2023[a]	2024[a]	2025[a]
AUD/USD exchange rate	0.69	0.66	0.68	0.72
Inflation rate[b]				
United States	8.0	4.1	2.8	2.4
	2021–22	**2022–23**	**2023–24[a]**	**2024–25[a]**
Australia	4.4	7.0	4.4	3.5

Notes: **a** Assumption; **b** Average CPI growth over the specified year (fiscal or calendar).
Sources: ABS (2023) Consumer Price Index, 6401.0; Bloomberg (2023); Department of Industry, Science and Resources; RBA (2023); IMF (2023)

Steel

Australia's steel sector

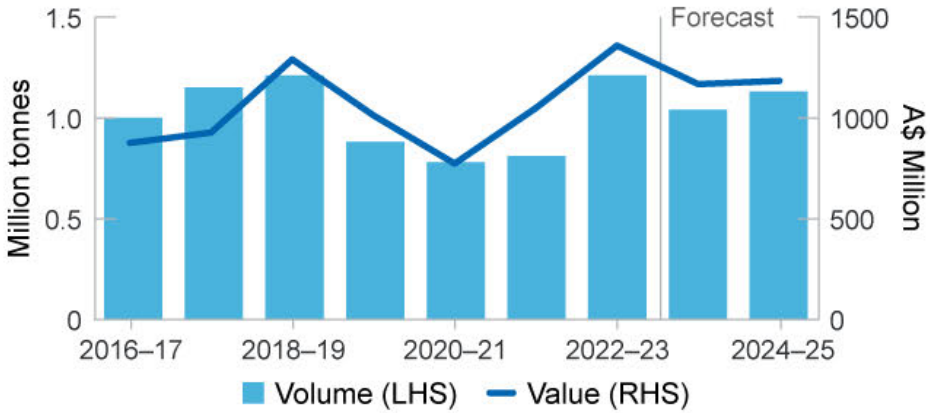
5m+ tonnes
produced each year

100,000+
employed in the steel industry

Significant
export markets
- China
- Japan
- South Korea
- Taiwan
- India

Refinery locations

Australian steel exports



Outlook

Global steel prices **continue to soften** due to **weaker demand**

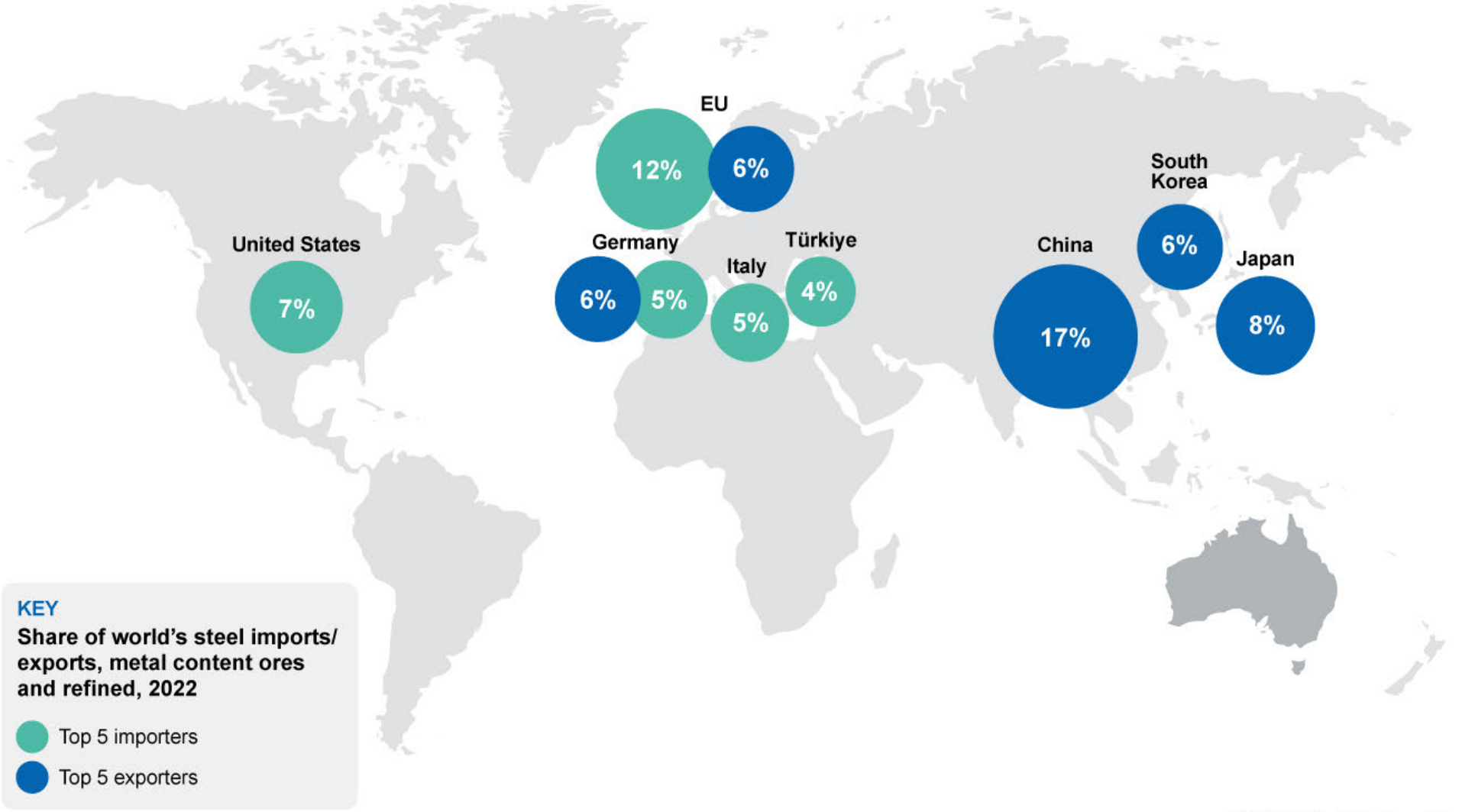
China's **property sector weakness** continues

Australian export values expected to **fall by 14%** in 2023-24

Expected **stabilisation** and **recovery** in global industrial production & construction in 2024

SOURCE: GA; DISR; OCE

Steel TRADE MAP



SOURCES: World Steel Association

3.1 Summary

- Global steel demand remains weak, driven by lower demand from manufacturing and construction in developed economies and ongoing weakness in China's property sector.
- World steel production fell 4.6% (quarter-on-quarter) in the September quarter 2023. An expected stabilisation and gradual pickup in global industrial production, combined with further stimulus-related infrastructure projects, should support stronger growth in steel demand in 2024.
- World steel production is projected to reach just under 2 billion tonnes by the end of the outlook to 2025. Growth will be supported by new capacity — either underway or planned — with projects in the pipeline in Asia, North America, Europe and the Middle East.

3.2 World production and consumption

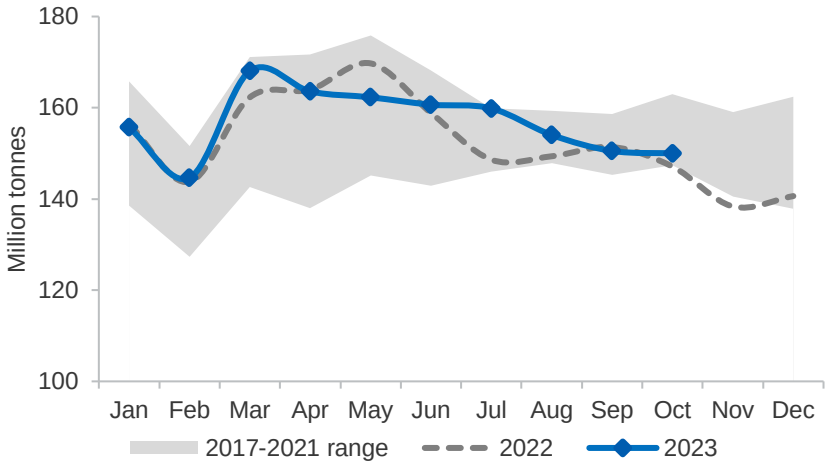
Global steel production falls again in the September quarter

In the September quarter 2023, global steel output reached 461 million tonnes. This represented a decline of 4.6% (22 million tonnes) from the June quarter 2023 but was around the middle of the range tracked in the 2017-2021 period, and above the September quarter 2022 (Figure 3.1).

Despite weaker steel production in recent months, world steel output is expected to record year-on-year growth of 1.6% in 2023. Global steel production was particularly weak in the second half of 2022. Chinese production last year was heavily affected by outbreaks of the COVID-19 pandemic and ongoing weakness in the nation's residential property sector. Higher energy prices also forced output cuts amongst large steel makers, such as the EU, US, and Japan.

Demand from exporters of manufactured products as well as some infrastructure investment, has helped offset the impact on steel of protracted weakness in Chinese property demand. While weak profitability amongst the majority of Chinese steel mills continues to weigh on the sector, the lack of strict enforcement of government steel production caps so far this year is supporting iron ore prices.

Figure 3.1: Global monthly steel production



Source: World Steel Association (2023); DISR (2023)

Subdued demand resulting from monetary policy tightening by major Western central banks over the past year is acting to dampen economic growth, and consequently demand for steel, across most major economies (ex China). An expected stabilisation and gradual pickup in growth in global industrial production next year, combined with further stimulus-related infrastructure projects, is expected to support stronger growth in steel demand over the rest of the outlook period.

World steel production is projected to grow by 1.6% in 2024 and 1.4% in 2025, to reach just under 2 billion tonnes by the end of the outlook period. Growth in world steel production over the period to 2025 will be supported by growth in new capacity — either underway or planned — with projects in the pipeline in Asia, North America, Europe and the Middle East.

Global industrial production expected to recover in 2024 and 2025

Growth in global industrial production — a key driver of steel consumption — is expected to see a mild recovery after a weak 2023. Global industrial production growth was 0.4% year-on-year in August, down from over 3% in the second half of last year (Figure 3.2). This will likely further dampen

global steel demand for the remainder of 2023. Global steel consumption is projected to grow by 1.7% in 2023, following a fall of 2.6% last year.

Global construction activity continues to register modest growth although there are substantial regional disparities. With private sector residential and commercial activity dampened by tighter credit conditions, global construction continues to be driven primarily by infrastructure. The Middle East and African regions registered the strongest conditions in the September quarter, followed by the Americas and India. Meanwhile activity continued to deteriorate in a Europe.

Global manufacturing activity remained weak over H2 2023, with the JP Morgan Global Manufacturing PMI reading at 49.3 in November. This was the 15th successive reading in 'contractionary' territory.

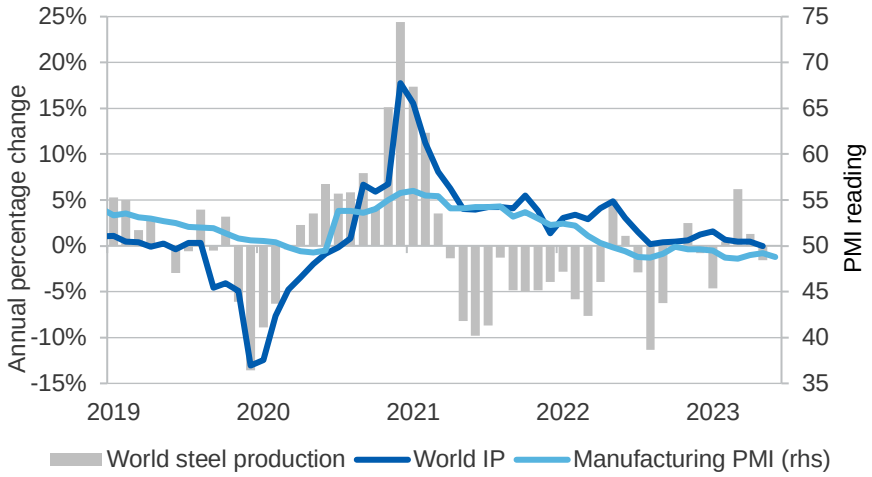
Global automotive sales are expected to remain modest in 2024. The Economist Intelligence Unit forecasts a 3.0% increase (year-on-year) in new vehicle sales in 2024, with a return to pre-pandemic production levels not expected until 2025. A number of factors are expected to constrain sales, including weak global economic growth, elevated living costs and relatively high interest rates. S&P Global Mobility notes that the semiconductor supply chain crisis, which severely hampered automotive production in 2022, now appears to have largely passed.

China's property sector headwinds continue

After protracted weakness over the past two years, China's property sector is yet to stabilise. Following a pickup in early 2023, new home sales were down 20% year-on-year in September, and floor space under construction was down 7.6% (Figure 3.3). Fixed asset investment was down 3.9% year-on-year in October, a halving in the fall registered in September and a rare positive sign amidst China's multi-year property decline.

So far, property sector stresses have been contained, but potential for spill over to other areas of China's financial system remains. Property sector instability has triggered concern from potential home buyers about the possibility that other developers could default. Confidence among homebuyers will take time to stabilise and remains a key downside risk which could undermine government efforts to stimulate property demand.

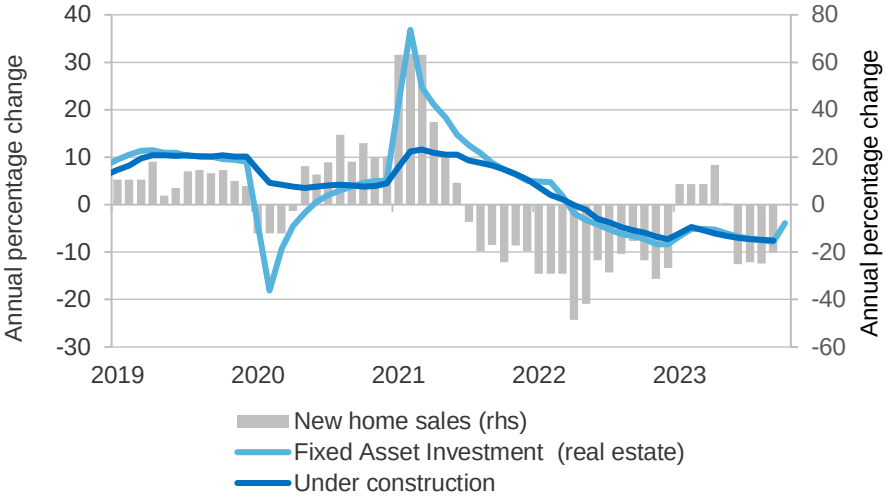
Figure 3.2: World manufacturing PMI, IP and steel output



Notes: JPMorgan Global Manufacturing Index; a reading above 50 indicating an overall increase compared to the previous month, and below 50 an overall decrease

Source: World Steel Association (2023); S&P Global (2023); Bloomberg (2023)

Figure 3.3: China's residential property sector pipeline

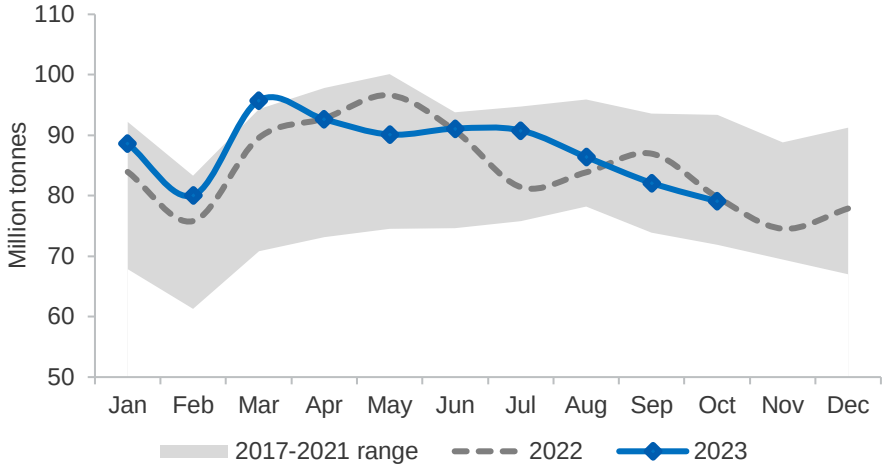


Notes: * Floor space reported on a cumulative calendar year basis in million squares metres. China's property data combines January and February monthly data (reported in February)

Source: NBS (2023); Bloomberg (2023)

China's steel output fell in the September quarter, though remained above 2022 lockdown-affected levels (Figure 3.4). Average Chinese steel mills' profit margins turned negative again in September due to weak steel prices and high raw material and energy prices. In November, about 75% of Chinese steel mills were estimated to be operating at a loss, raising the possibility of mills having to cut output in coming months.

Figure 3.4: China monthly steel production



Source: World Steel Association (2023); Department of Industry, Science and Resources (2023)

China's steel sector has been supported by strong growth in exports, partly offsetting the effects of property sector weakness. Chinese steel exports were up 53% year-on-year in October, down from 62% in September. Chinese infrastructure investment is also supporting steel demand, up 6.1% in the September quarter 2023. Overall, China's steel production in 2023 is expected to be 1.1% higher than in 2022.

The extent to which the Chinese Government enforces restrictions on steel production levels over the final weeks of 2023 remains uncertain. To date, production cuts have not been strictly enforced as the government prioritises economic growth. However, some slowing in Chinese steel output is expected as 2023 ends, to comply with emission controls and to match a seasonal drop in demand.

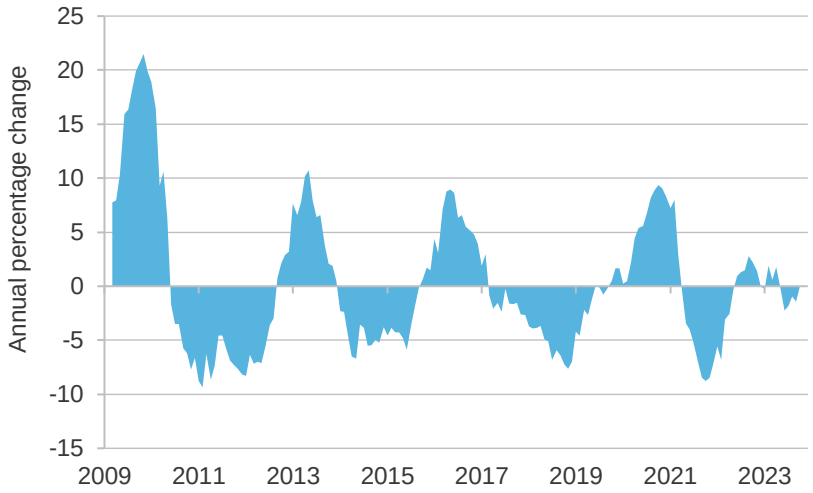
Over the rest of the outlook period to 2025, China is projected to see a mild fall in steel production, with zero growth projected in 2024 and a fall of 0.6% in 2025.

Chinese government introduces new fiscal stimulus to support growth

Infrastructure spending is expected to provide some support to China's economy over the outlook period. At the end of October, the government approved the issuance of an extra 1 trillion yuan worth of sovereign bonds in 2023. Legislators also renewed authorisations to frontload some local government bond issuance in 2024. In November, reports indicated a further 1 trillion yuan of low-cost financing will be made available to China's urban village renovation and affordable housing programs.

Despite monetary policy easing over 2023, there is yet to be a meaningful pick up of credit growth in the broader economy. Bloomberg's China's Credit Impulse (measuring new loans compared with broader GDP) remained in negative territory in September for the fifth consecutive month (Figure 3.5). Nevertheless, the lags involved in some of the policy changes may help underpin Chinese commodity demand in 2024.

Figure 3.5: China credit impulse

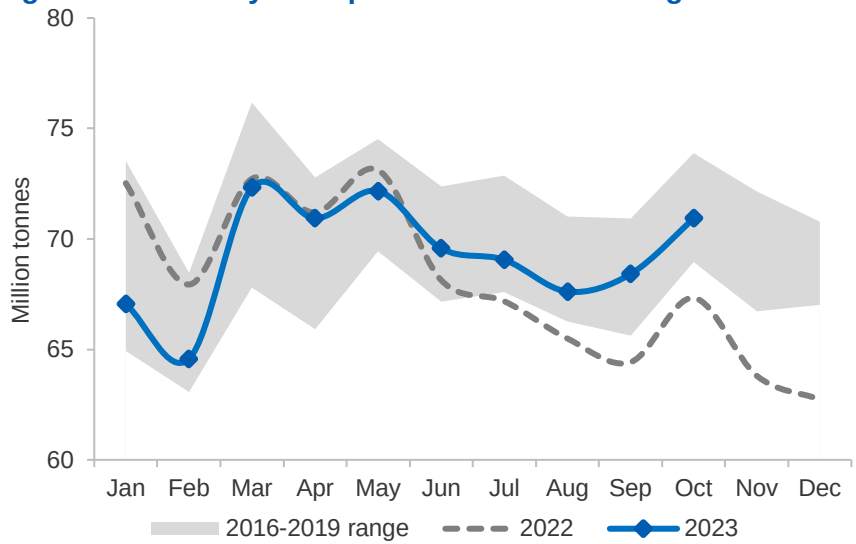


Source: NBS (2023); Bloomberg (2023)

Falls in ex-China steelmaking due to high energy costs and weak demand

Global steel production (excluding China) was around 205 million tonnes in the September quarter 2023. This represented a fall of 3.7% from the previous quarter but was 2.2% higher than the comparable period in 2022. Over the first ten months of 2023, total steel output reached around 693 million tonnes, a 1.8% fall in year-on-year terms (Figure 3.6).

Figure 3.6: Monthly steel production – ex-China global



Notes: Monthly production reporting provides data on 61 countries (excluding China) and accounted for approximately 98% of total world crude steel production in 2022.
Source: World Steel Association (2023); DISR (2023)

Higher energy and input costs, as well as moderating global demand, continue to impact manufacturing activity across major economies. Industrial production has been particularly weak in the EU and Japan during 2023. However, South Korea's industrial production has begun to recover after substantial falls last year (Figure 3.7).

Global steel prices remained weak in the December quarter, particularly in China and Southern Europe, for both reinforcing bar ('rebar') and flat steel products such as hot-rolled coil (HRC). US prices for HRC, by contrast, have picked up slightly in recent months following the large falls over 2023. The substantial price differential between US rebar prices and other markets widened in October (Figure 3.8).

European construction sector weakens in the December quarter

Weakening demand amid the European Central Bank's aggressive monetary policy tightening cycle saw the Eurozone construction sector slide deeper into contraction in the December quarter 2023. The HCOB Eurozone Construction PMI fell for an 18th consecutive month in October, to reach 42.7. This fall was also the sharpest in 2023.

Downturns were evident in all three construction subsectors (housing, commercial and infrastructure). Residential construction recorded the biggest fall, but commercial and infrastructure construction also declined. While new orders declined at a softer pace than in previous months the ongoing downward trend points to further weakness in business conditions extending well into 2024. Input prices picked up in October but remain well below those seen earlier in the year, reflecting reduced demand for inputs and greater material availability.

Slowdowns in construction activity were steepest in Germany and France, with German construction firms recording the largest fall in activity since early 2020. Italy, by contrast, recorded growth in output fuelled by growth in housing, commercial building and civil engineering.

While the European economy has shown surprising resilience to date in the face of the energy crisis created by the Russian invasion of Ukraine, high energy costs and interest rates continue to take their toll on manufacturing activities. Germany has been hit particularly hard, facing both a manufacturing recession and a housing crisis.

EU steel output fell by 9% year-on-year in the first nine months of 2023 (and remained 16% below pre-COVID 2019 levels). EU steel production is forecast to see a modest rate of growth over the outlook period to 2025, though production levels are forecast to remain below their pre-pandemic peak. Most of the EU's current or planned steel capacity developments are aimed at replacement (rather than additional) supply, with a focus on the shift toward EAF-based, lower-emissions facilities.

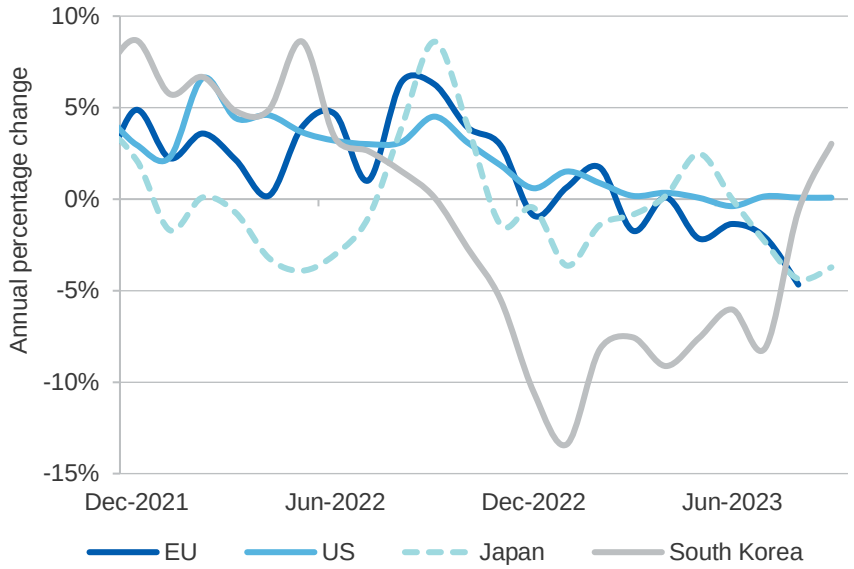
India's steel demand expected to continue growing strongly

Indian steel output reached 116 million tonnes in the ten months to September 2023, a rise of 12% year-on-year (Figure 3.9). Total production is forecast to grow 9.6% in 2023 (to 137 million tonnes).

India's economic outlook remains stable in the face of a high interest rate environment, with demand for steel expected to maintain its high growth momentum driven by the manufacturing and construction sectors. India's manufacturing PMI fell in October, but remained strongly positive, with steady growth reported in output, new orders and foreign sales.

India is projected to see some of the strongest growth in steel output globally over the outlook period (Table 3.1). Substantial new steel production capacity is expected to be added over the next few years, with the Government targeting a doubling in capacity by the end of the decade.

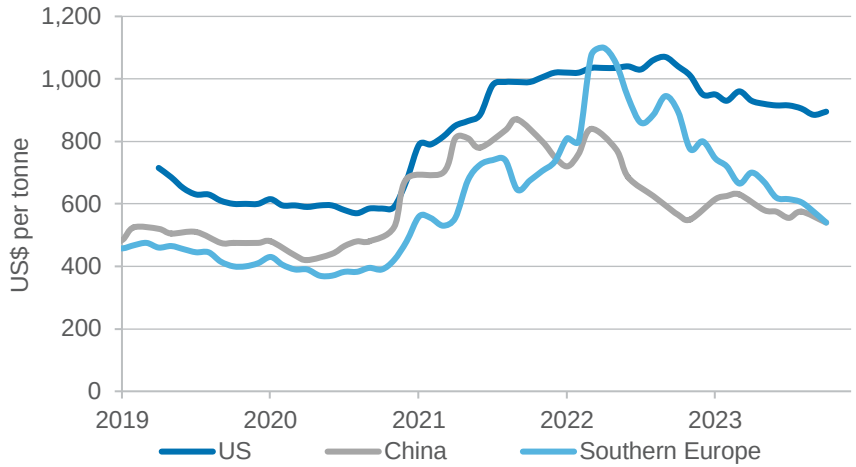
Figure 3.7: Industrial production — EU, US, Japan and S Korea



Source: Bloomberg (2023)

A considerable increase in total steel output is also expected in South-East Asia, with annual growth of around 10% expected over the outlook period to 2025. New steel production capacity expected includes sizeable projects in Vietnam, Philippines, and Malaysia.

Figure 3.8: Rebar steel prices



Source: Bloomberg (2023)

Japan and South Korean steel output remains subdued

Japanese steel output was about 22 million tonnes in the September quarter 2023, down 1.2% year-on-year. Rising costs and labour shortages are dampening growth in construction activities, but manufacturing steel demand is expected to show moderate growth in both 2023 and 2024, helped by the recovery of automotive production. Over the outlook period to 2025, Japan's steel production is expected to be flat (Table 3.1).

South Korea's economy remains subdued, with GDP growth of just 0.6% year-on-year in the September quarter. However, domestic industrial production increased in September for the first time in a year. Ongoing recovery from flood damage in 2022 and modest growth in construction after years of contraction is expected to support steel demand into 2024. After remaining flat over 2023, South Korean steel output is forecast to grow modestly over the outlook period (Table 3.1).

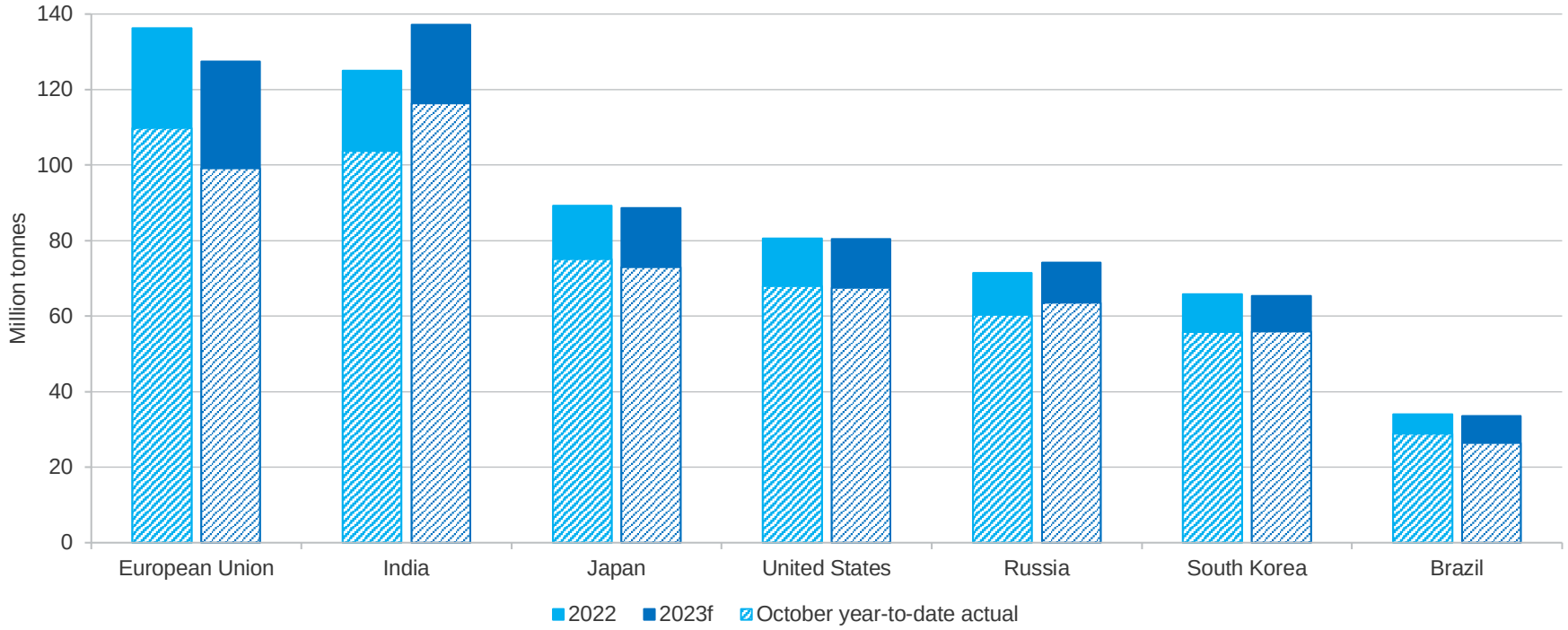
US commercial building counteracts weak residential construction

US steel production has been relatively weak so far this year. In the first ten months of 2023, production was down 0.8% compared with the corresponding period in 2022. This result reflects slowing industrial production, which has steadily deteriorated: from growth rates of 3-4% in 2022 to only 0.1% year-on-year in September 2023. Tightening monetary conditions have also weighed on US construction, particularly residential property. But the commercial building sector has recorded robust growth in part due to reshoring activities.

The outlook for US steel demand in 2024 contains downside risks. The lagged effect of tight monetary policy and higher land and material costs point to headwinds for residential construction in 2024. The outlook for manufacturing is flat, with the US Manufacturing PMI recording a neutral level of 50 in October. While new orders increased for the first time in six months, work backlogs shrank and employment levels fell for the first time in over 3 years.

US steel production is projected to record moderate growth over the outlook period to 2025 (Table 3.1).

Figure 3.9: Steel production – other major producers



Source: World Steel Association (2023); DISR (2023)

Table 3.1: World steel consumption and production

			Million tonnes				Annual percentage change
Crude steel consumption	**2022**	**2023 s**	**2024 f**	**2025 f**	**2023 f**	**2024 f**	**2025 f**
China	965	984	983	978	2.0	0.0	-0.6
European Union	159	153	158	162	-4.0	3.8	2.0
India	118	126	136	146	7.6	7.4	7.3
United States	102	102	103	107	-0.8	1.6	3.3
Other Asia[a]	114	119	125	127	4.3	5.2	2.2
Japan	62	61	61	62	-1.6	0.7	1.4
Middle East	56	56	57	59	-1.3	2.7	3.2
South Korea	54	55	56	57	3.5	1.1	1.4
Russia	43	45	45	45	4.9	-0.2	1.0
World steel consumption	1,895	1,927	1,962	1,990	1.7	1.8	1.4
Crude steel production	**2022**	**2023 s**	**2024 f**	**2025 f**	**2023 f**	**2024 f**	**2025 f**
China	1,018	1,030	1,022	1,016	1.1	-0.7	-0.6
European Union	136	127	133	133	-6.4	4.0	0.7
India	125	137	145	154	9.6	6.0	6.2
Japan	89	89	90	89	-0.6	1.6	-0.8
United States	81	80	82	84	-0.2	2.0	2.6
Russia	71	74	75	75	3.7	0.9	0.1
South Korea	66	65	67	68	-0.6	3.1	1.4
Other Asia[a]	66	68	76	85	2.4	11.9	12.0
World steel production	1,885	1,916	1,947	1,974	1.6	1.6	1.4

Notes: **a** Asia ex. China, India, Japan, South Korea and Taiwan; **f** Forecast; **r** Annual percentage change

Source: World Steel Association (2023); Department of Industry, Science and Resources (2023)

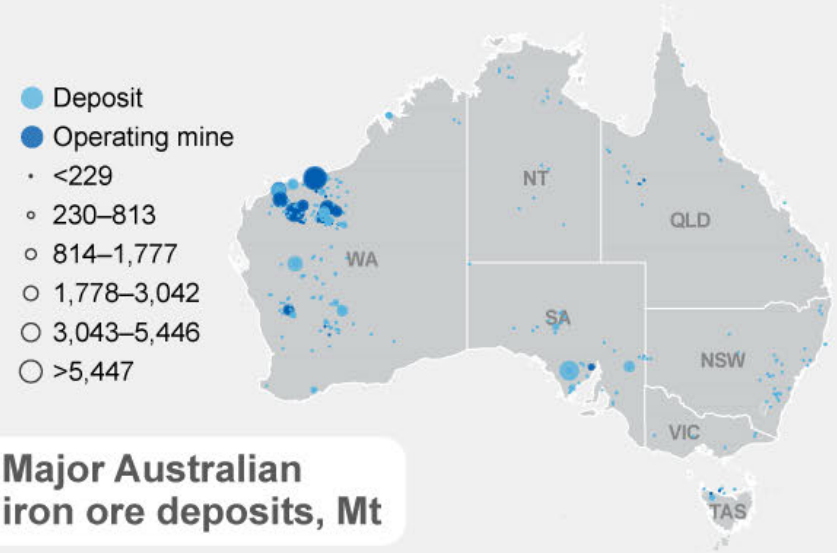
Iron Ore

Australia's iron ore sector

World's no.1
for iron ore **resources**

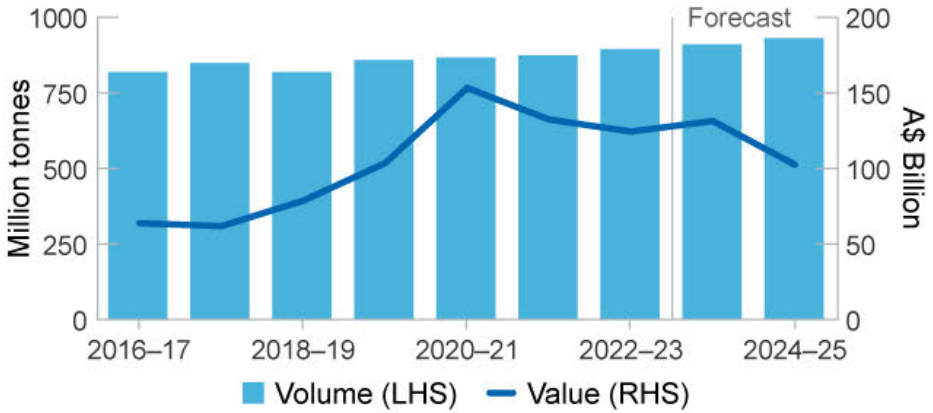
Largest
iron ore producer in the world

$124 billion
earned in **exports** in 2022–2023



Major Australian iron ore deposits, Mt

Australian iron ore exports



Outlook

Prices strengthen as China introduces measures to stabilise its **property market**

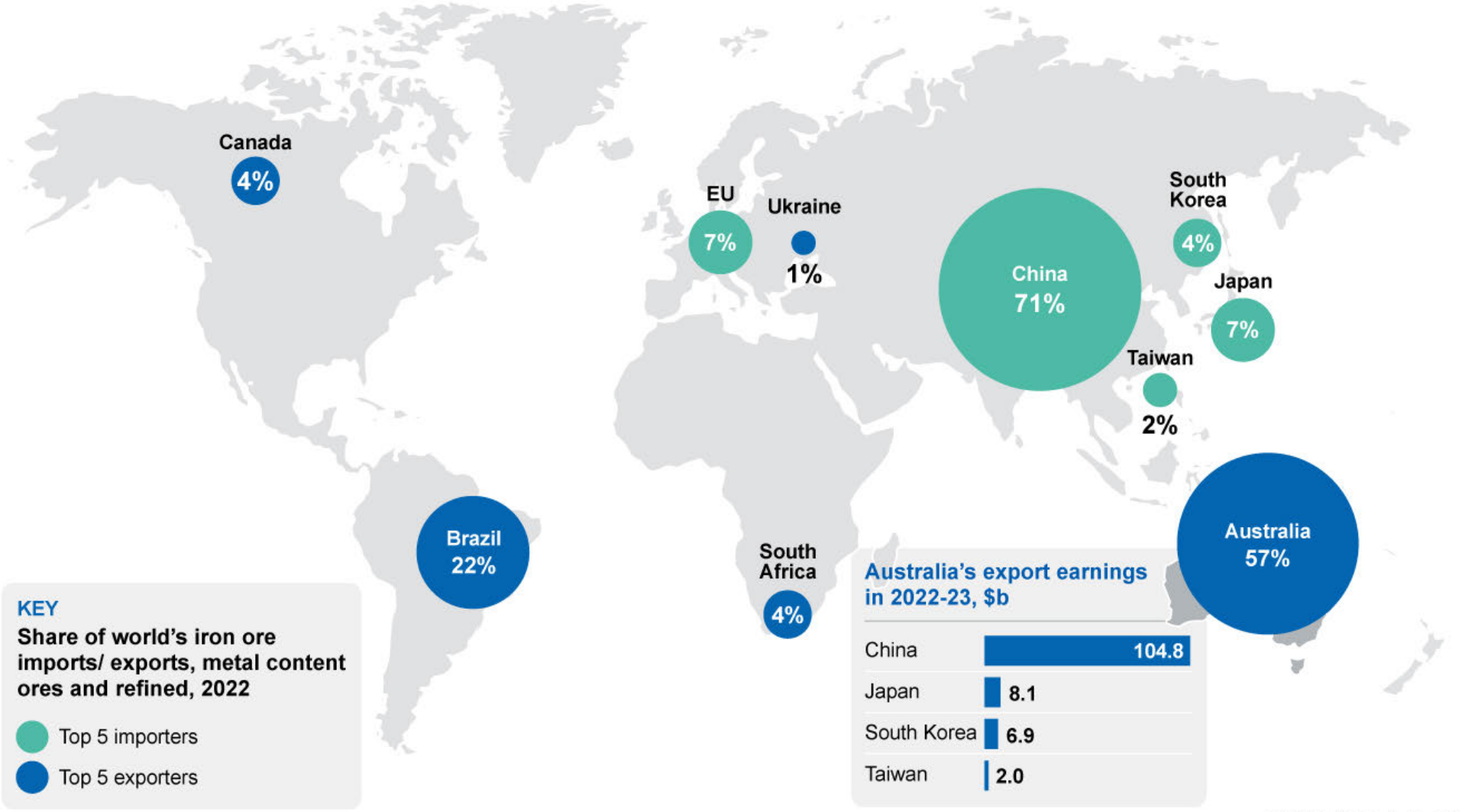
Future export earnings to **fall** as **prices decline**

Australian **export volumes rising**, with further greenfield supply expected

Exploration expenditure **remains strong**

SOURCE: GA; ABS; DISR; OCE

Iron Ore TRADE MAP



SOURCE: ITC Comtrade; ABS

4.1 Summary

- Spot iron ore prices strengthened in the December quarter driven by positive sentiment associated with the ongoing policy stimulus provided to the Chinese economy. Prices are likely to drift lower over the outlook period.
- Australian export volumes over H2 2023 have remained healthy, reflecting an ongoing ramp up in new operations from established and emerging producers. Export volumes should rise steadily over the outlook period.
- Australia's iron ore export earnings are expected to rise from $124 billion in 2022–23 to $131 billion in 2023–24, before falling to $102 billion in 2024–25 — driven by lower prices over the outlook period.

4.2 Prices

Iron ore prices further strengthened in the December quarter

Iron ore prices have lifted in recent months driven by improved market sentiment following a series of Chinese government measures to support China's economy. After falling to around US$108 a tonne in August 2023 the benchmark iron ore spot price (basis 62% Fe fines CFR Qingdao) rose to average over US$120 a tonne in November 2023 (Figure 4.1). The spot price for 62% Fe iron ore fines (FOB) for calendar 2023 is estimated to average around US$105 per tonne (Figure 4.5).

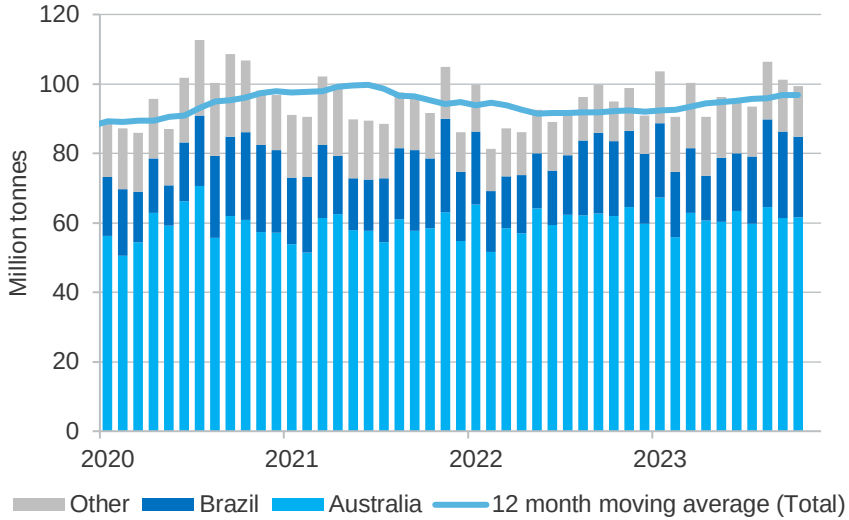
The rally in iron ore prices through the December quarter 2023 contrasts with seasonal trends seen over the two previous years: in both 2021 and 2022, prices fell sharply late in the calendar year as Chinese steel mills cut output to meet government production caps. Production cuts have not been strictly enforced in 2023 as the Chinese government prioritises economic growth over other considerations (see *Steel* chapter).

China's stronger than expected steel production has seen China's total iron ore imports continue to rise, increasing by 4.8% year-on-year in the September quarter 2023, up 7.7% on June quarter 2023 imports (Figure 4.2).

Figure 4.1: Iron ore price, monthly

Notes: China import Iron ore fines 62% Fe spot (CFR Tianjin port)
Source: Bloomberg (2023) China import prices

Figure 4.2: China's iron ore imports, monthly



Source: Bloomberg (2023)

However, China's monthly steel demand has been gradually losing momentum over the second half of 2023, resulting in rising steel inventories across China. The weakness in steel demand builds on the large falls in Chinese steel consumption observed in 2022.

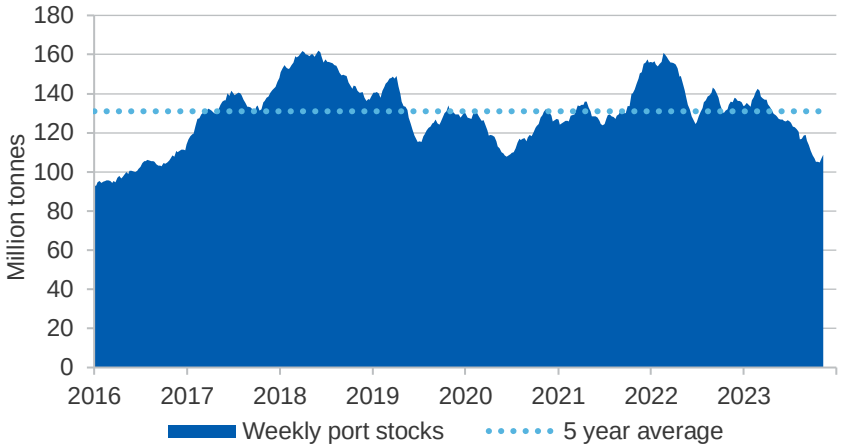
New infrastructure investment in China — resulting from substantial levels of funding allocated over the past year — as well as new measures by the Chinese government to alleviate weakness in the domestic property sector, should provide support for construction activity, and hence Chinese steel and iron ore demand into 2024 and 2025 (see *Steel* chapter).

Iron ore demand should also receive some support from restocking of iron ore inventories in China in coming months. In mid-November, China's portside iron ore inventories fell to around 20% below historic averages, the lowest level since 2016 (Figure 4.3). Reported iron ore inventories at Chinese steel mills have also remained low compared with previous years. This reflects negative margins in a majority of Chinese steel mills, due to low steel prices in recent months. This likely contributed to a continuation of the decline in the spread for premium 65% pellet, as well as maintaining downward pressure on premiums for high-grade iron ore fines — as mills seek to reduce operating costs (Figure 4.4).

Following last year's production falls, ex-China steelmaking has made a modest recovery over H2 2023, with output in the September quarter up around 2.2% year-on-year. The outlook period should see a modest rise in iron ore imports by major purchasers in Europe and North America, as well as East and South-East Asia and the Middle East. This pickup should provide support for iron ore demand and prices.

While risks to the global iron ore demand outlook remain, they have eased slightly in recent months. Inflation is moderating back towards target levels in the major Western nations, potentially allowing central banks to remove their restrictive monetary policy stance. The IMF's November upgrades to the Chinese GDP growth forecasts for 2023 and 2024 point to the potential for stronger underlying demand for steel. However, this is contingent on improved economic growth translating into improved confidence among homebuyers, a key uncertainty at present.

Figure 4.3: China's weekly iron ore port stocks



Source: Bloomberg (2023)

Prices to moderate over outlook period as supply rises and demand eases

China is projected to see modest falls in steel output over the outlook period to 2025. This is expected to soften the rate of growth in global iron ore demand in the coming years, driving iron ore prices down.

China's stated aim to shift its economy away from investment-led (and toward consumption led) growth is expected to be a key driver of this downward trend in prices. Lower demand for new residential and infrastructure-related construction is expected, due to China's declining population (and workforce) and the tapering in China's rate of urbanisation in recent years (see box 2.1 *Resources and Energy Quarterly* September 2023). These structural trends are likely to add to the current over-supply and financing problems in the real estate sector, further weakening steel demand over the outlook period.

Rising steel demand and production capacity in regions such as emerging Asia and the Middle East will see ex-China iron ore demand increase over the outlook period. This includes over 100 million tonnes of integrated (Blast Furnace-Basic Oxygen Furnace) steelmaking capacity, expected to come online in the next few years in Asia alone.

Turning to global iron ore supply, the world's two largest producers — Australia and Brazil — are expected to continue to collectively grow export volumes by 2.3% per annum over the outlook period to 2025. This follows a ramp up of greenfield projects for major Australian miners, and major expansions planned by Brazilian producers including Vale and CSN. New supply from emerging producers in Africa will also contribute to the growth in global trade of iron ore (see *World trade* section).

From an estimated average price of around US$105 a tonne (FOB) in 2023, the benchmark iron ore price is projected to steadily fall to an average of about US$77 a tonne by 2025 (Figure 4.5).

4.3 World trade

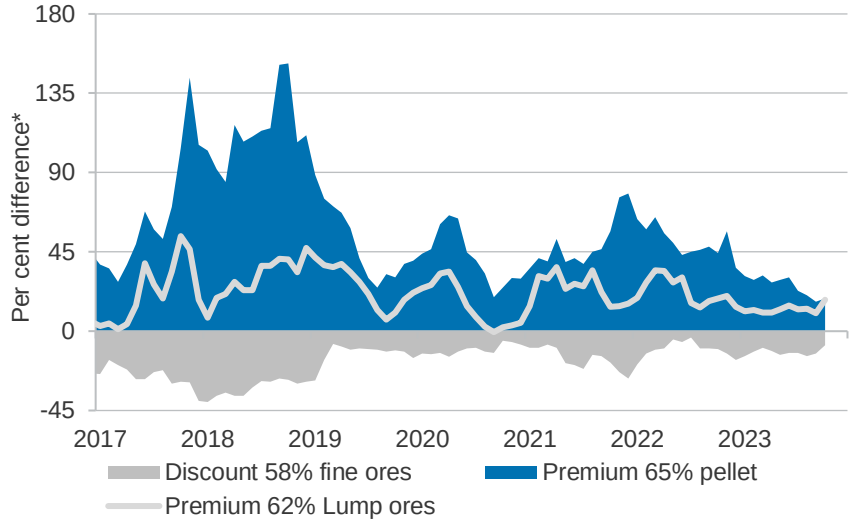
Global iron ore exports rose in the September quarter 2023

Combined shipments for Australia, Brazil, South Africa and Canada — representing more than 80% of global seaborne supply — were estimated at around 364 million tonnes in the September quarter 2023. This was a 5.0% rise quarter-on-quarter. In the year to September 2023, total shipments for the four major exporting-countries were around 1,028 million tonnes, a rise of 3.6% compared with the same period in 2022.

Over the outlook period to 2025, global trade is expected to grow by 1.9% annually, with new supply coming online in Australia, Brazil and Africa. Australia is projected to see continued ramp up of greenfield projects from established producers Rio Tinto, BHP and Fortescue, as well as emerging producers such as Mineral Resources Limited and Atlas Iron. Over the outlook period, Australia's iron ore exports are projected to reach 947 million tonnes by 2025 (see *Australia* section for more detail).

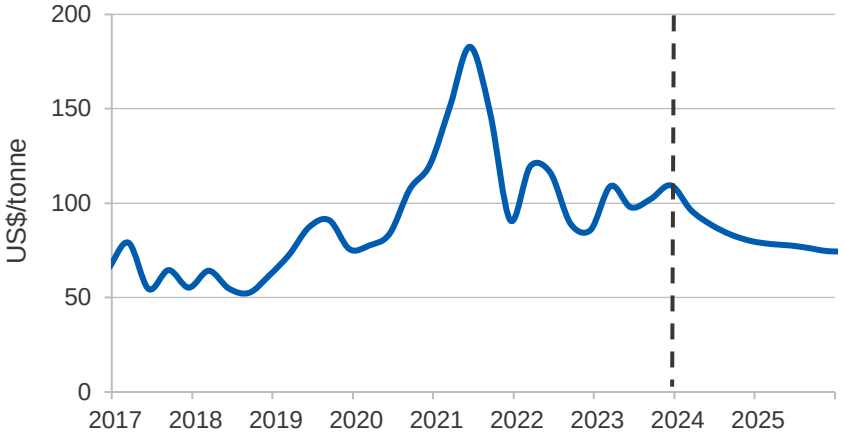
Total iron ore shipments from Brazil increased by 19 million tonnes in the year to September 2023. A conveyor belt failure at Vale's Northern System operations and a temporary stoppage to maintain a tailings pipeline at its Southern System operation, saw production fall in the September quarter. However, iron ore exports rose 6.6% year-on-year as miners drew on stockpiles built up in the first half of 2023.

Figure 4.4: Iron ore price spreads between grades



Notes: *Difference to 62% benchmark iron fines CFR; all grades reflect Chinese import prices
Source: Bloomberg (2023)

Figure 4.5: Iron ore price outlook, quarterly



Notes: China import iron ore fines 62% Fe spot (FOB)
Source: Bloomberg (2023); Department of Industry, Science and Resources (2023)

Vale has stated it remains on track to meet its 2023 production guidance of 310–320 million tonnes (compared with 310 for 2022).

Brazil is expected to grow iron ore exports by around 6.0% annually over the outlook period to 2025. This will include Vale's S11D expansion, as well as new and expanded output by a number of other producers, including CSN's Casa de Pedra mine, and IndoSino's Amapa high grade concentrate.

Outside of Australian and Brazil, iron ore exports are projected to be bolstered by additional supply from Canada and India and new projects coming out of Africa, including the 150 million tonne per annum plus Simandou mine which is targeting first production in 2025–26.

CMRG begins annual talks with major iron ore producers

It has been reported that China's state-owned company China Minerals Resources Group (CMRG) has commenced talks with the world's four largest iron ore mining companies — Rio Tinto, BHP, Vale and Fortescue. Reports indicated that CMRG is seeking preferential terms on transport, grades and delivery arrangements, as well as price. This follows a November statement by the President of CMRG that iron ore prices had reached 'unreasonable' levels and that the elevated input costs were squeezing steel makers' margins.

Over the outlook period, CMRG is expected to play an increasing role in contract negotiations and price setting in the global iron ore market. CMRG started negotiations in 2023 on iron ore supply on behalf of a number of China's major steelmakers. The Group was established in July 2022 and was widely seen as an effort by the Chinese government to guarantee the supply of important mineral resources — including the establishment of a single, central purchasing platform for iron ore.

Primary tender awarded for Guinea's Simandou mine

Progress on Guinea's Simandou 150-200 million tonne mine continued in the December quarter, with TAKRAF Group securing the primary tender for crushing and conveying systems at Rio Tinto's Simandou operations.

In August, Rio Tinto announced it had reached agreement with the Guinean Government and Winning Consortium Simandou to develop the 600 kilometre rail line required to transport the iron ore to the port. The Simandou mine is divided into 4 blocks, with 2 blocks controlled by Rio and Aluminum Corp of China, and the remaining 2 blocks owned by the Winning Consortium Simandou, backed by Chinese and Singaporean companies.

In October, Rio Tinto loaned US$100 million to the Chinese and Singaporean companies backing the Winning Consortium, with the loan to fund ongoing studies until a final feasibility study and funding agreement for the rail and port can be struck with the Guinean government and the rival mining consortium. The Guinean Government is targeting completion of infrastructure by 2024, and commercial production in either late 2025 or early 2026.

India's iron ore and pellet exports increased strongly in 2023

There remains considerable uncertainty about the likely trajectory of India's iron ore exports and imports over the next few years. Much will depend on the rate iron ore production capacity, and associated rail and other infrastructure, can be brought online.

India's iron ore and pellet exports reached an estimated 31 million tonnes in the year to September 2023, more than doubling year-on year. However, as India's steelmaking capacity continues to grow in the year ahead, this is likely to reduce the quantity of iron ore available for export.

In November 2022, the Indian government cut the tax rate (from 50% to 30%) for iron ore concentrates and scrapped the 50% export tax on low grade iron ore it introduced in early 2022. The higher tax rates were seen at the time as an effort by the government to manage input prices and retain iron ore for India's domestic industry. However, as India has historically been seen as a price-sensitive iron ore exporter — with domestic miners incentivised to export in times of high seaborne prices — the lower export tariffs are not expected to lead to a significant boost in India's iron ore exports over the outlook period.

4.4 Australia

Export volumes and values increased in September quarter

Australia's iron ore export earnings were $33.1 billion in the September quarter 2023, a 15% (or $4.3 billion) increase year-on-year. The increase reflected stronger iron ore prices and a weaker AUD/USD, with the unit export price in the September quarter averaging around $146 per tonne — 12% higher compared with the same period in 2022.

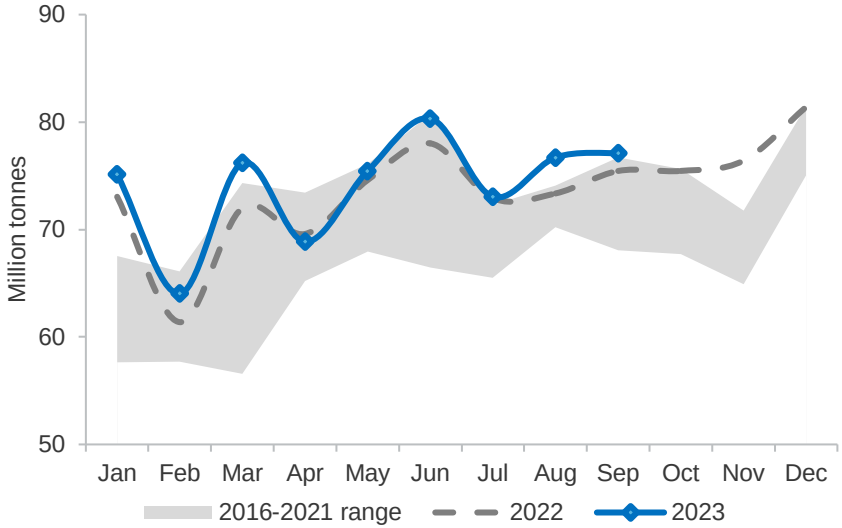
Australia exported 227 million tonnes of iron ore in the September quarter, up 2.3% year-on-year. The September quarter results lifted exports for the first nine months of 2023 to 667 million tonnes (Figure 4.6). The result reflected the ongoing ramp up of BHP's South Flank, Fortescue's Eliwana and Rio Tinto's Gudai-Darri operations.

Rio Tinto shipped 83.9 million tonnes of iron ore in the September quarter, up 6% quarter-on-quarter and 1% year-on-year. The result reflected productivity improvements across the Pilbara system and ramp up of the Gudai-Darri mine. Rio Tinto's 2023 guidance remains at the upper half of the 320–335 million tonne range. This includes a 5 million tonne benefit from the implementation of the Safe Production System, which focuses on improving safety, employee engagement and operational performance.

Rio Tinto announced it is seeking to increase production capacity of the newly opened Gudai-Darri mine to 50 million tonnes a year, at a cost of around US$70 million. The planned capacity increase will be achieved through upgrades within the plant, including chutes and conveyor belts, as well as utilising an existing incremental crushing and screening facility already on site.

BHP's iron ore output was 63.2 million tonnes in the September quarter, up 2% year-on-year. Production guidance for 2023–24 is unchanged at 254–264.5 million tonnes (equating to 299–311 million tonnes on a 100% basis). This includes the further ramp up of South Flank, which BHP expects to reach nameplate capacity (of 80 million tonnes per annum) by the end of the June quarter 2024, as well as its port debottlenecking project (PDP1) due for completion in 2024.

Figure 4.6: Australian monthly iron ore export volumes



Source: ABS (2023) International Trade, Australia, 5368.0; Department of Industry, Science and Resources (2023)

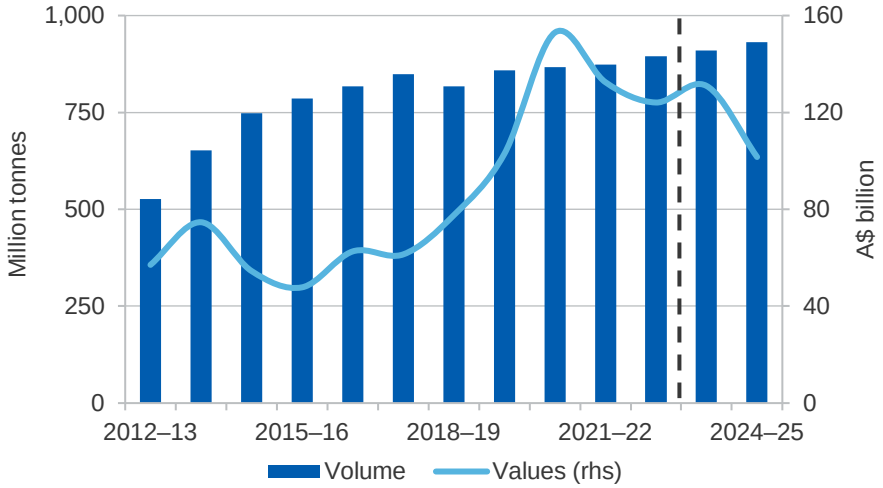
Fortescue's total iron ore shipments were 45.9 million tonnes in the September quarter 2023, a 6% decrease quarter-on-quarter. Fortescue's production guidance for the 2023–24 fiscal year remains at 192–197 million tonnes, which includes approximately 5 million tonnes of production from Iron Bridge. Iron Bridge transitioned to operational production in August 2023 when it achieved its first shipment of high grade magnetite concentrate.

Mineral Resources' iron ore production was 4.8 million tonnes in the September quarter 2023, an 8% increase quarter-on-quarter. Exports in the September quarter were 3.9 million tonnes and were impacted by temporary haulage and port constraints. Progress continues on the 30 million tonnes per annum Onslow Iron project. Drill and blast operations have commenced at the mine site, in addition to the commencement of earthworks on the private haul road. Port construction is also well progressed, with the first ore-on-ship delivery expected in June 2024.

Export values to ease over outlook on moderating prices

Australia's iron ore export earnings are estimated to reach $131 billion in 2023–24, up from $124 billion in 2022–23. The increase reflects higher production volumes, a weaker exchange rate and a slightly higher average price. Moderating prices and a higher AUD/USD over the outlook period are forecast to lead to lower iron ore earnings, with exports of $102 billion in 2024–25 (Figure 4.7).

Figure 4.7: Australia's iron ore export volumes and values



Source: ABS (2023) International Trade, Australia, 5368.0; Department of Industry, Science and Resources (2023)

Exploration rose in September quarter 2023

A total of $196 million was spent on iron ore exploration in the September quarter 2023 (Figure 4.8). This was 2.4% higher compared with the previous quarter, and 1.8% lower than the same period in 2022. Exploration has fallen from near decade highs last year. However, the latest results continue the broad upward trend in iron ore exploration which was triggered by the historical high iron ore prices of above US$200 a tonne reached in the first half of 2021.

Figure 4.8: Australian iron ore exploration expenditure

Source: ABS (2023) Catalogue 8412.0

Revisions

Export earnings in 2023–24 have been revised up from the September 2023 *Resources and Energy Quarterly* reflecting higher forecast prices and a lower-than-expected exchange rate; we now expect earnings of $131 billion rather than $120 billion. Earnings in 2024–25 are $2 billion higher than forecast in the September 2023 *Resources and Energy Quarterly*.

Table 4.1: World trade in iron ore

	Million tonnes				Annual percentage change		
	2022	2023 s	2024 f	2025 f	2023 f	2024 f	2025 f
World trade	1,574	1,609	1,635	1,665	2.2	1.6	1.8
Iron ore imports							
China	1,108	1,152	1,122	1,094	4.0	-2.6	-2.6
Japan	104	106	108	107	1.7	1.6	-0.8
European Union	114	99	113	114	-13.3	13.5	1.4
South Korea	66	71	73	74	7.4	3.0	1.3
Rest of Asia[a]	58	62	74	95	6.2	19.5	27.7
India	2	4	12	20	94.2	202.6	69.5
Iron ore exports							
Australia	884	902	917	947	2.1	1.7	3.3
Brazil	346	367	390	413	6.1	6.3	5.9
South Africa	58	59	60	61	1.7	1.7	1.7
Canada	54	56	58	60	3.7	3.6	3.5
India	16	35	32	27	118.5	-8.5	-15.6

Notes: **a** Excludes China, Japan, South Korea, Taiwan and India; **s** Estimate; **f** Forecast; **r** Annual percentage change

Source: World Steel Association (2023); International Trade Centre (2023); Department of Industry, Science and Resources (2023)

Table 4.2: Iron ore outlook

				Million tonnes			Annual percentage change	
World	**Unit**	**2022**	**2023 [s]**	**2024 [f]**	**2025 [f]**	**2023[r]**	**2024 [f]**	**2025 [f]**
Prices [a]								
– nominal	US$/t	103	105	87	77	1.9	-16.8	-12.0
– real [b]	US$/t	107	105	85	73	-2.3	-19.1	-14.1
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**
Production								
– Steel [c]	Mt	5.8	5.6	5.7	5.8	-2.6	1.4	1.2
– Iron ore [g]	Mt	929	957	971	1,012	3.0	1.5	4.3
Exports								
Steel [c]	Mt	0.81	1.21	1.04	1.13	50.1	-14.2	8.2
– nominal value	A$m	1,047	1,355	1,165	1,181	29.5	-14.0	1.4
– real value [i]	A$m	1,170	1,415	1,165	1,142	21.0	-17.7	-2.0
Iron ore [h]	Mt	874	895	910	931	2.4	1.7	2.2
– nominal value	A$m	132,489	124,101	130,958	101,599	-6.3	5.5	-22.4
– real value [i]	A$m	148,058	129,580	130,958	98,209	-12.5	1.1	-25.0

Notes: a Spot price, 62% iron content, fob Australian basis; b In 2023 US dollars; c 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; f forecast; g In wet metric tonnes; h In dry metric tonnes; i In 2023–24 Australian dollars; r Annual percentage change; s Estimate
Source: ABS (2023) International Trade in Goods and Services, Australia, 5368.0; Bloomberg (2023); World Steel Association (2023); company reports; Department of Industry, Science and Resources (2023)

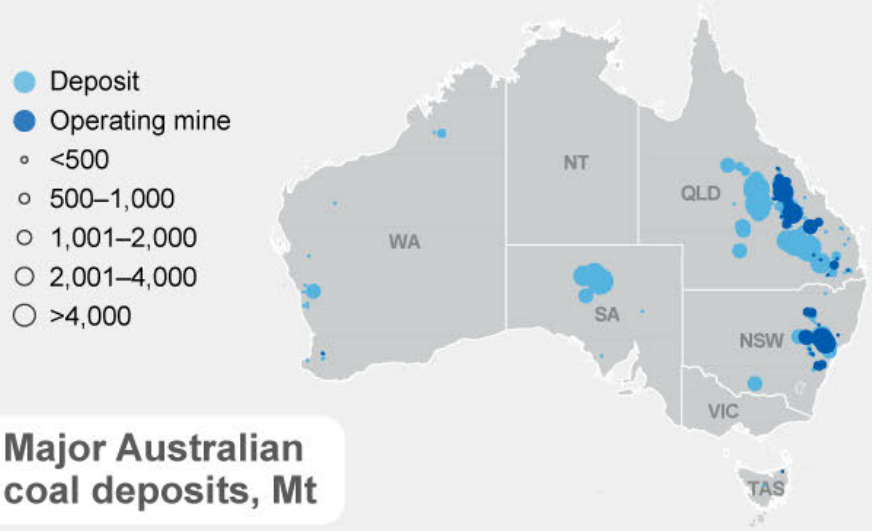
Metallurgical Coal

Australia's metallurgical coal sector

Largest
exporter, around **170Mt** exported annually

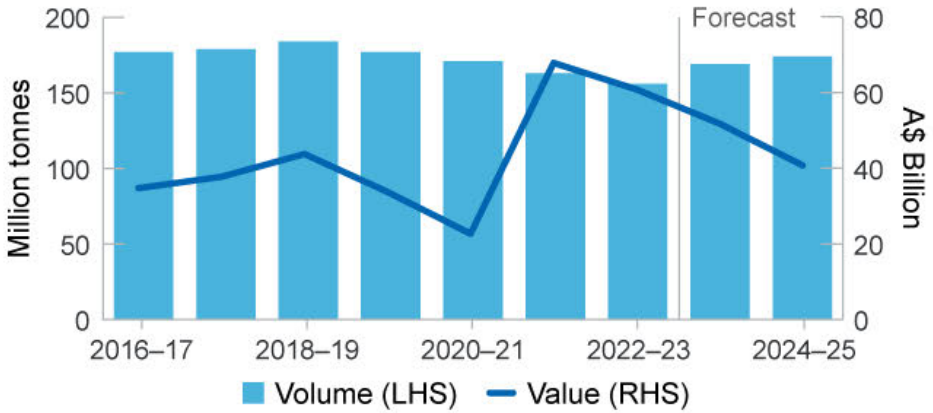
Strong growth
in exports to **India** and **South Korea** in recent years

Almost all
of Australia's **production** is exported



Major Australian coal deposits, Mt

Australian metallurgical coal exports



Outlook

Metallurgical coal prices **rose again late 2023** following **supply concerns**

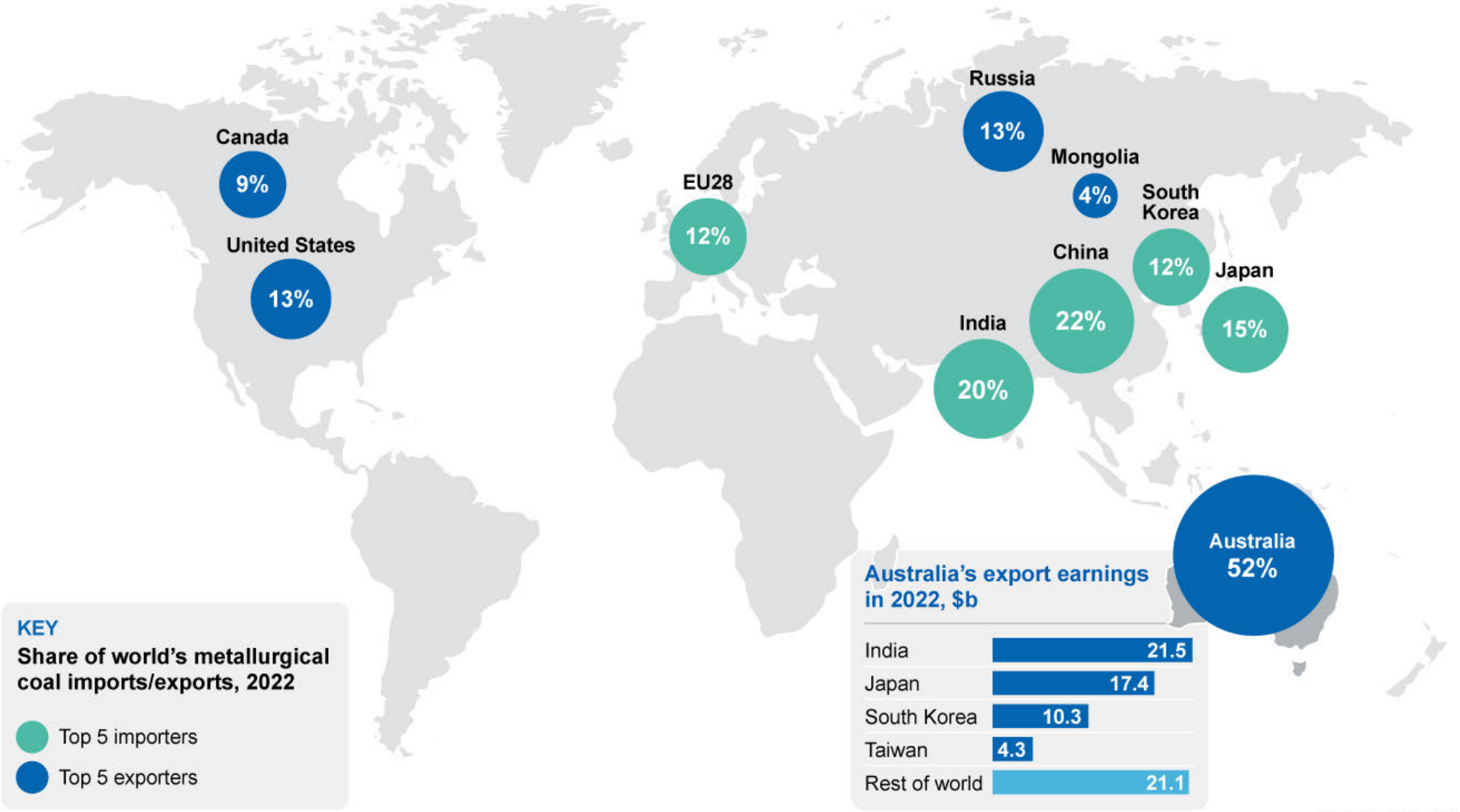
Earnings **expected to decline** over time as prices continue to ease off their 2022 peak

Volumes should lift as weather disruptions ease and new mines commences in Qld

Exploration spending **rose** through the year

SOURCE: World Steel; GA; DISR; OCE

Metallurgical Coal TRADE MAP



SOURCE: WSA; ABS

5.1 Summary

- Metallurgical coal prices remain well above pre-2019 levels and have spiked further in recent months on the back of supply concerns.
- The Australian premium hard coking coal price is expected to average US$293 a tonne in 2023, easing to around US$203 a tonne by 2025.
- Australia's exports are forecast to lift from 156 Mt in 2022–23 to 174 Mt in 2024–25, as several new mines open (see Australia section).
- As prices decline, the value of Australia's metallurgical coal exports is forecast to fall from $61 billion in 2022–23 to $41 billion in 2024–25.

5.2 World trade

Demand for metallurgical coal has remained strong, increasing by 18% in the first 8 months of 2023 compared to the equivalent months in 2022. The largest increase came from China, whose January to August 2023 imports rose by 61% compared with the same period of 2022. This increase is off a relatively low base since China's 2022 steel production was affected by COVID-19 lockdowns and a slowdown in the residential property sector.

Prices for metallurgical coal have been relatively stable compared to the spikes immediately following Russia's invasion of Ukraine. The price of Australian prime hard coking coal is estimated to average US$293 a tonne in 2023, although prices have started rising in the last couple of months, averaging US$338 a tonne over October and November. This recent growth is attributable to increased demand from China and India and tight supply from Australia.

World metallurgical coal trade is forecast to increase from 312 Mt in 2022 to 318 Mt by 2025, led by rising demand in India. The supply gap experienced in the first half of the year has started closing with improved weather conditions. Chinese imports are expected to fall back from record levels in 2024 before increasing slightly in 2025.

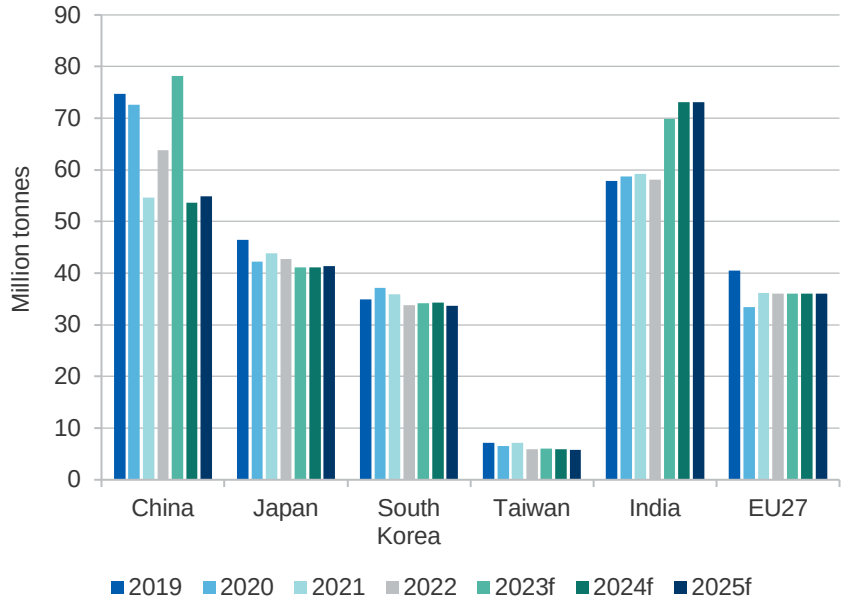
India is expected to overtake China as the primary growth market for steel production and will become the biggest driver for long term growth in demand for metallurgical coal. India's steelmaking pipeline includes projects that will come online over the outlook period, leading to a jump in metallurgical coal imports (Figure 5.1).

Steelmaking in Europe remained soft in December quarter with overall steel output in the European Union falling by 9% in the first nine months of 2023 compared with the equivalent period in 2022. High interest rates contributed to the softening in construction with residential, commercial, and infrastructure construction all seeing declines.

5.3 World imports

A significant theme in the outlook period will be the ongoing switch to India from China as the largest importer of metallurgical coal, particularly as India's steel making capacity continues to rise.

Figure 5.1: Metallurgical coal imports



Notes: **f** forecast **s** estimate

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

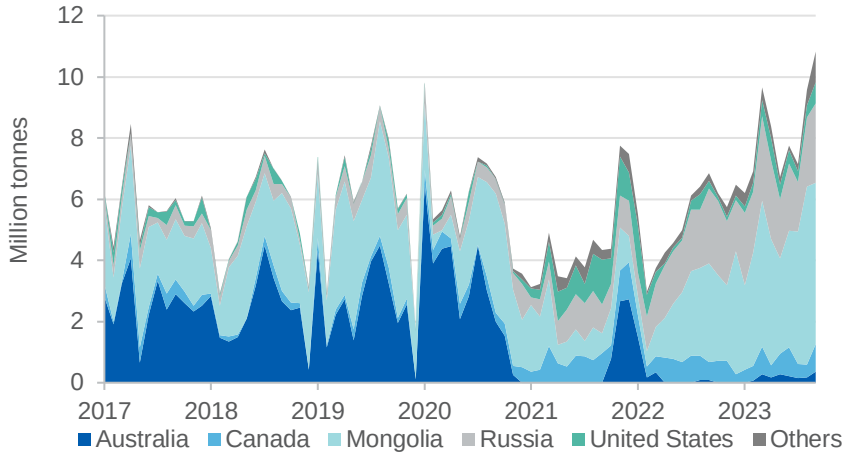
Chinese metallurgical coal imports likely to ease

Demand for metallurgical coal from China is influenced by the expected outlook for steel, and Chinese government policy. China's steel output fell in the September quarter 2023. Although China's property sector continues to slow, demand for Chinese manufacturing and infrastructure investment has assisted in maintaining metallurgical coal imports.

China's policy settings heavily influence the Chinese steel industry which has faced government mandated production cuts for the third year in a row to reduce carbon emissions. China is also looking to increase its use of scrap steel in its production of recycled nonferrous metals which could further reduce demand for metallurgical coal.

Despite the downturn in China's steel output, imports of seaborne metallurgical coal rose in 2023 (Figure 5.2). One of the factors contributing to this increase is safety concerns around China's coal mines. In early 2023, reports began to emerge of a number of accidents in coal mines. Local authorities carried out safety inspections resulting in the stoppage of operations and an overall strengthening of mining and safety regulations. These stoppages have led to greater demand for seaborne imports.

Figure 5.2: Chinese metallurgical coal imports, monthly



Source: McCloskey (2023)

The removal of Chinese restrictions on imports of Australian coal saw Australian thermal coal resume their pre-2020 levels. Comparatively, imports of Australian metallurgical coal have not recovered in the same way. In 2019–20, China imported large amounts of its metallurgical coal from Australia (41% share) and Mongolia (45% share), with Russia only making up 7%. The primary source markets to fill the loss of Australian imports were Russia and Mongolia, with the share of Russian imports jumping even higher following the Ukraine invasion. From January to August 2023, Russia supplied 28% of China's metallurgical coal, Mongolia supplied 52%, and Australia supplied just 2%. Imports of Mongolian coal rose as rail links to China were substantially upgraded.

India's metallurgical coal imports are growing on structural factors

Indian metallurgical coal imports were strong in 2023, with a 13% rise in the first 8 months of 2023 compared with the equivalent period in 2022. This comes despite a general softening in the global steel outlook and reflects years of investment intended to build up India's steel production.

Australia continues to be the primary supplier of metallurgical coal to India however has lost market share over the last couple of years. In 2019, Australia supplied India with two thirds of its metallurgical coal. In the first 8 months of 2023, this dropped to 49%. Discounted coal from Russia has been the primary driver of this change, with Russian metallurgical coal making up 19% of total Indian metallurgical coal imports, compared to 6% in 2019. As the discount for Russian coal diminishes further, Australia will likely regain some of this share.

India's demand for steel is expected to continue to grow, driven by the manufacturing and construction sectors. India's steel output rose 12% in the first nine months of the year compared to the equivalent period in 2022. India is rapidly expanding its domestic steel production capacity and aims to double crude steel production capacity by 2030.

Some of the projects in India's steelmaking pipeline are expected to come online over the outlook period, leading to a corresponding jump in metallurgical coal imports to 73 million tonnes in 2024 and 2025. This is 26% higher compared to the 2022 total of 58 million tonnes.

5.4 World exports

Structural shortfalls in metallurgical coal markets have mostly eased, but a small shortfall is likely to persist for at least another year. Inventories are low in some countries and some Russian supply remains stranded from world markets. Any further downturn in global steelmaking (or tightening policy from China) could result in a surplus of metallurgical coal supply, potentially lowering prices.

US coal exports remain strong but potential disruptions signalled

US suppliers are benefitting from infrastructure and transport upgrades, and from the removal of some competing Russian supply due to sanctions by many western nations.

Coal exports remain strong and have been supported recently by the resolution of several infrastructure faults. However, lack of access to capital has hampered investment opportunities. US mines are also facing labour force shortages which pose risks to US supply over the outlook period. Despite these disruptions Rameco has hit its long-term goals early in 2023, reaching 3.6 Mt by September.

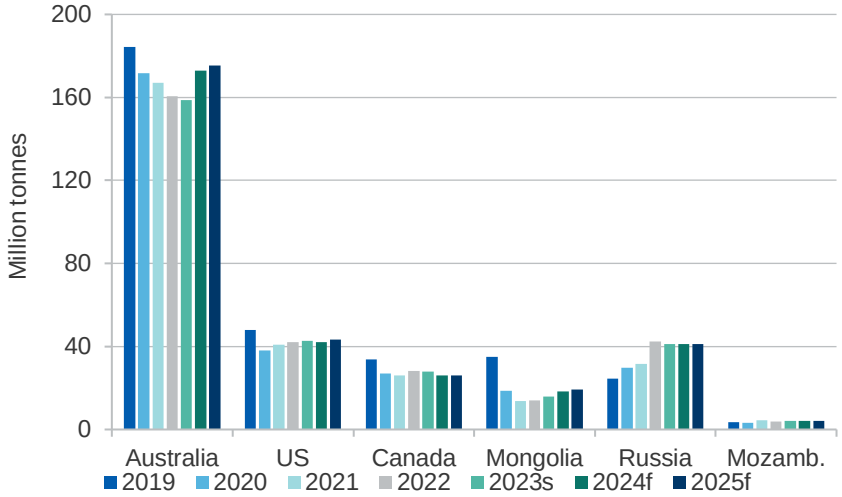
US metallurgical coal exports are generally high-cost but remain profitable for the time being. Over the outlook period, US exports are expected to experience minimal growth as prices fall and marginal or cost-sensitive exporters withdraw from the seaborne market.

Safety concerns may hamper Mongolian coal exports in the short term

Mongolian exports are expected to steadily rise to 19 Mt by 2025, recovering from a drop off due to COVID-19 restrictions and reduced worldwide demand. Despite the easing of disruptions, supply is unlikely to reach the pre COVID-19 highs of 27 Mtpa in either year of the outlook period (Figure 5.3).

Short term supply from Mongolian mines could be affected by safety inspections following an accident involving multiple fatalities in October. Whilst the accident occurred in a thermal coal mine, the sweeping safety checks could disrupt supplying metallurgical coal mines.

Figure 5.3: Metallurgical coal exports



Notes: f forecast s estimate
Source: IEA (2023); Department of Industry, Science and Resources (2023)

Canadian mines expected to maintain output

Canadian output is expected to remain largely steady through the outlook period, with falling output at ageing mines offset by ramp-ups at Canada Coal's re-opened Grand Cache mine. The mine previously produced around 2 Mt annually and is expected to match this level again by 2024.

Canada has also experienced some mine safety issues which will impact supply. A stop work order was issued after a roof fall at the Donkin Mine in Nova Scotia. The mine has since been given approval to move towards restart, but the operator has indicated there may be further delays.

Exports out of Mozambique are growing, supported by improved transport

In the early stages of the COVID-19 pandemic, Mozambique's exports fell temporarily as low prices forced much of the nation's high-cost production out of the market.

Neighbouring nations use Mozambique's ports to export their metallurgical coal. Exports from the Majhado project in South Africa are expected to

commence from mid-2025. The mine has potential to produce up to 4 Mt of metallurgical coal per annum.

Russian mines reapproaching capacity but tariffs may hurt production

Russia's invasion of Ukraine has resulted in a dramatic decline in thermal coal exports – and initially a more modest easing in metallurgical coal output from the region. The war has recently escalated around the Black Sea where significant quantities of seaborne coal are traditionally loaded and shipped.

Despite the ongoing sanctions, raw coking coal output partially recovered in September, with the Kuzbass mine set to return to normal operations. Output at the mine rose by 2% in September but remains 3% lower through the year.

The Russian Government is imposing export duties on exports outside of the Eurasian Economic Union from 1 October 2023 until the end of 2024. This could result in a duty of up to 7% on metallurgical coal. The duty is dependent on the Ruble-US dollar exchange rate. This duty will squeeze the already tight margins of coal miners from US$5-15 a tonne to US$0-8 a tonne, resulting in the potential curtailing of output if prices don't rise.

5.4 Prices

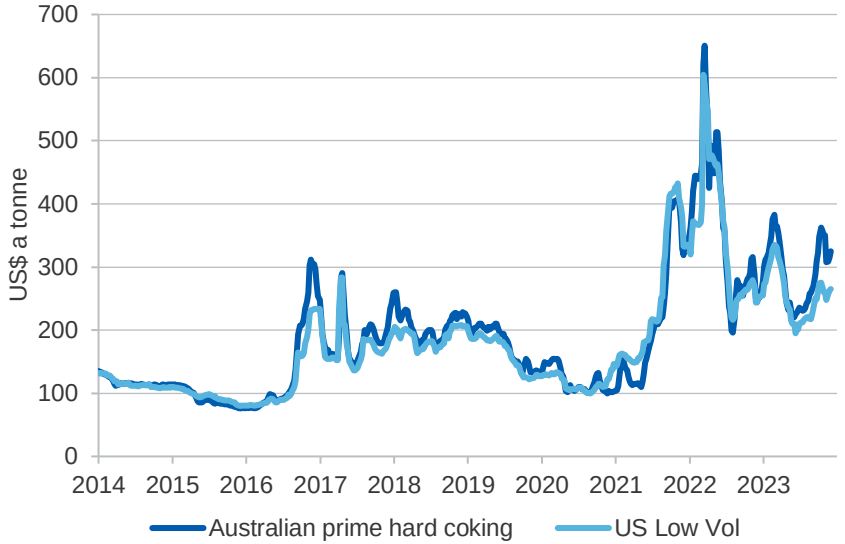
Metallurgical coal prices set to decline further

Metallurgical coal prices experienced further increases in the December quarter as supply tightened in Australia. Australian premium hard coking coal prices averaged US$320 a tonne in November 2023 — the highest level observed in any month this year (Figure 5.4).

Australian coal supply was disrupted in September when operations at BMA's Peak Downs mine in central Queensland were suspended after two truck sliding incidents. Although the suspension applied to only parts of the mine's operations, they were enough to place upward pressure on prices.

The weak monsoon season and government spending in India supported steel production in August, with additional construction activity leading to a drawdown of coal supplies. The long-term expansion of India's steelmaking capacity may also add upward pressure to metallurgical coal prices over the long term.

Figure 5.4: Metallurgical coal prices — Australian vs US, FOB



Notes: 'Low Vol' is low volatility coking coal.
Source: McCloskey (2023); Department of Industry, Science and Resources (2023)

Supply constraints experienced during the La Niña cycle have eased, with demand for metallurgical coal likely to follow the softening outlook for growth in global steelmaking. Chinese steelmaking still carries downside risks as overall policy settings are unfavourable to the carbon intensive sector. The removal of China's informal import restrictions on Australian coal have allowed trade to resume but shifts in trade patterns away from Australian imports (that occurred after 2020) appear likely to persist.

Over the outlook period, more stable supply and weaker demand should result in a moderate decline in prices, though weather events and conflict around the Black Sea region add to upside risks. The price of Australian metallurgical coal is forecast to decrease from US$293 a tonne in 2023 to around US$203 a tonne by 2025.

5.5 Australia

Metallurgical coal export volumes are growing, offsetting lower prices

Australia remains the world's largest metallurgical coal producer, accounting for 53% of the worlds exported volume. Australian metallurgical coal output steadied in 2023 and then began to rise as persistent disruptions from La Niña finally eased (Figure 5.5). The current El Niño episode is likely to bring about sustained dry conditions over the rest of 2023–24, though summer storms remain a risk factor for ports/shipping.

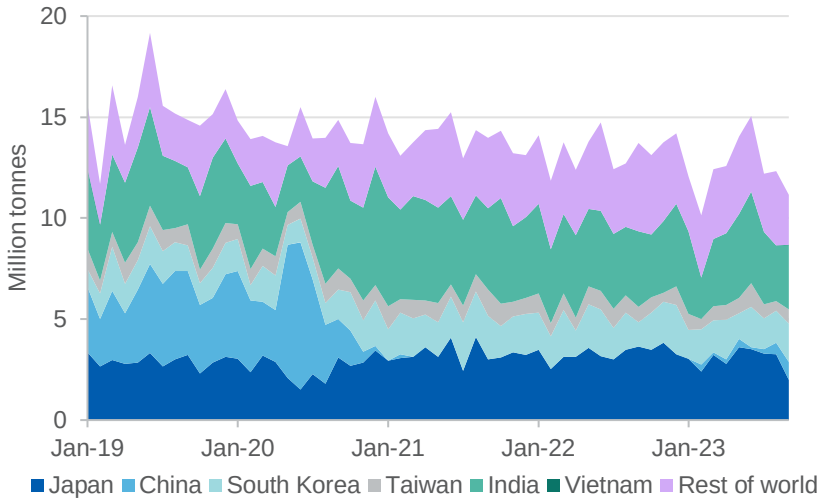
Labour force shortages continue to impact metallurgical coal production across mine sites. According to ABS labour force data, total employment in the coal mining sector has dropped 14% from pre-pandemic levels. The average number of persons employed in coal mining in 2019 was 53,000, compared to 46,400 in 2021 and 45,900 in 2023. Some of this may reflect capital deepening and other structural changes, but labour shortages are also believed to be acting as a constraint.

Demand for Australian metallurgical coal could be propped up by growing thermal coal prices. Metallurgical coal can be substituted for thermal coal for the purpose of power generation; however, the reverse is not possible. Therefore, sales of metallurgical coal into thermal markets remains a possibility, especially when the price per calorific value of metallurgical coal falls below that of thermal coal. There is a risk that an unusually harsh winter or summer could result in metallurgical coal becoming more competitive than thermal coal, and the pivot of 2022 (when substantial quantities of metallurgical coal were dumped into thermal markets) could recur.

Growth in production is still expected over the outlook period. Mine expansions and openings are expected to exceed closures (depending on approvals), with metallurgical coal exports expected to experience stronger growth than thermal coal. Over the outlook period, this will position Australia to meet the demand of emerging steel markets in the region.

Mines that could expand commercial operations in the next couple of years include the Hillalong, Wilton and Fairhill projects in Queensland (depending on approvals). Sojitz Blue has also received approval for its Gregory Crinum open cut coal extension, which could now potentially run for another 20 years. The extension of the Mandalong and Vickery mines in NSW will also boost output.

Figure 5.5: Australia's metallurgical coal export volumes, monthly



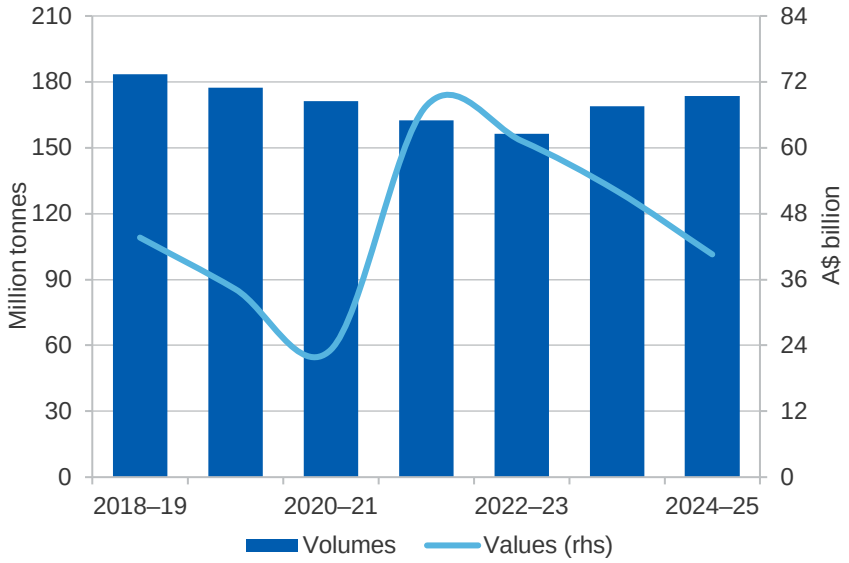
Source: ABS (2023) International Trade, Australia (trade tables subscription)

Higher production in New South Wales and (especially) Queensland is expected to lift Australia's exports from a weather-affected 156 Mt in 2022–23 to 174 Mt by 2024–25. Metallurgical coal export earnings are expected to ease from $61 billion in 2022–23 to $41 billion by 2024–25 (Figure 5.6), with higher volumes partly offsetting falling prices.

Revisions to the outlook for Australian metallurgical coal exports

The earnings forecast for 2023–24 has been revised up by around $5 billion from the September 2023 REQ, based on an upward revision to prices. The forecast for 2024–25 is largely unchanged.

Figure 5.6: Australia's metallurgical coal exports



Source: ABS (2023) International Trade, Australia 5454.0; Department of Industry, Science and Resources (2023)

Table 5.1: World trade in metallurgical coal

	Unit	2022	2023[s]	2024[f]	2025[f]	Annual percentage change 2023[s]	2024[f]	2025[f]
World trade	Mt	312	313	311	318	0.2	-0.6	2.1
Metallurgical coal imports								
China	Mt	64	78	54	55	22.6	-31.4	2.2
India	Mt	58	70	73	73	20.1	4.7	0.0
Japan	Mt	43	41	41	41	-4.0	0.2	0.5
European Union 28	Mt	36	36	36	36	-0.2	0.0	0.0
South Korea	Mt	34	34	34	34	1.2	0.1	-1.8
Metallurgical coal exports								
Australia	Mt	161	159	173	176	-1.1	8.9	1.5
United States	Mt	42	43	42	43	1.5	-1.2	2.3
Canada	Mt	28	28	26	26	-0.7	-6.0	-0.2
Russia	Mt	42	41	41	41	-2.8	0.0	0.0
Mongolia	Mt	14	16	18	19	14.0	13.8	6.1
Mozambique	Mt	4	4	4	4	6.7	0.0	0.0

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

Source: IEA (2023) Coal Information; IHS (2023); Department of Industry, Science and Resources (2023)

Table 5.2: Metallurgical coal outlook

World	Unit	2022	2023[s]	2024[f]	2025[f]	Annual percentage change 2023[s]	2024[f]	2025[f]
Contract prices[e]								
– nominal	US$/t	372	289	229	204	-22.2	-21.0	-10.7
– real[d]	US$/t	389	289	224	195	-25.7	-22.7	-12.6
Spot prices[g]								
– nominal	US$/t	364	293	219	203	-19.6	-25.1	-7.4
– real[d]	US$/t	382	293	214	194	-23.4	-26.8	-9.3
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Production	Mt	168	167	173	178	-0.5	3.6	2.8
Export volume	Mt	163	156	169	174	-4.3	8.3	3.0
– nominal value	A$m	67,588	61,252	52,113	40,575	-9.4	-14.9	-22.1
– real value[i]	A$m	71,972	61,301	49,969	37,697	-14.8	-18.5	-24.6

Notes: **d** In 2023 US dollars. **e** Contract price assessment for high-quality hard coking coal. **i** In 2023–24 Australian dollars. **s** Estimate **f** Forecast. **g** Hard coking coal fob Australia East Coast ports. **s** Estimate.

Source: ABS (2023) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Science and Resources (2023)

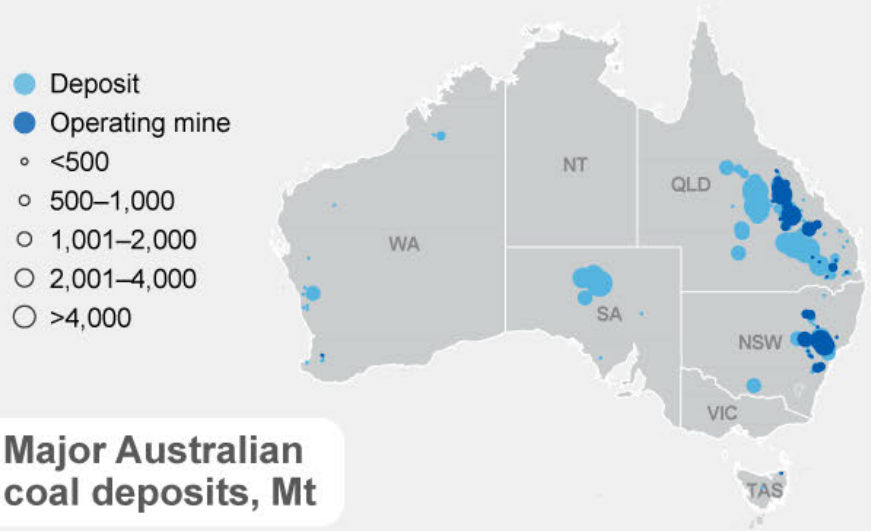
Thermal Coal

Australia's thermal coal sector

World's 2nd
largest thermal coal **exporter** & **4th largest** black coal resource

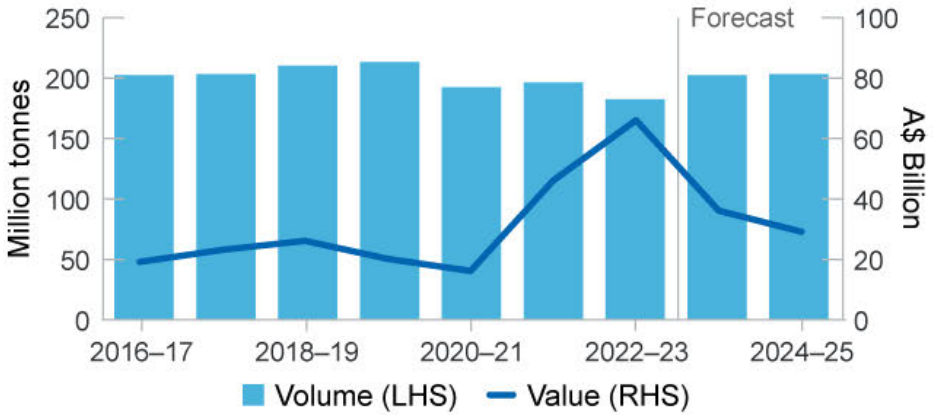
Strong growth
in exports to **India** in recent years

75-80%
of Australia's thermal coal is **exported**



Major Australian coal deposits, Mt

Australian thermal coal exports



Outlook

Prices **well below** 2022 peaks as **supply conditions improve**

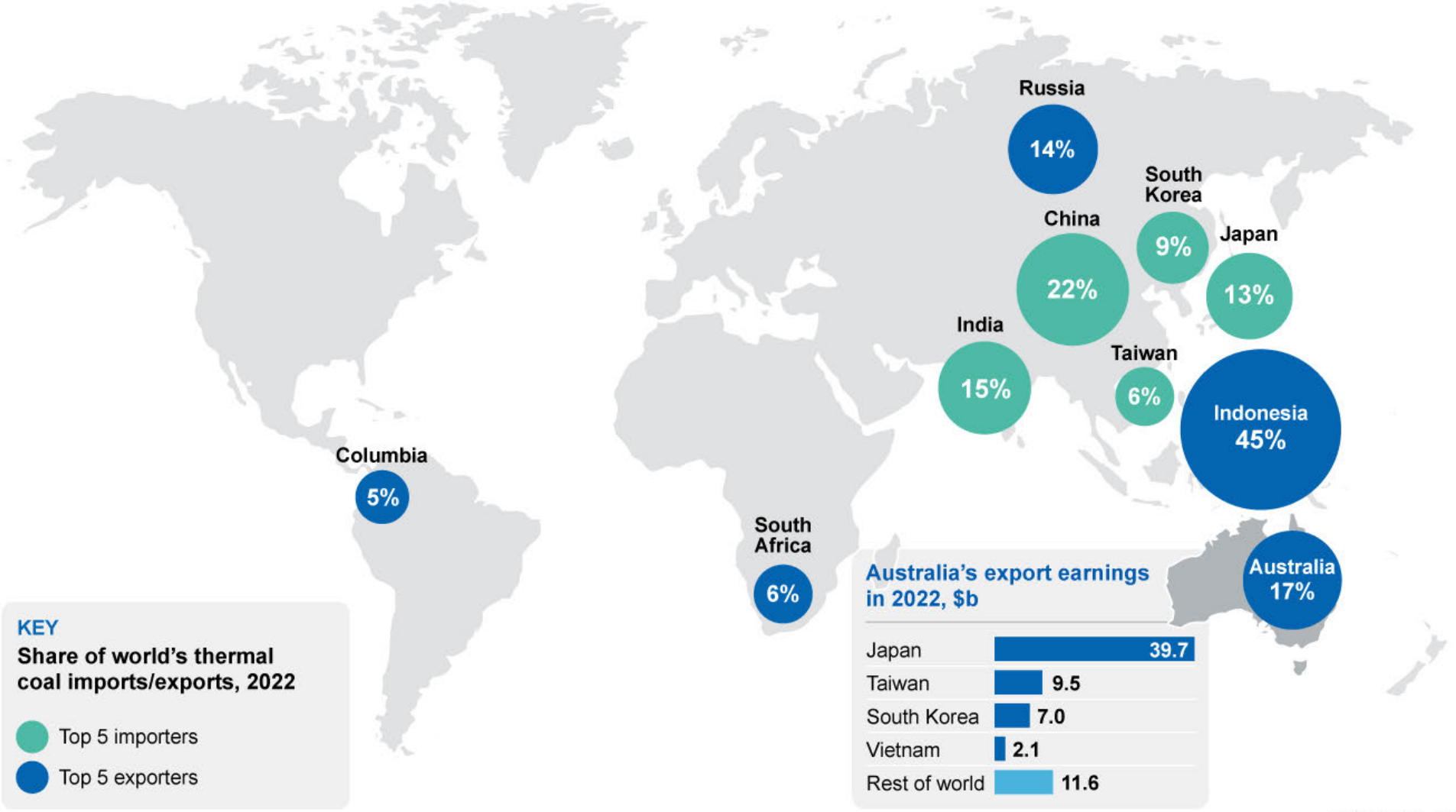
Earnings remain on a **downward trajectory**, as prices **continue to ease**

Volumes should lift as **weather disruptions ease** and **new mines** ramp up

Supply shortages are expected to **drive prices** over the longer term

SOURCE: GA; DISR; OCE

Thermal Coal TRADE MAP



SOURCE: IEA; ABS

6.1 Summary

- As prices fall, Australian thermal coal exports are forecast to fall from a peak above $65 billion in 2022–23 to about $29 billion by 2024–25.
- Prices for Newcastle 6,000kcal thermal coal dropped to US$122 a tonne in November 2023, compared with US$159 a tonne in September 2023. The price weakness largely reflects high stockpiles in China and fewer supply disruptions. Prices are expected to drift lower as supply rises and demand moderates over the outlook period.
- A return to more favourable production conditions is expected to see Australian thermal coal exports rise from 182 million tonnes (Mt) in 2022–23 to 203 Mt by 2024–25 (see Australia section).

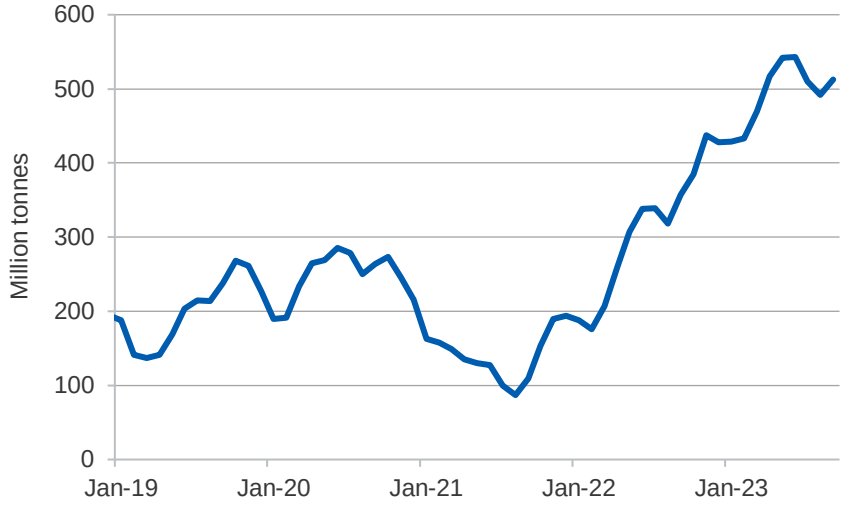
6.2 World trade

Global demand for coal held up in 2023 (year to date), increasing by 2% compared with the same period in 2022. The most notable lift in demand came from China, where coal imports almost doubled in 2023, in response to increased demand for cooling, and significant stockpiling of coal. Imports to the European Union and United Kingdom fell to 52 Mt over the year to August. This compares with 69 Mt over same period a year ago as European nations scrambled to obtain substitutes for Russian coal. Europe accumulated ample stocks of coal and gas in 2022, reducing its 2023 import needs considerably.

Thermal coal trade in Asia in 2023 is set to outpace 2022 by 17%, with the biggest driver of this rise being China's stockpiling of coal (Figure 6.1). Vietnam more than doubled imports in the first 8 months of 2023, and is expected to continue to lift imports in the outlook period. The most notable fall in imports in 2023 was in Japan where two nuclear reactors restarted.

Energy security concerns — which were already high from the Russia-Ukraine war — have been exacerbated by the Hamas-Israel conflict. While the Gulf region does not export material volumes of thermal coal, it does export LNG, which is one of the primary substitutes used in power generation. Further escalation of the Hamas-Israel conflict could result in increased gas and oil prices, leading to additional thermal coal demand.

Figure 6.1: Chinese coal inventory



Source: Bloomberg (2023)

6.3 World imports

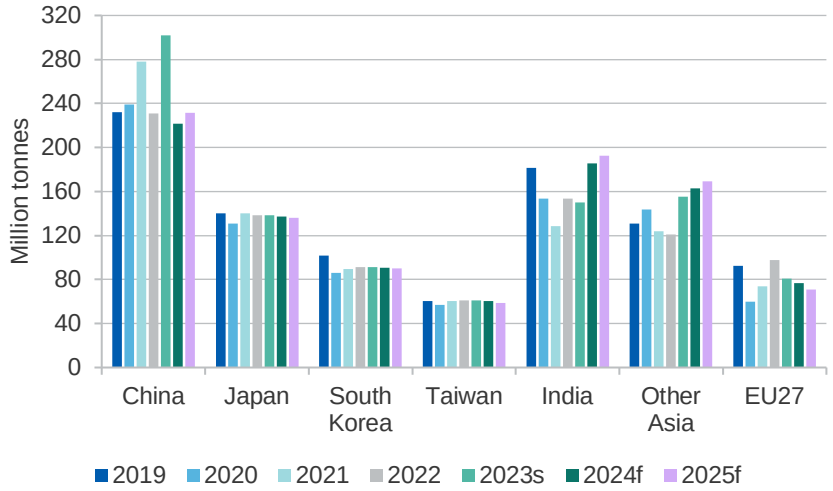
Global imports of thermal coal are expected to increase by about 0.4% in 2023 as a result of high demand for seaborne coal from China, Vietnam, and Turkey (Figure 6.2). In 2024 and 2025, world imports are expected to drop by 2.1% in 2024 to allow high inventory levels to normalise, before resuming in 2025 with a 1.5% increase.

China's inventory levels steadily increased to record levels

Energy security concerns borne of geopolitical tensions have prompted China to stockpile coal inventories to record levels in 2023. China's coal inventories have more than tripled over the last couple of years. Import volumes have been up every month in 2023, resulting in a total increase of 77% of coal imports in the first nine months of 2023 compared with 2022 (Figure 6.3).

Indonesia, Australia and Russia are the primary exporters meeting this additional demand.

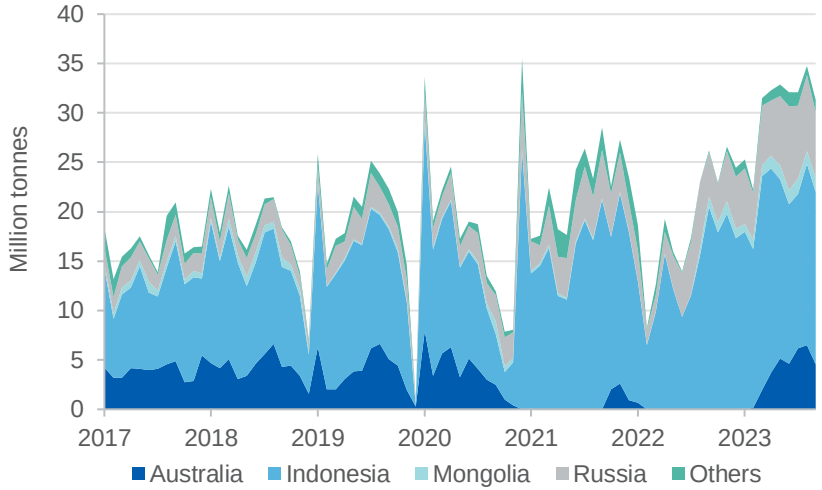
Figure 6.2: Thermal coal imports



Note: **e** Estimate **f** Forecast

Source: McCloskey (2023); IEA (2023) Coal Market Report; Department of Industry, Science and Resources (2023)

Figure 6.3: China's thermal coal imports, monthly



Source: McCloskey (2023)

China's coal-fired power output rose in 2023 despite its announced target of reducing output. China also loosened the rules governing its carbon market to make it easier for power generators, helping to mitigate the risk of electricity shortages. China's Emissions Trading Scheme allocates carbon permits based on a power plant's output, with different benchmarks for each fuel and technology. Reports suggest coal-fired power plants that need to buy permits to meet emissions targets by the end of the year have been allowed to borrow from future allowances.

China aims to lower its carbon intensity by over 65% by 2030 compared to 2005 levels, and to reach 1,200 GW of installed wind and solar power.

Hong Kong continues to transition its energy use ahead of mainland China, with imports declining a further 9% in 2023 compared to the same period in 2022. Imports to Hong Kong fell sharply in 2020 following the pandemic, reducing from 10 Mt in 2019 to just 5.5 Mt in 2020. Hong Kong also bucked the trend of returning to historical import levels in 2021 (6.5 Mt) during the post pandemic surge in economic activity, and in 2022 (6.2 Mt) following Russia's invasion of Ukraine. These reduced imports of coal had been planned for some time with Hong Kong having ceased building coal-fired generation units and phasing out existing units. Hong Kong plans to phase out coal for use in power generation by 2035.

India's coal imports will increase as industrial and consumer use rises

More favourable weather conditions and the resulting increase in domestic production led to a slight drop in India's seaborne thermal coal imports – dropping to 150 Mt in 2023 compared to 153 Mt in 2022. India is expected to increase thermal coal imports over the outlook period, remaining the most significant growth market. This growth will be supported by rising industrial use and higher electricity requirements in the consumer sector.

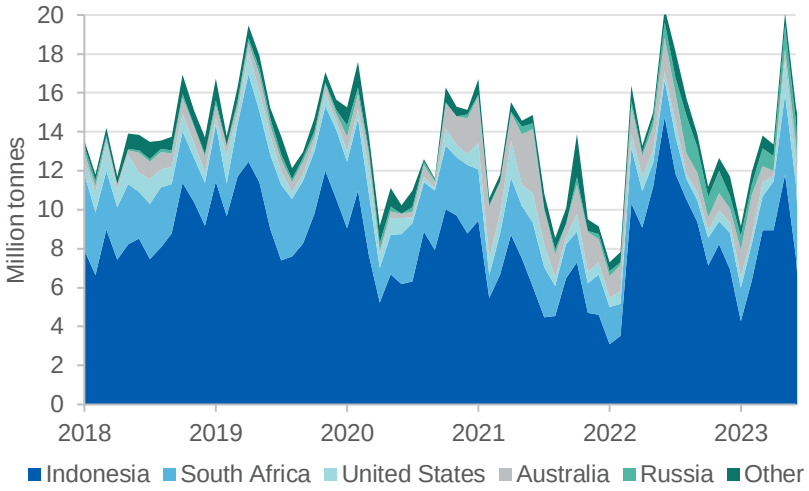
India's demand for thermal coal has remained high over the last few months due to the monsoon season. Insufficient rainfall contributed to increased temperature and humidity levels and drought conditions in parts of the country, leading to increased cooling and irrigation requirements. These same conditions also helped India's domestic coal mining, with production from Coal India – India's largest domestic coal producer –

increasing by 13% in August 2023 compared with August 2022. India's demand for thermal coal is expected to remain elevated as the December quarter brings India's festivities season, and higher winter demand.

India's Power Ministry asked utility companies to import at least 6% of their coal needs until September 2023. This mandate has now been extended to March next year at 4% to meet demand.

With domestic coal production expected to steadily increase, India is planning to lift the efficiency of coal transportation to consumption centres. India has set a target to nearly treble the volume of coal transport via coastal route or Rail-Sea-Rail method. Measures being considered could lift seaborne transport from 40 Mt per year, to 112 Mt by 2030.

Figure 6.4: India's thermal coal imports, monthly

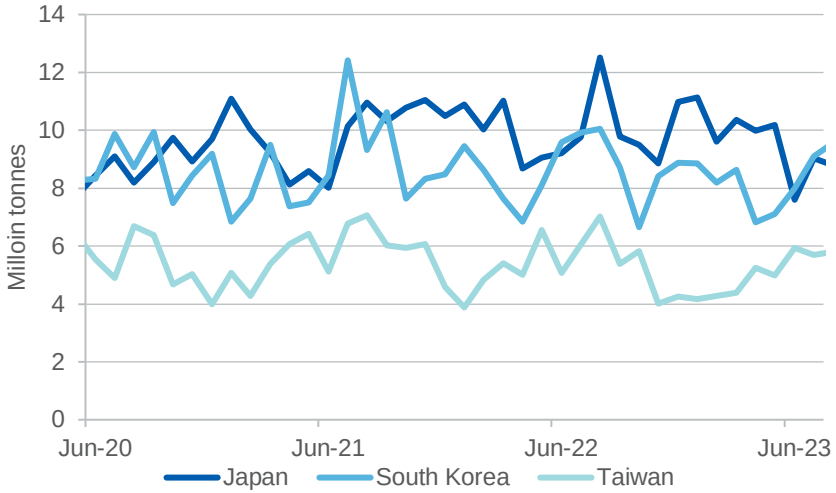


Source: McCloskey (2023)

Japan's coal imports are expected to remain strong in the short-term

Mild weather during much of 2023 has reduced Japanese electricity use, and the restart of two nuclear reactors in August and September also reduced the need for thermal coal imports. Japan's imports of thermal coal dropped by 11% over the first 9 months of 2023 compared to the equivalent period in 2022 (Figure 6.5). The most significant fall was in imports from Russia, which the Japanese Government has been seeking to cut following Russia's invasion of Ukraine. In 2021, before the Russia invaded Ukraine, Russian imports accounted for 12% of thermal coal imports to Japan. In 2023, that has dropped to just 3%. The US and South Africa have helped to fill this gap.

Figure 6.5: Japan, South Korea and Taiwan's thermal coal imports



Source: McCloskey (2023)

Taiwan's imports are falling as policy measures ramp up

Taiwan's thermal coal imports fell by 18% in the first 9 months of 2023 compared to the equivalent period in 2022 due to muted domestic power demand, and Taiwan's continued plans to transition away from thermal coal. Imports have steadily declined over the last few years, except for 2021 during the post pandemic surge in economic activity.

Demand picked up over the summer due to the lack of rainfall and dry weather, which led to a decline in hydropower output. This resulted in a moderate uptick in thermal coal imports in June, July, and August, which offset some of the decline in other months. A typhoon hit Taiwan in October, with heavy rain and winds which affecting port operations.

South Korean power generation companies to reduce Russian coal

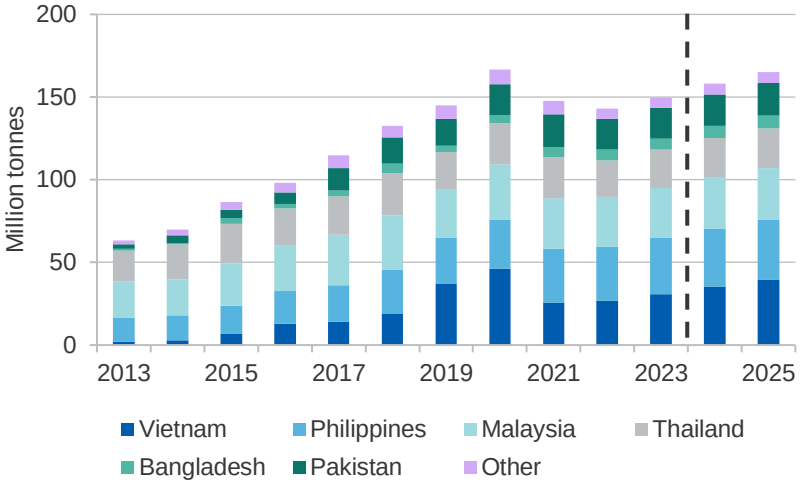
South Korea's imports of thermal coal dropped by a moderate 6% over the first 9 months of 2023 compared to the equivalent period in 2022. Demand peaked over the summer months and remained high (at 9.6 Mt) in August, before dropping off in September (7.9 Mt).

The South Korean government has asked state owned power generation companies to reduce coal imports from Russia, in protest to its invasion of Ukraine. This appears to have contributed to a 16% drop in thermal coal imports from Russia in September compared with August, though the end of the Northern Hemisphere summer could also have contributed.

South and South-East Asian coal imports

South and South-East Asia is one of the few regions that is expected to see a rise in demand over the forecast period (Figure 6.7). This region imported 150 Mt in 2023, an increase of 5% from 2022. Imports are expected to rise to 165 Mt by 2025 due to the number of coal-fired power plants under construction.

Figure 6.6: South and South-East Asia thermal coal imports



Source: IEA (2023) Coal Information; Department of Industry, Science and Resources (2023); McCloskey (2023)

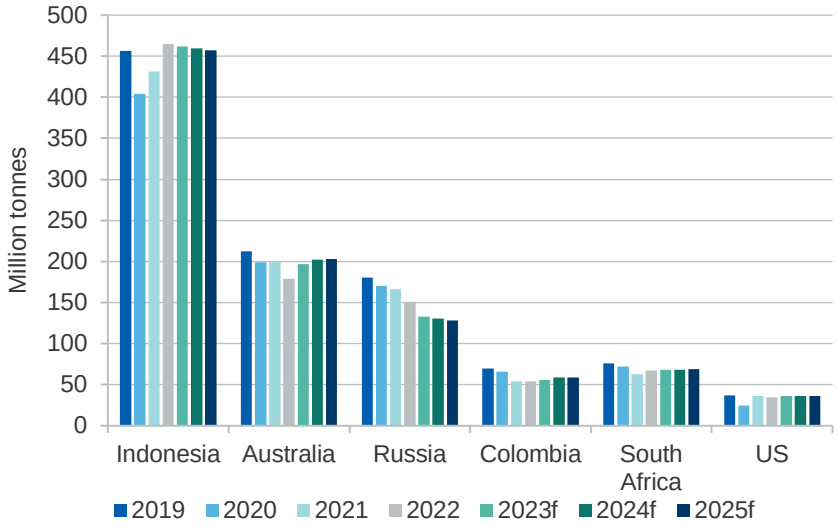
The biggest contributor to this growth is Vietnam. Vietnam's energy plan calls for an increase of 40% in coal-fired power generation capacity by 2030. Vietnam still aims to eliminate coal from its energy mix by 2050, however a material drop in coal fired capacity is not expected before 2045.

A number of other nations in the region are expected to experience minor growth in thermal coal imports over the outlook period, including Malaysia, the Philippines, Thailand and Pakistan. But, with coal-fired power plant constructions becoming increasingly stalled, it is likely that a larger share of growth in electricity generation will be driven by gas and renewables.

6.4 World exports

World seaborne exports are estimated to increase this year by 0.4%, going from 1,043 Mt in 2022 to 1,047 Mt in 2023. Exports are then expected to decline to 1,026 Mt by 2024 before climbing back up to 1,041 by 2025.

Figure 6.7: Thermal coal exports



Notes: **e** Estimate **f** Forecast.
Source: McCloskey (2023); IEA (2023) Coal Information; ABS (2023); Department of Industry, Science and Resources (2023)

In September 2023, the Australian Bureau of Meteorology declared that an El Nino weather episode was underway. Moreover, the Indian Ocean Dipole is strongly positive. Both suggest drier than normal weather in Australia and Indonesia over the near term. These dryer weather conditions could be more favourable for Australian coal exports than over the past three years. However, an El Niño raises the likelihood that river levels will drop in Indonesia, making barging more difficult.

Indonesia's exports are facing a new cycle of weather disruptions

Indonesian exports remained strong in 2023, with the nation easily maintaining its position as the world's top exporter of thermal coal. In 2022, Indonesia went from shipping just over a third of the world's thermal coal, to shipping almost half, replacing most of the supply gap left by Russia. But the El Niño-driven drought in Indonesia is now lowering river levels, and this threatens to make thermal coal more difficult to barge to deepwater ports — potentially impacting a large volume of exports.

Indonesian exports to China face growing competition from Australia and Russia, with both providing a higher share of China's imports as it seeks coal with a higher calorific value to blend with lower calorific coal.

Indonesia introduced a new tariff collection system in October for ship-to-ship services at the Muara Berau port in east Kalimantan. Mine companies and floating crane operators are holding protests, with some loading operations ceasing. Muara Berau is one of the largest anchorages in Indonesia. If the issue escalates, it could add to supply pressures.

Russia coal exports are continuing to face challenges

Russian coal was sold at a heavy discount following the invasion of Ukraine, with discounts of up to 73% on spot markets, and 58% to buyers who did not impose sanctions such as Türkiye and India. However, these discounts reduced around mid-2023 as Russian thermal coal prices began converging with other price indexes in the region.

The most notable shift post invasion occurred in India, where buyers are typically highly sensitive to price changes. Imports of Russian thermal coal jumped from about 1,500 tonnes in 2021, to almost 19,000 tonnes in just the first eight months of 2023. After the discount began to ebb, a 30% drop in imports of Russian coal was observable from mid-2023. This is likely due to a combination of factors including seasonality, increased risk from Russian ports being declared a war zone (and large subsequent increases to insurance costs), and reduced discounts for Russian coal compared to other competitors in the region.

US exports remain hampered by weather conditions and high costs

US exports of thermal coal have been particularly strong recently, with exports in almost every month surpassing their equivalent in 2022. Indian demand for US thermal coal was especially high. US thermal coal exports also helped filled the supply gap faced by Europe following sanctions on Russian coal. Sanctions went into full effect in August 2022, and US exports to the EU the UK more than doubled between 2021 and 2022.

Columbian thermal coal exports unlikely to recover to pre pandemic levels

Exports from Columbia are on track to exceed 2022 levels this year, with weather conditions easing following the end of La Niña. Although Colombian thermal coal exports had faced a gradual decline over the years, they fell sharply during the COVID pandemic, falling to 52 Mt in 2020 from 76 Mt in 2019. With some mines now permanently closed and others disrupted, it is not expected that Colombia will reach its pre-COVID export levels.

The Cerrejon mine continues to experience sporadic disruptions to operations from local indigenous communities protests and potential union strikes. Cerrejon will be able to continue with expansion into the La Puente pit following a court decision.

South African exports are facing cost pressures

South African exports have been relatively stable in 2023, despite an early dip linked to heavy rain and flooding caused by the La Niña weather episode. But lower prices have begun to affect higher-cost coal producers in South Africa, resulting in less usage of the more expensive forms of transportation. Coal truck volumes to South African ports were down by over 30% in July relative to January 2023. Rail transport is largely

unaffected, but use of rail is generally dominated by the nation's larger/wealthier coal mining companies.

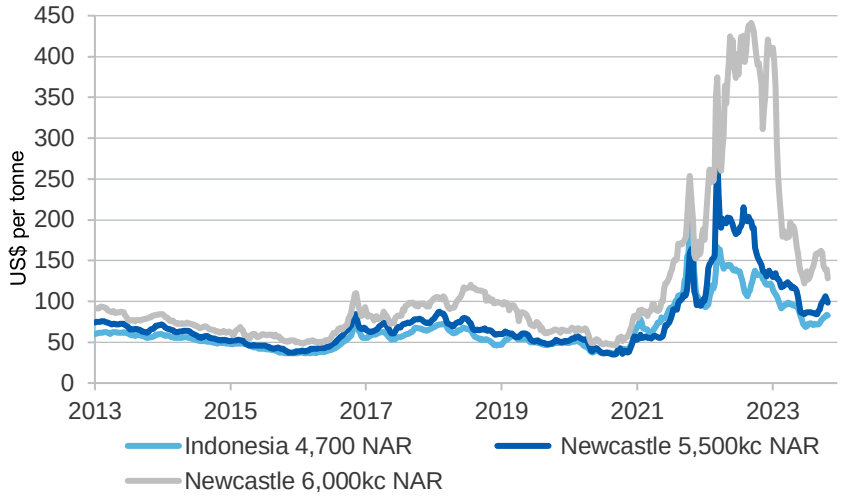
The monsoon season in India — which usually runs from June to September — led to a temporary decline in the Indian market with exports sharply dropping in June and slowly recovering in the following months. High demand in South Korea over summer helped mitigate the loss.

6.5 Prices

Prices have stabilised following a sustained decline

The price of Newcastle 6,000kc NAR thermal coal has recently settled in a relatively narrow band (between US$120 and US$160 a tonne) after falling sharply in the March quarter 2023. The price differential between high and low-grade thermal coal contracted in 2023 (Figure 6.8).

Figure 6.8: Thermal coal prices — Australian vs Indonesian



Source: McCloskey (2023). NAR = Net as received.

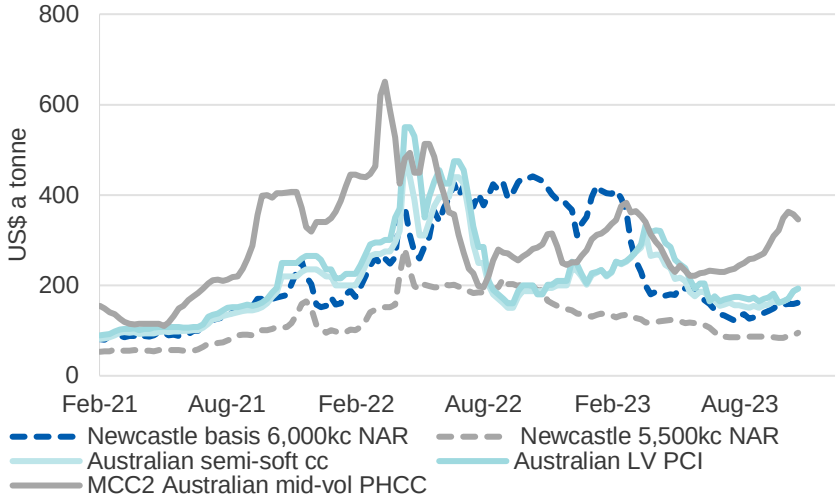
Firmer prices are possible as the year turns, with the recent lift in gas/LNG prices improving the competitiveness of thermal coal, especially in Asia. A colder than normal Northern Hemisphere winter could also add to thermal coal demand, though stocks are high (especially in China and Europe).

Most factors point to a decline in prices over the outlook period. Supply has not yet fully recovered from La Niña disruptions, and there is capacity to bring additional supply into markets over coming months. The end of the Northern Hemisphere winter will place downward pressure on thermal coal demand in early 2024. Global gas supplies are expected to increase in 2025 and 2026 with the US and Qatar bringing extra supply online. Lower gas/LNG prices should reduce pressure on thermal coal markets.

Prices are not expected to decline to 2019 levels. A range of structural price pressures have manifested in thermal coal markets over the last few years. Supply is likely to remain constrained by low capital availability, labour shortages, loss of Russian output following the invasion of Ukraine, and rising global freight costs.

Australian metallurgical coals have retained their premium to thermal coal, after dipping below the price for benchmark Newcastle 6,000kc NAR in H2 2022 and Q1 2023 (Figure 6.9). This premium encouraged some metallurgical coal producers to dump (low grade) product into thermal coal markets, eventually depleting metallurgical coal inventories to low levels.

Figure 6.9: Prices for thermal and low-grade coking coals



Source: McCloskey (2023)

Chinese demand pivoted towards lower grade Indonesian coal following the commencement of trade restrictions targeting Australia. However, Chinese buyers are shifting back towards traditional mixes as trade resumes between the nations.

Price risks remain somewhat balanced. Thermal coal demand faces downside risks, with a weak Chinese recovery, a mild Northern Hemisphere winter, and increased stockpiles potentially constraining coal use. However, shocks to supply — such as the El Niño weather pattern impacting Indonesian exports — could again lead to price increases.

Profit margins may become narrower in some countries over the outlook period, as prices decline and cost of production pushes up. If costs continue to rise significantly over coming years, this could place another floor under coal prices.

The 6,000 kcal Newcastle coal price is expected to decline from just under US$173 a tonne over 2023 to around $US115 a tonne by 2025. This is still well above the 2019 average of US$76 a tonne, and prices retain significant potential to vary in either direction given the likely ongoing stranding of some Russian coal production.

6.6 Australia

Australian thermal coal export volumes have recovered

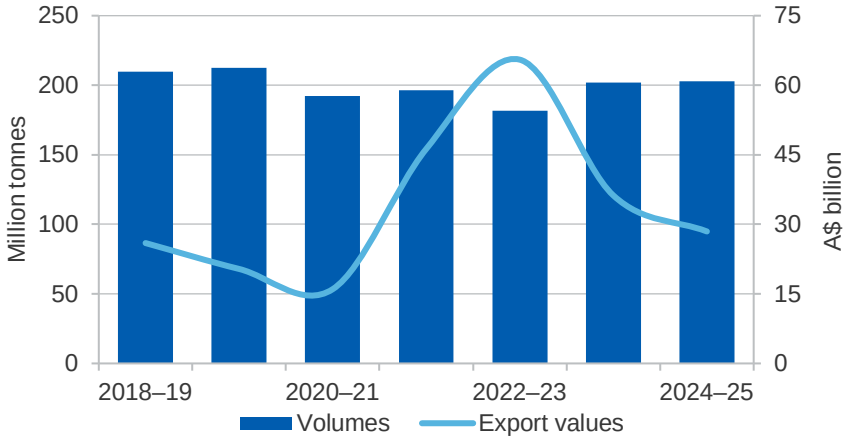
Demand for Australian thermal coal exports remained high in 2023, and supply to the export market improved following two years of wet weather and labour force disruptions. The former was associated with the La Niña weather episode, while the COVID pandemic and mine labour shortages drove workforce problems. Exports were especially high over June and July 2023 to meet summer demand in Asia.

Australian thermal coal exports to China rose steadily over H1 2023, reaching a peak in June 2023 during China's peak summer demand. In value terms, thermal coal exports to China total $5.3 billion in the first 9 months of the year. Japan — usually the largest market for Australian thermal coal — was pushed to second place in the June quarter.

Mine expansions and closures are expected to largely balance out over the outlook period. Whitehaven's Vickery project commenced construction in June 2023. The company is investing $150 million to start up a small-scale version of the mine with first coal expected around mid-2024. Whitehaven coal is seeking to extend the existing Narrabri underground mine. The project has been approved by the NSW Independent Planning commission but still needs approval under the Federal Environment Protection and Biodiversity Conservation Act to start. If the project proceeds it would extend the life of the mine from 2031 to 2044.

On balance, it is expected that export volumes will experience minor growth over the outlook period (Figure 6.9) with better weather conditions and increased production from several mines. Thermal coal exports are forecast to rise from 182 Mt in 2022–23 to 203 Mt by 2024–25. Ebbing prices are expected to lead to a decline in export values from $65 billion in 2022–23 to $29 billion by 2024–25.

Figure 6.10: Australia's thermal coal exports



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

Revisions to the outlook for Australian thermal coal exports

The forecast for export earnings experienced little changed for 2023–24 and have been revised up by $329 million for 2024–25 from the September REQ.

Table 6.1: World trade in thermal coal

	Unit	2022	2023[s]	2024[f]	2025[f]	Annual percentage change 2023[s]	2024[f]	2025[f]
World trade	Mt	1,043	1,047	1,026	1,041	0.4	-2.1	1.5
Thermal coal imports								
Asia	Mt	796	898	858	878	12.7	-4.4	2.3
China	Mt	231	302	221	231	30.7	-26.7	4.4
India	Mt	153	150	186	193	-2.4	23.9	3.8
Japan	Mt	138	138	137	136	0.0	-0.9	-0.8
South Korea	Mt	91	91	91	90	0.0	-0.5	-0.5
Taiwan	Mt	61	61	60	59	0.0	-1.1	-2.5
Thermal coal exports								
Indonesia	Mt	465	462	459	457	-0.7	-0.5	-0.4
Australia	Mt	179	197	202	203	10.0	3.0	0.4
Russia	Mt	151	133	130	128	-12.0	-1.7	-1.5
Colombia	Mt	54	56	59	59	2.7	5.4	0.0
South Africa	Mt	67	68	68	69	1.5	-0.6	1.3
United States	Mt	35	36	36	36	4.6	0.1	-0.6

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

Source: International Energy Agency (2023); IHS Markit (2023); Department of Industry, Science and Resources (2023)

Table 6.2: Thermal coal outlook

						Annual percentage change		
World	**Unit**	**2022**	**2023[s]**	**2024[f]**	**2025[f]**	**2023[s]**	**2024[f]**	**2025[f]**
Contract prices[b]								
– nominal	US$/t	324	249	163	131	-23.2	-34.6	-19.2
– real[c]	US$/t	326	245	156	123	-24.9	-36.2	-20.9
Spot prices[d]								
– nominal	US$/t	359	173	138	115	-51.7	-20.5	-16.6
– real[e]	US$/t	374	174	135	110	-53.6	-22.5	-18.3
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Production	Mt	236	216	252	253	-8.5	16.8	0.4
Export volume	Mt	196	182	202	203	-7.2	11.2	0.3
– nominal value	A$m	46,258	65,592	36,193	28,792	41.8	-44.8	-20.4
– real value[h]	A$m	49,266	65,803	34,710	26,759	33.6	-47.3	-22.9

Notes: **b** refers to benchmark Japanese Fiscal Year 6322kcal GAR thermal coal contract reference price; **c** In current JFY US dollars; **d** fob Newcastle 6000 kcal net as received; **e** In 2023 US dollars; **f** Forecast; **h** In 2023–24 Australian dollars; **s** estimate

Source: ABS (2023) International Trade in Goods and Services, Australia, Cat. No. 5368.0; IHS (2023); NSW Coal Services (2023); Queensland Department of Natural Resources and Mines (2023); Company Reports; Department of Industry, Science and Resources (2023)

Gas

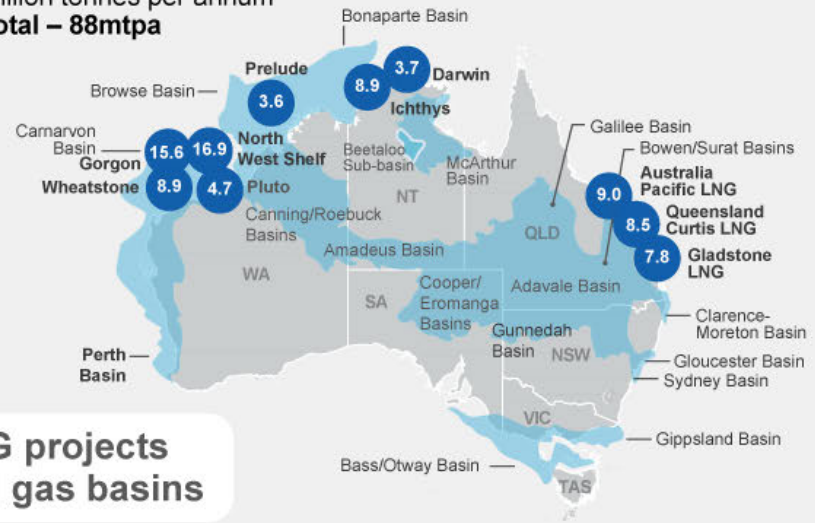
Australia's LNG sector

82m tonnes
exported in 2022-23, **valued at $92bn**

80%
of Australian LNG exports sold to **Japan, China and Korea**

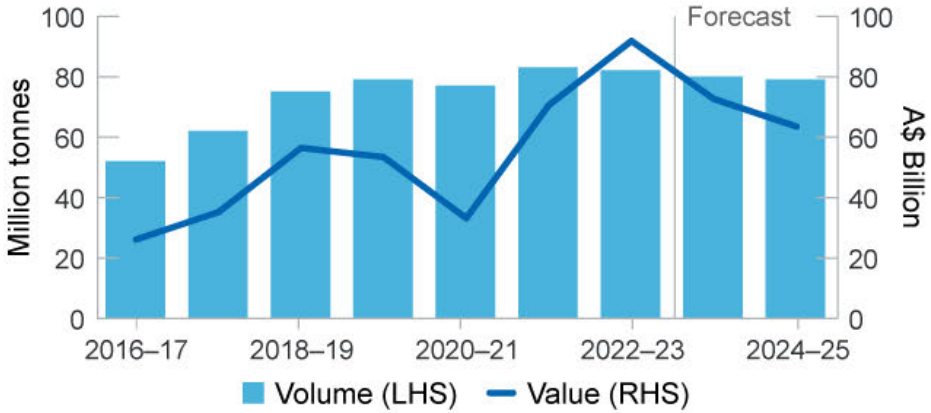
Around 3/4
sold on **long-term contracts**

- Gas basin
- Nameplate capacity, million tonnes per annum
  Total – 88mtpa



LNG projects and gas basins

Australian LNG exports



Outlook

Earnings **easing in 2023-24** due to declining energy prices

Future **earnings to fall,** price pressures ease given high European storage inventories

Conflict in Gaza adds to global uncertainty, but has **not** affected the outlook yet

Expenditure on exploration **remains relatively modest**

SOURCE: IEA; GIIGNL; NexantECA; ABS; DISR; OCE

7.1 Summary

- Australia's LNG export revenues held at $17 billion in the September quarter. In annual terms, earnings are expected to ease from A$92 billion in 2022–23 to A$64 billion by 2024–25, as global energy prices soften and some supply disruptions resolve.
- Geopolitical risks have worsened with the outbreak of conflict in Gaza. However, seasonal risks have abated as European countries successfully filled inventories ahead of the northern winter. The price outlook is largely unchanged, with winter demand expected to lift prices from US$12/MMBtu in the September quarter to around US$17/MMBtu by the March quarter 2024, with gradual declines to follow.
- Longer-term structural pressures should ease after 2025 as the US and Qatar bring new supply sources online.

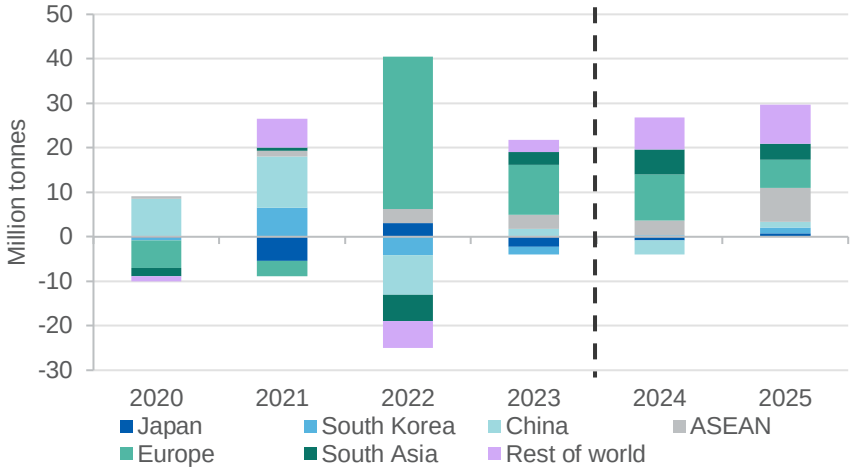
7.2 World trade

Markets remain tight, though signs of easing are evident

Gas markets remain relatively tight, though countervailing pressures are evident. European gas storage has been virtually filled following successful efforts to pivot off Russian pipeline gas. Weather conditions across much of Europe have been warm and mild in recent months, and high reserves have reduced demand pressure (Figure 7.1), leaving most countries well prepared for falling winter temperatures. However, imports from the Ukraine and Turk stream routes remain well below the pre-invasion level of imports from Russia, and the resulting dependency on shipborne LNG reduces the flexibility of European buyers over the outlook period.

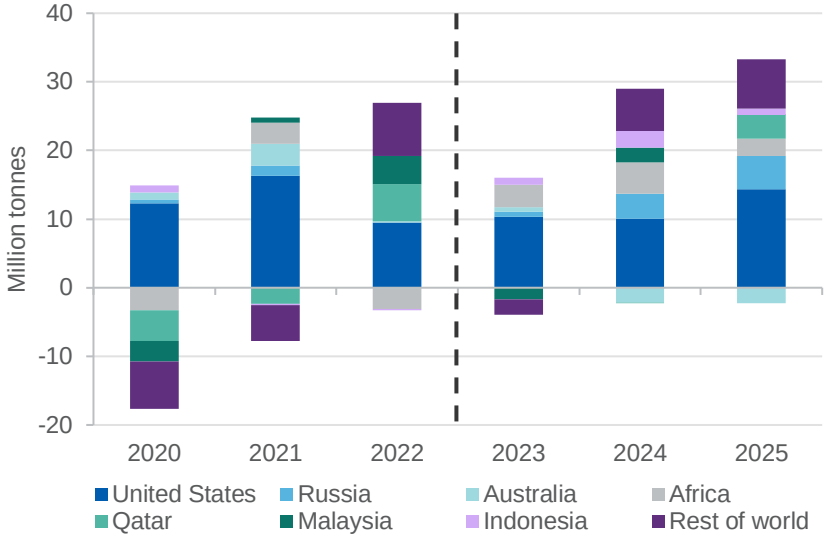
Asian countries have a mixed demand outlook and significant unfilled storage capacity. After a weak start to 2023, LNG demand across Asia surged in the second half of the year, driven by China and India. Demand in Taiwan and South Korea remains more constrained, and nuclear restarts have reduced LNG demand in Japan. However, growth among ASEAN nations including Singapore, Indonesia, Thailand and Malaysia has picked up, with more growth appears likely in the final quarter of 2023.

Figure 7.1: Global LNG demand growth forecasts, 2020–25



Notes: 2020, 2021 and 2022 figures based on historical data.
Source: Department of Industry, Science and Resources (2023), Nexant ECA (2023)

Figure 7.2: Global LNG supply growth forecasts, 2021–25



Notes: 2020, 2021 and 2022 figures based on historical data.
Source: Department of Industry, Science and Resources (2023); Nexant ECA (2023)

The baseline outlook for supply is broadly in line with demand over the near-term (Figure 7.2), but risks have risen as a result of recent geopolitical conflicts. The destruction of the Nord Stream pipeline has shut down a significant channel for gas supply, and the outbreak of conflict in the Gaza Strip could add further complications and disruptions. Forward prices rose rapidly in October as markets priced in additional risks, and held much of the price gain even after it became clear that Europe had managed to insulate itself from potential winter gas shortages.

Gas supply appears likely to have grown in net terms in 2023. A number of gas plants previously out of operation began producing again, though progress has stalled at some newer projects.

Exports are expected to grow from various sources in the US, the Middle East and Africa. In the US, exports from the Freeport terminal have recommenced and are expected to add around 11 Bcm to global export capacity in 2023–24. Supply from Africa is also expected to grow, with 7 Mt of annual gas output expected to come online in Nigeria. This will be supported by output from the new Coral FLNG facility in Mozambique, and by additional feedgas from Algeria and Trinidad. The Greater Tortue plant in Senegal is expected to start supplying additional gas from 2024–25.

On balance, global LNG trade is expected to increase by 52 million tonnes (Mt) over the next two years to reach around 455 Mt by 2024–25.

Gas markets are expected to remain in broad equilibrium over the outlook period, albeit with relatively high prices and supply risks. This pattern will likely persist until late 2025 or 2026 when substantial investments in new supply sources in Qatar and the US start to pay off.

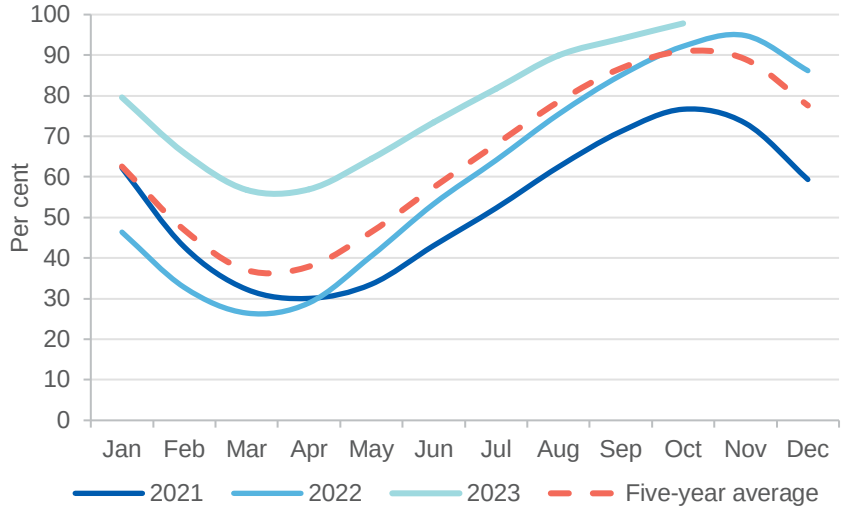
7.3 World imports

European imports edged back, but remain strong

European LNG imports edged back to 23 Mt in the September quarter 2023, to be down by 2% from the September quarter 2022. The recent surge in European imports (which reflected the rapid build-out of regassification terminals following Russia's invasion of Ukraine) now appears to have levelled out. However, another rise in imports remains possible if weather conditions deteriorate or relatively weak industrial demand rebounds more quickly than expected.

European countries have sought to mitigate the risks of shortages by building inventories — which reached virtually 100% of capacity by early November (Figure 7.3). European inventory movements have gained additional importance given the loss of access to a traditional source of gas and the consequent loss of flexibility in gas supply chains.

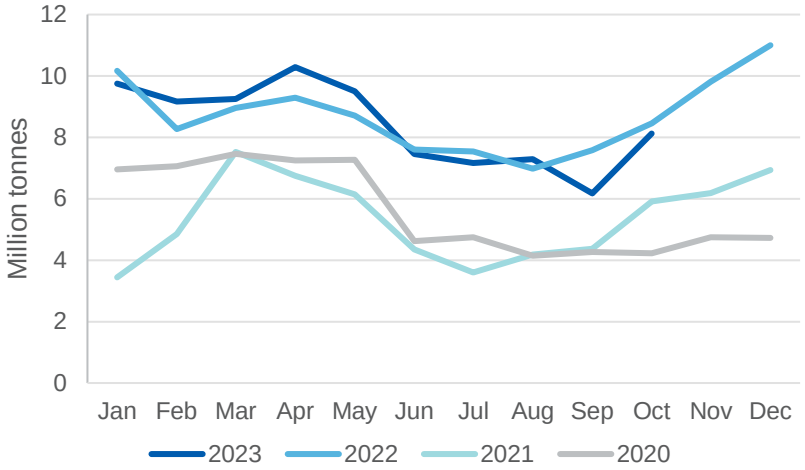
Figure 7.3: European storage inventories, 2021–23



Note: Five-year average calculated between 2016 and 2020. Dotted blue line is a forecast.
Source: Bloomberg (2023); Eurostat (2023).

European demand is expected to grow further over the outlook period, capturing the largest share of global LNG supply by 2025. European imports are forecast to grow from 112 Mt in 2022 to 140 Mt by 2025 as Germany, Belgium, Italy, and Greece commission new LNG import facilities to offset the loss of Russian pipeline gas supply. European imports of LNG are markedly higher than they were prior to Russia's invasion of Ukraine (Figure 7.4).

Figure 7.4: European LNG imports, 2020–23



Source: Kpler (2023)

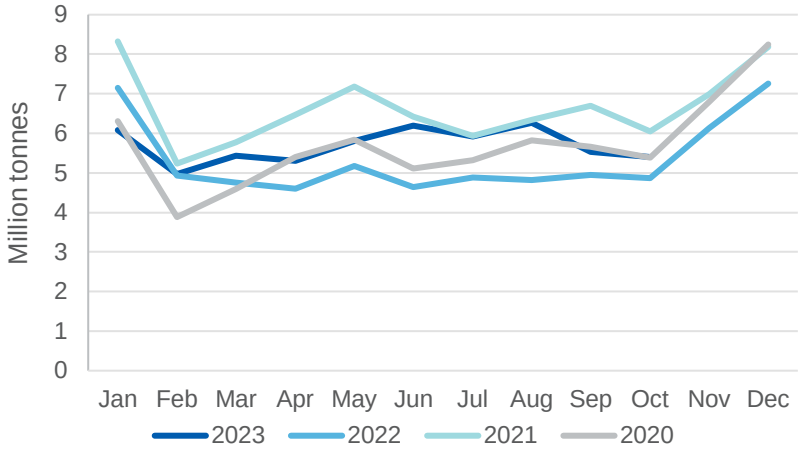
China's imports are expected to be steady through the outlook period

Chinese LNG demand edged up to 18 Mt in the September quarter 2023 as global LNG prices remained well below their peaks of 2022. Higher spot prices over the previous financial year had weighed on China's gas use and created strong incentives to on-sell surplus contracted volumes to European buyers (Figure 7.5). This trend persisted until early 2023, but eased as prices edged down in the middle of the year.

Australia exported 23 Mt of LNG to China in 2022–23. This was down by nearly 25% on the total for 2021–22. However, relatively strong prices helped to offset the impact, with Australia's China earnings holding at A$20 billion, only marginally below 2021 22 earnings of A$21 billion. Despite the fall, China remains the second largest destination for Australian LNG (by volume and value) in 2023, and Australia remains China's largest source of LNG.

China's LNG demand is forecast to remain flat at 70 Mt out to 2025, albeit with a larger share of demand being serviced by pipeline imports from Russia. Pipeline capacity between the nations is now operating at full capacity, and investment is likely to increase the flow further, though the exact timeframes are vague. China has large gas reserves and significant potential to bring more domestic supply online. Large pipelines to Russia and Central Asia have also provided a measure of security to China, which has significant buying power given its control over much of the global gas infrastructure.

Figure 7.5: China's monthly LNG imports, 2020–2023

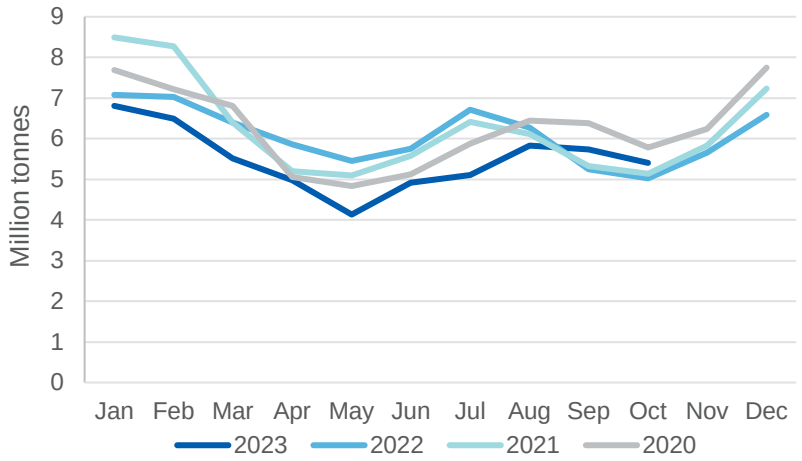


Source: Kpler (2023)

Japan's LNG imports have been contained by growth in nuclear power

Japanese LNG imports fell 9% year-on-year in the September 2023 quarter to 17 Mt (Figure 7.6). This represented a recovery in quarterly terms from the 14 Mt recorded in the June quarter — Japan's lowest quarterly LNG imports in over 15 years. The progressive restart of Japan's nuclear fleet is expected to result in more downward pressure on LNG imports over the next decade (see *Uranium* chapter). Japan remains the largest destination for Australian LNG, importing 29 Mt of LNG (worth about A$16 billion) in 2022

Figure 7.6: Japan's monthly LNG imports, 2020-2023



Source: Kpler (2023)

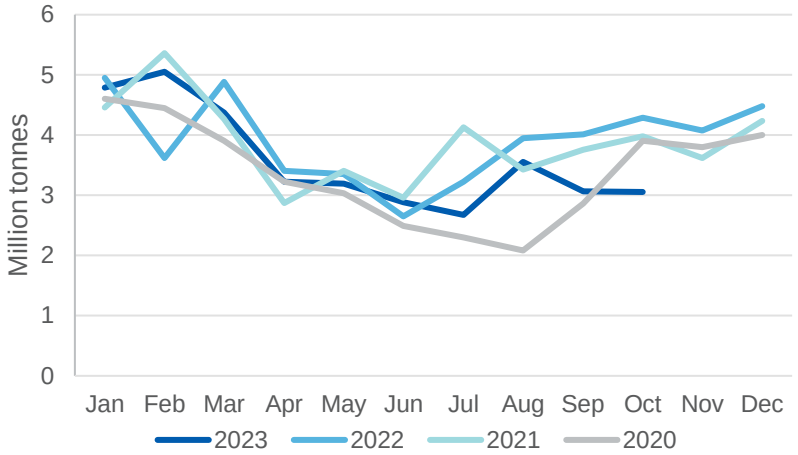
Japan's total LNG imports are expected to fall to 73 Mt in 2023 and then remain steady till 2025. Nuclear power is likely to be the only part of Japan's electricity sector to grow significantly over the next few years. Japan's Ministry of Energy, Trade and Industry expects the share of total electricity generation supplied by gas to fall from 38% in 2022 to 27% by 2030, with the share of nuclear power rising from 6% to 22%. It is not clear that the new targets will ultimately be met, but the change could be indicative of shifting priorities from the Japanese Government.

South Korean imports are likely to have peaked

South Korea's LNG imports dropped by 17% year-on-year in the September quarter 2023 (Figure 7.7). Imports were roughly steady (at 9 Mt) in quarterly terms. Australia accounts for about 25% of South Korean LNG imports and has become a more important supplier in recent years.

LNG is likely to come under additional pressure in South Korea, with demand forecast to be relatively flat at 41 Mt annually out to 2025. The Ministry of Trade, Industry and Energy's 10th Basic Plan aims to lift nuclear energy's share of total power generation from 27% to 30% by building additional plants and extending the lifespan of existing plants. This represents a significant departure from the previous government's nuclear phase-down policy and is accompanied by a proposal to also lift hydrogen targets, though the latter will continue to require co-fired gas power generation. The latest gas supply plan includes a downward revision in forecasts for domestic gas needs by 2030, but a slight upward revision in expected use of gas storage. This creates a potential upside risk for gas imports to South Korea over the next few years.

Figure 7.7: South Korea's monthly LNG imports, 2020-2023



Source: Kpler (2023)

Taiwan's imports are growing as other energy sources wind back

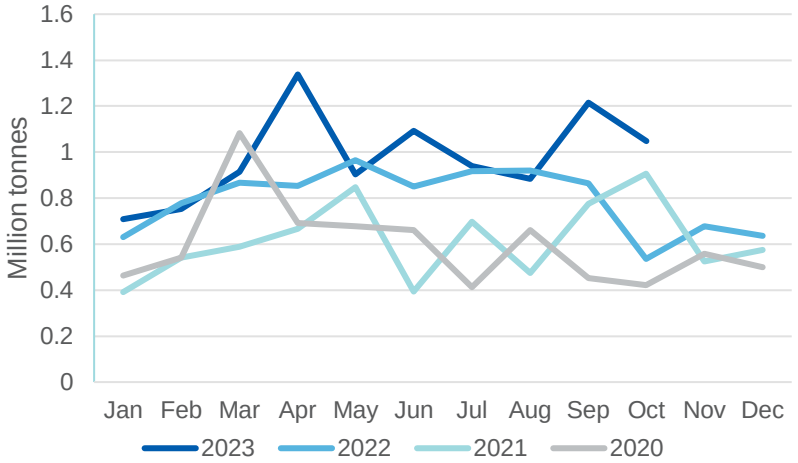
Taiwan's LNG imports held largely steady at 5 Mt in the September quarter 2023. Australia remains the largest supplier of LNG to Taiwan, accounting for around 40% of Taiwan's LNG supply. The majority of LNG is used for power generation, and usage is forecast to rise modestly to 23 Mt in 2025 as new gas-fired generation capacity replaces nuclear power under Taiwan's long-term decommissioning plan.

LNG use is rising elsewhere in Asia, with investment plans emerging

ASEAN imports have risen since August (Figure 7.8) and are forecast to grow further: from 19 Mt in 2023 to 30 Mt in 2025. This growth is likely to accelerate beyond the outlook period, creating strong incentives for new

investment in gas production. Efforts to lift gas output are already underway in a range of member nations, with some large regional energy companies, including Petronas (Malaysia), the Philippines' Department of Energy and PTTEP (Thailand) announcing plans to drill new wells.

Figure 7.8: ASEAN monthly LNG imports, 2020-2023



Source: Kpler (2023)

South Asia looking to broaden its import channels

South Asia's LNG is largely imported from the Gulf region, with strong infrastructure links allowing rapid transfer between zones: it takes approximately two days to ship a cargo of LNG from Ras Laffan in Qatar to Gujarat in India (see *Table 7.1*). South Asia's LNG demand is forecast to rise by 14% to 43 Mt by 2025, driven by gas-fired power generation needs.

LNG demand growth is outpacing contracted positions across the region, forcing greater reliance on spot markets. This is partly a correction from earlier quarters, when price-sensitive buyers in the region yielded to higher bids from Europe. However, some growth is also structural and relates to rising population and industrialization.

LNG demand is expected to grow particularly rapidly in Thailand, Bangladesh and Pakistan.

Table 7.1: Average LNG Shipping Duration, by LNG region

Days	China (Shanghai)	Japan (Tokyo)	Korea (Incheon)	India (Gujarat)
Western Australia	8	7	8	9
Queensland (Australia)	8	9	9	14
US Gulf Coast (via Panama Canal)	20	22	21	21
US Gulf Coast (via Cape of Good Hope)	36	34	35	24
American West Coast	10	9	9	19
Qatar (Ras Laffan)	14	12	13	2

Notes: Days shipping is based on a vessel at maximum speeds of 19.5 knots.

Source: WA Department of Jobs, Tourism, Science and Innovation based on information from Shipscene and the International Group of LNG Importers (GIIGNL). US Gulf Coast (via Cape of Good Hope) and North American West Coast estimated from S&P and Shell reports.

7.4 World exports

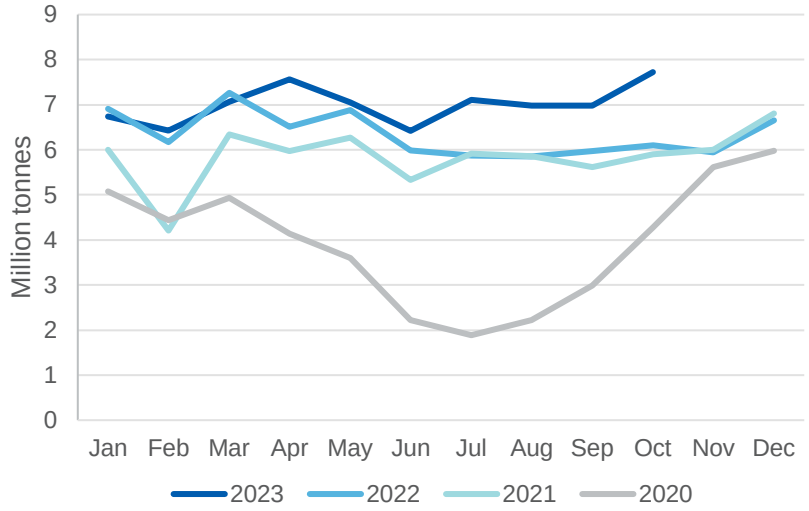
The US is becoming an increasingly dominant global exporter

The long boom in US gas production continues, with dry natural gas output rising by about 5% in the first nine months of 2023 compared with the same period of 2022. This was driven by expansion from shale sources including the Permian Basin, where output rose almost 10% in H1 2023.

Supply growth has been sufficient to support higher domestic use as well as higher exports (Figure 7.9). US LNG exports remained strong through 2023, with substantial redirection to Europe occurring after LNG flows between Russia and Europe were stopped. Over 80% of US LNG was exported to Europe in 2022–23, and the trend is expected to largely hold as Europe continues to seek reliable alternatives to Russian pipeline gas.

Growth in US LNG exports has been facilitated by a return to normal shipping at the Freeport export facility, where cargo loading halted for almost 9 months before resuming in the March quarter 2023. Exports have been further supported by a ramp-up at Calcasieu Pass, which has been producing for around 18 months.

Figure 7.9: US LNG exports, 2020–2023



Source: Kpler (2023)

North America is expected to become an even larger supplier over the outlook period. New supply sources include the Canada and Saguaro Energía (Mexico Pacific) LNG projects (both with nameplate capacity of 28 Mt) which are scheduled for completion by 2025. The US became the world's biggest exporter in 2023, and further growth in output will likely lift its share of global LNG supply from about 20% in 2022 to over 25% by 2026. Export flows are expected to remain strong given rising geopolitical tensions and an expected softening in domestic buying in late 2023.

Qatar is expected to bring sizable new capacity online from 2025

Over the last decade, Qatari export volumes have been relatively stable at about 80 Mt per annum. Consistent with this trend, Qatari exports were stable at 20 Mt in the September quarter 2023, with the Qatar Government noting that the nation's export capacity is currently fully utilised.

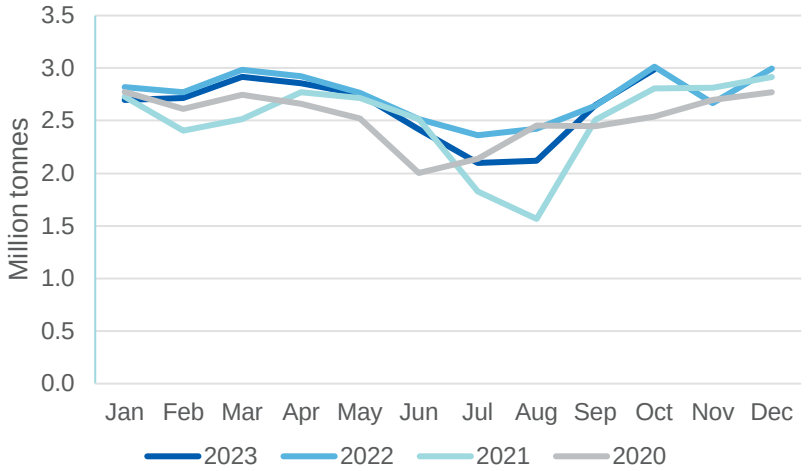
More capacity is expected to come online soon, with 6 LNG trains under construction at Ras Laffan. On completion, the trains are projected to raise Qatar's LNG exports from 79 Mt in 2023 to 105 Mt by 2026. Demand for Qatar's new volumes has been high, with Qatar's Energy Minister, predicting that all the new volumes will be contracted out by end 2023.

Qatar's regional dominance as an LNG supplier grew further in recent weeks with the brief suspension of production at the Tamar field in Israel. Output from Tamar is directed to Egypt for refining, but the field was shut as a precaution after the outbreak of conflict in Israel and the Gaza Strip. At the time of writing output from Tamar has resumed, but any further shutdowns would present a risk to the outlook for gas/LNG.

Russian gas exports have fallen, and face further downside risks

Russian natural gas output dropped sharply following the invasion of Ukraine and the subsequent severing of trade links to Europe. Output is expected to reach its lowest level for 14 years in 2023, having fallen more than 20% since 2021. Russian exports of refined LNG have been marginally more resilient (Figure 7.10), falling by 8% (to 7 mt) through the year to the September quarter 2023. However, large quantities remain stranded, causing issues across parts of the Russian supply chain.

Figure 7.10 Russian monthly LNG exports, 2020-2023



Notes: Russia has two LNG facilities: Yamal in Europe and Sakhalin in Asia. Russia can only economically redirect European imports to Asia during the Northern Hemisphere winter.
Source: Kpler (2023)

Russian LNG exports are forecast to rise from 31 Mt in 2023 to 39 Mt in 2025 (Figure 7.10). Russia currently has two LNG terminals: Yamal LNG, which supplies Europe, and Sakhalin LNG, which supplies Asia from Russia's far east. A third large scale LNG facility, Arctic LNG-2, is under construction, and is forecast to start producing from the end of 2023.

Russia is also expected to commence construction of the Power of Siberia 2 pipeline in 2024. When the pipeline is completed after 2029, it will allow some stranded Russian gas from Western Siberia to be sold into the Chinese market.

However, Russia's ongoing invasion of Ukraine presents supply and price risks. Russia's pipeline and shipping infrastructure is vast and exposed, and earnings from gas continue to play a significant role in financing the Russian military campaign. Ukraine has yet to mount any attacks on this infrastructure, but risks of such an attack could grow under some scenarios.

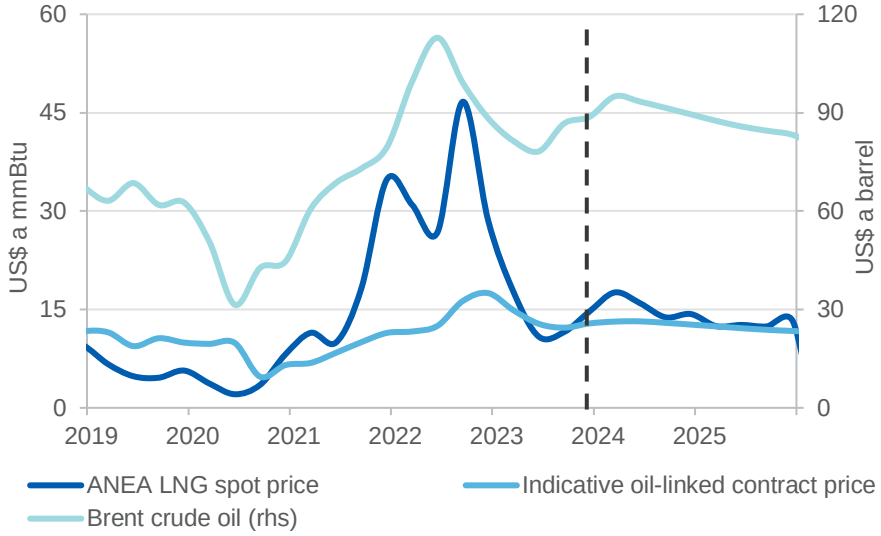
7.5 Prices

Prices are expected to pick up in the short term, but should ease with time

Gas markets have been steadily rebalancing following the cessation of Russian gas exports to Europe. The surge in prices during 2022 has gradually unwound. Prices have become less volatile in recent months, but are expected to remain vulnerable to future shocks as a result of the loss of Russian supply and the greater reliance by many nations on seaborne product.

Prices declined steadily through early 2023 and settled at around US$10/MMBtu by mid-year. Prices averaged around US$12/MMBtu in the September quarter, but are expected to lift to US$17/MMBtu by the March quarter 2024 as winter demand adds to pressure on gas supplies. As markets continue to adjust to the war in Ukraine and the loss of Russian output, prices are expected ease back down to US$12/MMBtu by the end of 2025.

Figure 7.11: LNG spot and contract prices, 2019–25



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

Recent high gas prices have disrupted a decade-long cycle of strong growth in gas production and use. Gas has lost competitiveness against other energy sources, and its position as a price-setting fuel has come under greater scrutiny. European countries have legislated a price cap to contain costs, and caps have also been implemented in Australia's eastern states. European governments are accelerating renewable construction timetables, and Asian governments pivoting towards renewable power and nuclear energy. While gas is still growing (strongly in ASEAN countries), this recent pivot other sources may reduce the ultimate extent of growth in gas demand. Long-term demand for gas will also be influenced by emissions reduction policies of different countries.

The full effect of emerging policies — in conjunction with the re-organisation of gas markets following the invasion of Ukraine — is not fully apparent yet. The price outlook thus remains subject to significant risks, weighted to the upside.

Prices should settle somewhat beyond the outlook period. with new supply sources coming online in Qatar and the USA during 2025 and 2026.

High oil prices continue to support LNG contract earnings

The price of oil directly affects Australia's LNG earnings. Around 80% of Australian LNG exports are sold under long-term contracts that link the price of LNG to the Japanese Customs-Cleared Crude (JCCC) oil price (with a 3-6 month lag, depending on contractual arrangements). Oil-linked LNG contract prices are forecast to average US$13/MMBtu in the 2023 to 2025 period, based on an oil price of US$83 per barrel (Figure 7.11).

Since 2021, oil-linked contract prices have been selling at a discount to spot prices. However, in May 2023 this trend was reversed, with the OCE's indicative oil-linked contract price achieving parity to LNG spot prices. Between 2021 and 2022, higher relative spot prices incentivised buyers holding contracts with Australian facilities to increase LNG volumes bought under their agreements; both to limit their exposure to spot markets and arbitrage the differential between the two prices.

7.6 Australia

Australia's LNG export volumes should hold up through the outlook period

Australia exported 20 Mt of LNG in the September quarter 2023, largely maintaining the same level as the September quarter 2022. Exports have faced headwinds due to maintenance at several different terminals, with disruptions persisting into the September quarter at the North West Shelf terminal. The Prelude terminal has also faced maintenance-related falls in output since August, though this is expected to wind down in November. In the Northern Territory, the Darwin LNG facility faces temporary closure due to insufficient feedgas as from its main source, Bayu-Undan, approaches end of field life.

In response to potential domestic shortfalls after 2023, the West Australian Government has announced a ban on exports which applies to most onshore gas generated in the State. Western Australia already reserves 15 per cent of its production for domestic usage, and tight enforcement is expected over the outlook period. Price caps on domestic gas contracts in the eastern Australian market are not expected to affect exports directly.

Among individual facilities, exports from Woodside's Pluto facility rose after Woodside installed new infrastructure at Pluto LNG to enable the facility to process gas from the Scarborough Field. Santos's East Coast facility, Gladstone LNG, also underwent maintenance in June, and the company is reported to have reduced its output to ensure greater volumes of natural gas were available to the domestic market.

Quarterly production from Prelude FLNG is estimated to have reached its highest level since the facility commenced operations in 2019, with output estimated at just under 1 Mt of LNG in the June quarter 2023. Chevron commenced production from Gorgon Stage 2 in the June quarter 2023. The project involved the installation of 11 additional wells in the Gorgon and Jansz-lo fields off the coast of West Australia.

Ichthys LNG is expected to ship a record 132 LNG cargoes in 2023, up 18% from 112 cargoes in 2022, as it starts working on debottlenecking the facility to boost production. The project aims to build a framework capable of a stable supply of 9.3 Mtpa in 2023, by upgrading cooling systems for liquification and taking measures against vibration.

Australia is forecast to export 80 Mt of LNG in 2023–24, slightly lower compared to 2021–22 (83 Mt). Volumes are forecast to edge down to 78 Mt in 2024–25, on lower North West Shelf output (Figure 7.12).

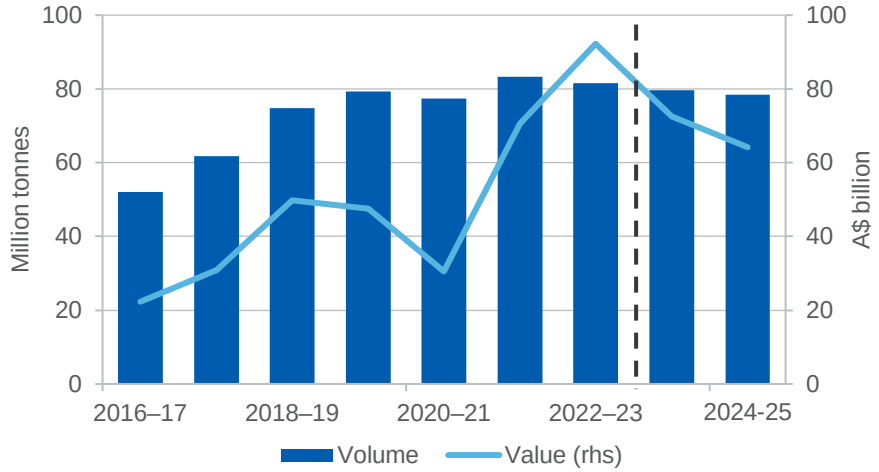
Australia LNG earnings are expected to ease from their recent record

Australian LNG export earnings are forecast to fall to A$73 billion in 2023–24, easing to A$64 billion in 2024–25 (Figure 7.12). Key risks to the forecast include a regional escalation of the Hamas-Israel conflict, as well as seasonal demand fluctuations that could raise earnings from spot sales.

Exploration expenditure has rebounded

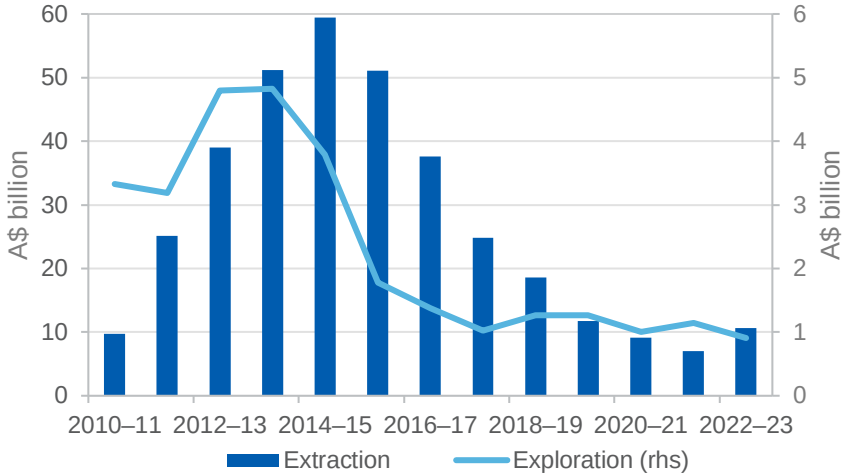
Exploration expenditure grew strongly in the September quarter 2023, rising by 42% to $329 million. This was 45% higher through the year, and the strongest quarterly result since the December quarter 2021.

Figure 7.12: Australia's LNG exports by value and volume



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Figure 7.13: Petroleum expenditure, extraction and exploration



Notes: Extraction expenditure consists of all expenditure on buildings and structures, plant and machinery equipment associated with Oil and Gas extraction.
Source: Australian Bureau of Statistics (2023) Private New Capital Expenditure and Expected Expenditure, 5625.0; and Mineral and Petroleum Exploration, 8412.0

Solid quarterly growth was recorded for both onshore exploration (up by 31% to $190 million) and offshore exploration (up 61% to $139 million).

In annual terms, exploration has fallen over recent years (Figure 7.13). However, the latest result suggests that price surges in 2022 may be having an effect, with investors showing new confidence about the prospects for Australian gas production and exports.

Revisions to the outlook

Australian LNG export earnings forecasts have been revised up by just over $1 billion for 2023–24 and for 2024–25. This reflects recent geopolitical events which added to risk and lifted prices slightly relative to expectations from the September *Resources and Energy Quarterly.*

Table 7.2: Gas outlook

World	Unit	2022	2023[g]	2024[g]	2025[g]	Annual Percentage Change 2023[g]	2024[g]	2025[g]
JCCC oil price[a]								
– nominal	US$/bbl	102.7	86.7	86.3	79.3	-15.6	-0.4	-8.2
– real[i]	US$/bbl	106.9	86.7	84.0	75.3	-18.9	-3.1	-10.3
Asian LNG spot price								
– nominal	US$/MMBtu	33.2	13.6	15.4	12.7	-59.2	13.6	-17.4
– real[h,i]	US$/MMBtu	34.6	13.6	15.0	12.1	-60.8	10.5	-19.4
LNG trade	Mt[e]	385.3	403.2	425.5	455.6	4.7	5.5	7.1
Gas production	Bcm	4,057	4,038	4,132	4,214	-0.5	2.3	2.0
Gas consumption	Bcm	4,044	4,036	4,132	4,223	-0.2	2.4	2.2
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[g]**	**2024–25[g]**	**2022–23[g]**	**2023–24[g]**	**2024–25[g]**
Production[b]	Bcm	162.0	164.5	164.0	158.4	1.5	-0.3	-3.4
– Eastern market	Bcm	59.5	57.8	57.0	53.4	-2.9	-1.3	-6.4
– Western market	Bcm	85.6	91.0	88.3	85.7	6.3	-2.9	-3.0
– Northern market[d]	Bcm	16.8	15.1	16.5	17.0	-10.3	9.0	3.2
LNG export volume	Mt[e]	83.2	81.5	79.7	78.5	-2.1	-2.3	-1.5
– nominal value	A$m	70,571	92,238	72,617	64,196	30.7	-21.3	-11.6
– real value[f]	A$m	78,865	96,310	72,617	62,054	22.1	-24.6	-14.5
LNG export unit value[h]								
– nominal value	A$/GJ	16.1	21.4	17.3	15.5	33.4	-19.4	-10.3
– real value[f]	A$/GJ	17.9	22.4	17.3	15.0	24.7	-22.8	-13.3
– nominal value	US$/MMBtu	12.3	15.2	12.0	11.5	23.8	-21.3	-4.3
– real value[i]	US$/MMBtu	13.7	15.9	12.0	11.1	15.7	-24.6	-7.5

Notes: **a** JCCC 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; **c** Gas production from Bayu-Undan Joint Production Development Area is not included in Australian production; **d** Browse basin production associated with the Ichthys project is classified as Northern market; **e** 1 Mt of LNG is equivalent to approximately 1.36 bcm of gas; **f** In 2023–24 Australian dollars; **g** Forecast; **h** 1 MMBtu is equivalent to 1.055 GJ; **i** In 2023 US dollars**; r** Average annual growth between 2021 and 2027 or 2020–21 and 2026–27; **s** Estimate; **z** Projection.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023); Company reports; Nexant (2023) World Gas Model.

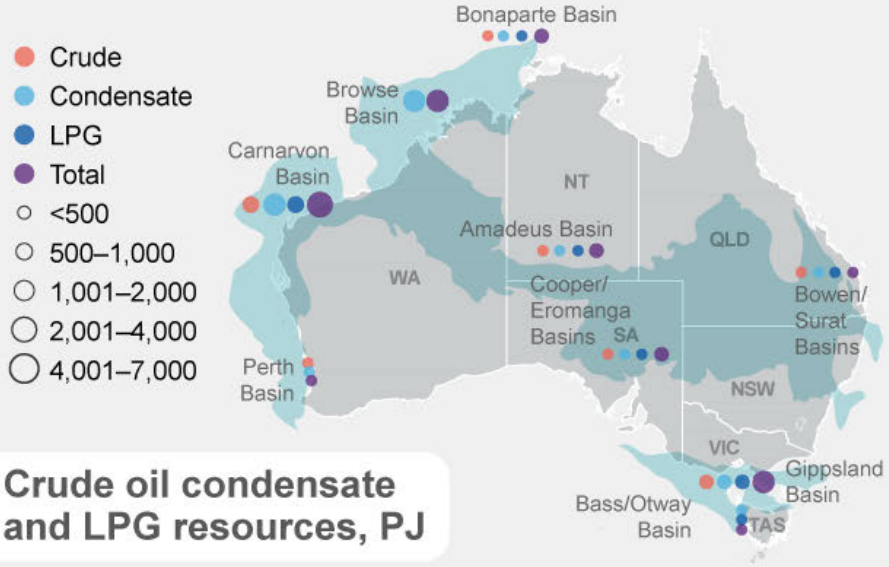
Oil

Australia's oil sector

0.3%
of the world's oil **reserves** and **0.5%** of production

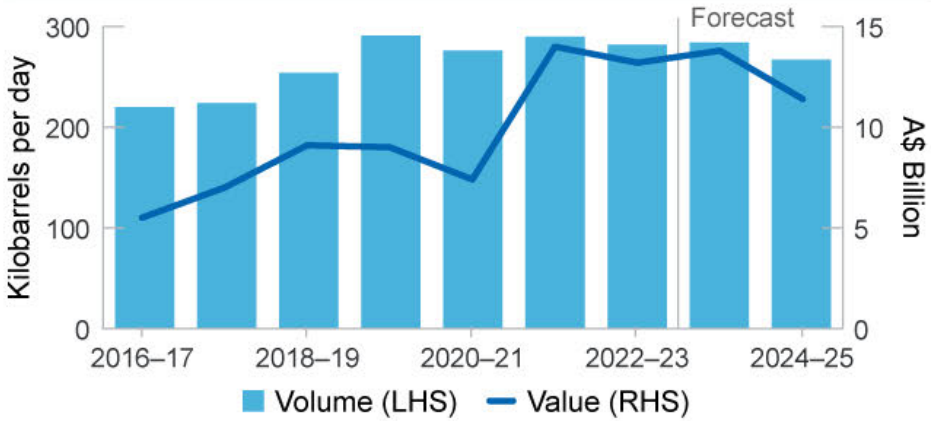
20%
crude & condensate **exported** to Singapore and S. Korea each

Around 2/3
crude & condensate produced at **Carnavon basin,** offshore WA



Crude oil condensate and LPG resources, PJ

Australian oil exports



Outlook

Oil **prices began to weaken** from high North and Latin American supply

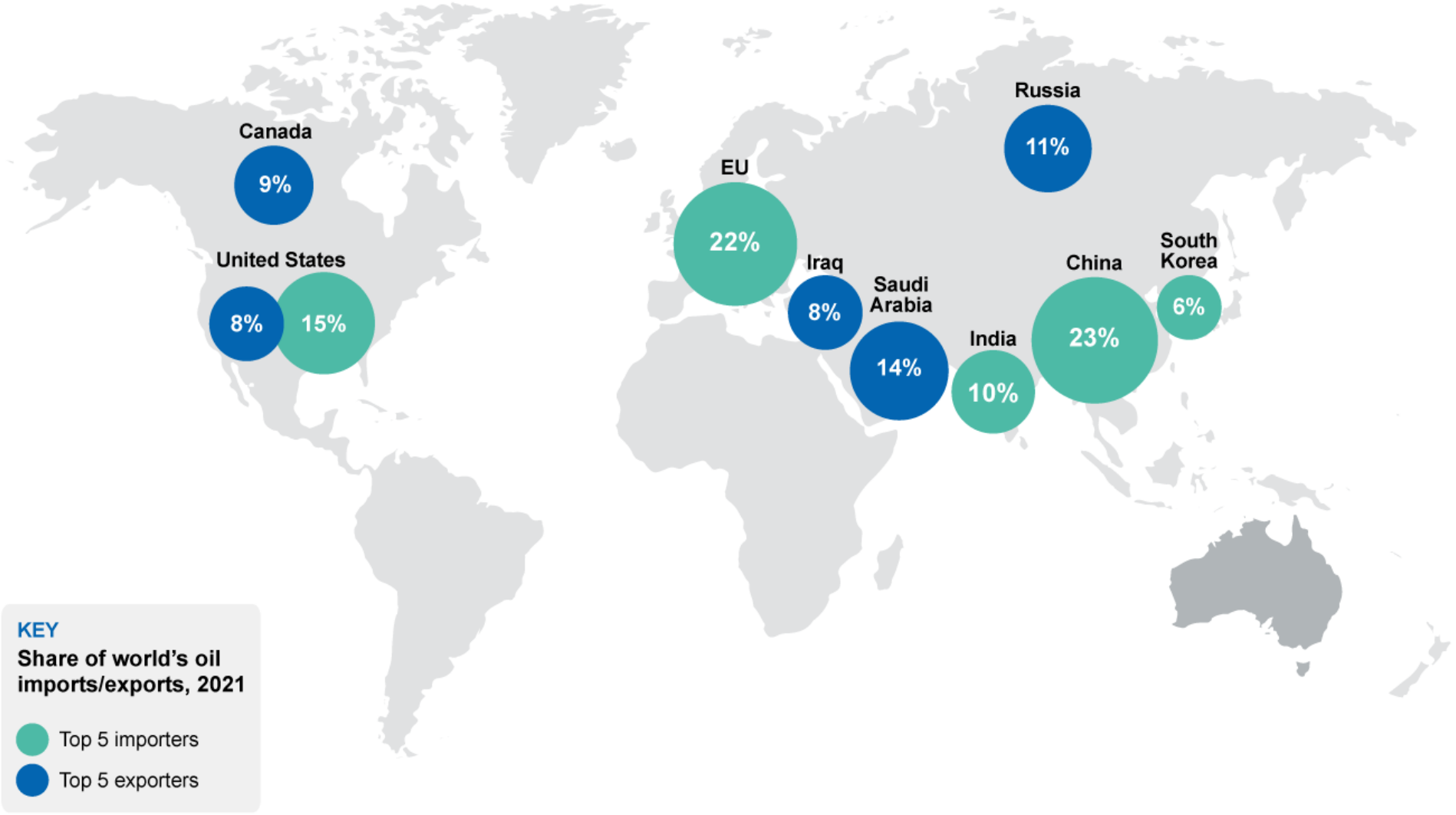
Earnings to **fall by 2024-25** as additional global supply becomes avaliable

Australian production **volumes ease** as offshore fields depletes

Petroleum exploration expenditure **remains subdued**

SOURCE: GA; DISR; OCE

Oil TRADE MAP



SOURCE: International Energy Agency, World Oil Statistics
Note: Trade data includes crude oil, natural gas liquids, refinery feedstocks, addititves and other hydrocarbons

8.1 Summary

- The Brent crude price is forecast to fall slightly to average US$83 in 2024, but then fall significantly further to US$76 a barrel by 2025. The fall will be driven by weak demand and gains in non-OPEC production.
- Australia's crude and condensate production is expected to fall to about 280,000 barrels per day by 2024–25, as North-West Shelf output falls.
- Australia's crude and condensate export earnings are expected to lift to A$13.8 billion in 2023–24 due to a weaker AUD/USD, before falling to A$11.4 billion in 2024–25 as prices fall and output declines.

8.2 World consumption

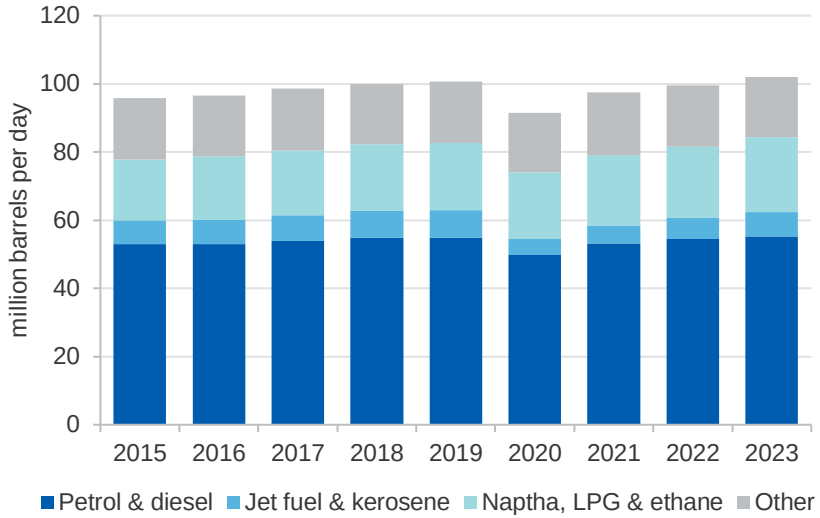
Global petrochemical production shifts towards China

Global oil consumption is largely driven by demand from the transport sector, with industrial use having a secondary, but still substantial, role (Figure 8.1). Petrol and diesel, primarily used in road transport, accounts for most of global oil consumption, while jet fuel and kerosene — primarily used for air travel — makes up a relatively small proportion of usage. LPG, ethane and naphtha are primarily used in industrial processes, including to produce the chemicals used to make polymers.

Global oil consumption is estimated by the International Energy Agency (IEA) to have risen by 2.8% year-on-year in the September quarter 2023, as the short run effects of recovery from pandemic restrictions (particularly in China) offset a structural slowdown in demand. Chinese consumption rose by 17% year-on-year, largely due to base effects from the pandemic restrictions in the September quarter 2022. Chinese consumption is also strong when compared with the September quarter of 2021, rising by 12%.

China's post pandemic rebound unleashed strong pent-up demand for services, and the recovery in transport demand for oil has been robust. Domestic aviation demand grew strongly, and China's Civil Aviation Administration has released plans which include a 34% increase in domestic flights from 2019 levels by the March quarter 2024. However, the recovery in China's international air travel volumes has been much weaker, and remain well below pre-pandemic levels.

Figure 8.1: Global oil consumption by refined petroleum product



Source: International Energy Agency (2023)

Despite broader weakness in the Chinese economy, China's industrial demand for oil strengthened in the September quarter. Chinese petrochemical plants have raised their capacity over the pandemic period, allowing for production to ramp up following the removal of pandemic restrictions.

Increasing petrochemical production in China appears to be displacing industrial demand across OECD member countries. Total demand from OECD countries fell 0.3% year-on-year in the September quarter, while demand for naphtha fell 9.2% year-on-year. The fall in the demand for naphtha in the OECD was primarily from Western Europe and Asia, with American demand showing resilience. Demand for petrol and diesel fell by 2.8% year-on-year, driven partly by the rapid adoption of electric vehicles (EVs). Air travel continued to recover from the pandemic. Jet fuel demand across OECD countries continued to grow strongly in the September quarter 2023, rising by 10.0% year-on-year, with increased demand across most countries.

Industrial use to drive consumption growth, while transport demand slows

Global oil consumption is forecast to rise by an average of 1.2% per year in 2024 and 2025. The growth is expected to be led by industrial fuels — driven by polymer demand — while the growth in the consumption of petrol, diesel and jet fuel is forecast to slow.

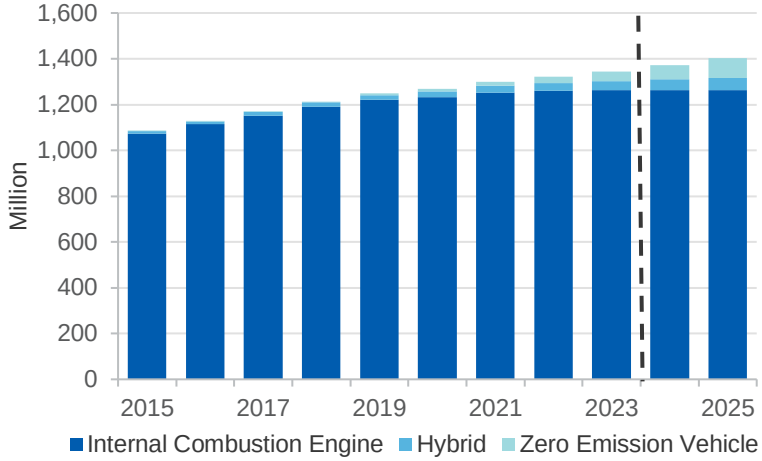
Global polymer demand is expected to rise steadily over the outlook period, driving industrial demand for oil. Aircraft and vehicles are increasingly replacing metal components with plastics to reduce weight — and thus improve fuel efficiency — while sensors and other electronic components in EVs also use additional plastics to produce. Demand from packaging is also expected to rise, driven by the ongoing growth of e-commerce. The OECD's *Global Plastics Outlook: Policy Scenarios to 2060* published in mid-2022 projects that global plastics use by 2060 will be triple 2019 levels, with the largest growth by application being in vehicles.

EVs are rapidly gaining market share in the global passenger vehicle market (see *Lithium* chapter) as their prices fall. Price falls are flowing from improvements in battery technologies, incentives from the US Inflation Reduction Act, and the increasing export penetration of cheaper Chinese models. Material cost pressures on batteries — including record lithium prices in 2022 — acted to slow EV cost declines in 2021 and 2022 but are now easing as lithium prices fall back.

The share of EVs sold in the global passenger vehicle market is forecast to exceed 25% by 2025, with strong adoption expected in China, Europe and the US. The shift in the composition of the global vehicle fleet towards EVs will accelerate over time as EVs gain market share in new car sales and will result in an accelerating fall in demand for petrol and diesel.

As a result of increased EV sales, the global ICE passenger vehicle fleet is forecast to plateau over the next two years (Figure 8.2), having grown at an average annual rate of 3.3% in the four years before the pandemic. Improved fuel efficiency among the ICE vehicle stock will also contribute to declining demand, as retiring ICE vehicles tend to be less fuel efficient than newer models. For OECD countries, the consumption of petrol and diesel likely peaked in 2019.

Figure 8.2: Global passenger vehicle stocks



Notes: Zero-emission vehicles includes battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEVs), while EVs refers to only BEVs and PHEVs.

Source: Wood Mackenzie (2023)

The International Air Transport Association reported that in August, global kilometres travelled by paying passengers reached 96% of pre-pandemic volumes, suggesting the rebound in demand from COVID restrictions is largely complete. Jet fuel consumption remains substantially below pre-pandemic levels due to improvements in aircraft fuel efficiency.

Growth in jet fuel consumption is expected to be slower than the pre-pandemic trend. Growth in recreational air travel heavily depends on rising incomes in middle income countries, and slower economic growth in China has weakened the outlook for jet fuel. Policies targeting aviation emissions in Europe will also reduce jet fuel demand, with the EU planning to phase out free allocations of carbon permits for domestic flights by 2026.

Unlike road transport, low-carbon alternatives are unlikely to substitute substantial volumes of petroleum jet fuel over the outlook period, with current electric and hydrogen technologies not yet viable for air travel — long haul or short.

8.3 World production

North and Latin American supply rises faster than expected

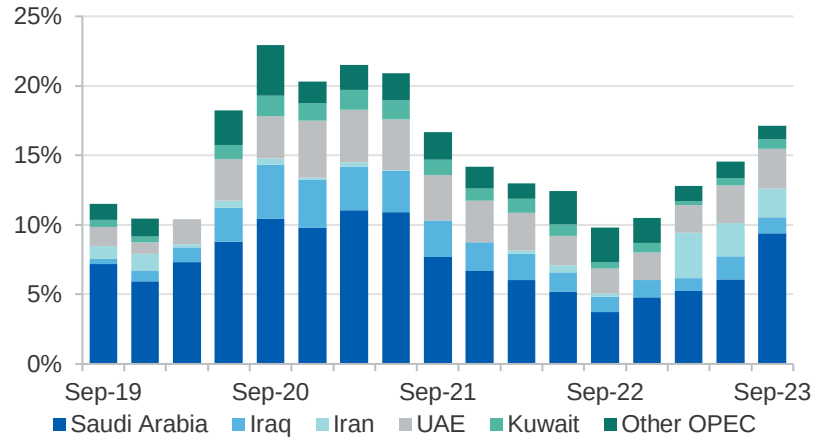
The IEA estimates world oil production rose by 0.5% year-on-year in the September quarter 2023. Production from North and Latin American producers is rising faster than expected, offsetting production cuts by OPEC+. Production in the US rose by 7.2% year-on-year (1.4 million barrels a day) in the September quarter 2023, with the US Energy Information Agency (EIA) attributing the higher-than-expected lift to rising well productivity, even though the number of active oil-directed rigs has declined. Production in Brazil rose by 15% year-on-year (by 0.5 million barrels a day) in the September quarter 2023: new offshore facilities have been deployed and are ramping up production.

Spare OPEC crude oil capacity is estimated to have risen to 17% in the September quarter 2023 (Figure 8.3), which is close to levels seen during the pandemic. OPEC+ leaders reduced production targets by 1 million barrels a day in May 2023. Saudi Arabia has further reduced output from levels agreed by OPEC by 1 million barrels a day from July and have pledged to do so until the June quarter of 2024. Saudi Arabian output fell 15% year-on-year (by 1.9 million barrels a day) in the September quarter 2023, while output in most other OPEC members fell more modestly.

Despite ongoing sanctions on Iranian oil exports, Iranian production rose 18% year-on-year (by 0.7 million barrels a day) in the September quarter 2023. Iranian exports have helped supply the global market in a period when Saudi Arabia has cut back on production. However, this increase in production — or much of it — may be at risk given the escalation in the Hamas-Israel conflict. On 3 November, a bipartisan vote in the US House of Representatives passed a bill to strengthen sanctions on Iranian oil, targeting foreign ports and refineries that process Iranian oil.

Russia announced output cuts of 0.5 million barrels a day from levels agreed at OPEC in August 2023, and then eased the cut — to last until end 2023 — to 0.3 million barrels a day in September. Russian production fell 2.4% year-on-year (by 0.3 million barrels a day) in the September quarter 2023 to 10.8 million barrels a day. The decline in Russian output comes as the withdrawal of Western companies and bans on technology exports is resulting in delays for new projects. Russian production peaked in 2019, at 11.6 million barrels a day.

Figure 8.2: OPEC spare crude oil capacity, as a percentage of total



Notes: Spare capacity is the estimated capacity which can produce within 90 days. Condensate excluded.

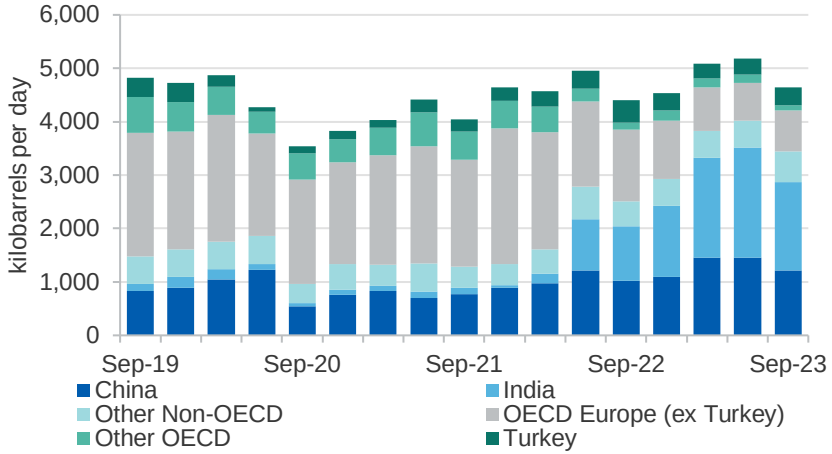
Source: Wood Mackenzie (2023), International Energy Agency (2023), Department of Industry, Science and Resources (2023)

Russia circumvents Western sanctions on oil exports

Since the invasion of Ukraine, Russian oil trade has diverted away from OECD countries, and India had become the largest destination for Russian crude oil exports (Figure 8.4). The G7, EU and Australia all imposed price caps on Russian crude and refined products from 5 December 2022 and 5 February 2023, respectively, by preventing the sale of insurance for Russian oil cargoes if they are sold at a price above the cap.

Price caps imposed on Russian oil are proving increasingly difficult to enforce. Russian oil exports are now largely carried by a fleet of older tankers operating outside of the Western shipping system to circumvent the insurance bans and price caps. The Kyiv School of Economics estimates that only 31% of Russian seaborne crude oil exports are shipped by tankers using insurance from G-7 and EU firms in September.

Figure 8.3: Russian seaborne crude oil and condensate exports



Notes: Export volumes are estimated using vessel tracking data and may deviate from customs data.

Source: Kpler (2023)

Discounts on Russian crude have narrowed substantially since the start of the year. The IEA weighted average FOB price for seaborne Russian crude rose to US$82 a barrel in September, above the price caps imposed by US, EU and Australia. The difference between the Brent crude oil price and the IEA weighted average FOB price has fallen from US$30 a barrel in January to US$12 in September.

OPEC+ credibility in doubt; US and Latin America to drive supply growth

World oil output is forecast to grow by 1.9% in 2024, driven largely by additional North and Latin American supply. An OPEC+ meeting on 30 November 2023 announced production cuts of an about 0.9 million barrels a day from the start of 2024. However, most of the cuts announced are voluntary from smaller OPEC+ producers such as Iraq and Kuwait, and it is unclear to what extent these voluntary reductions would be implemented. Angola, Nigeria and Congo saw official cuts to their quotas. The production quota cut was rejected by Angola, raising concerns over tensions within OPEC+, undermining its ability to credibly coordinate production cuts across its members. The OPEC+ meeting on 30 November 2023 was delayed by a week over disagreement amongst members on the level of production cuts.

The US EIA forecasts that US crude output will grow by about 1.9% (or about 250 kb/d) in 2024. This growth is much lower than in the peak years of the shale oil revolution (2012-2019), when US crude oil output grew by about 800 kb/d per year, with investors remaining cautious about potential investment in new oil capacity.

Latin American nations are expected to add to global supply over the outlook period. The IEA is expecting Brazil to add about 300 kb/d to global crude supply in 2024, with Brazil's state-owned oil company Petrobras expected to deploy additional offshore platforms over the period. Brazil is expected to join OPEC+ in 2024 but has declared it does not intend to accept production quotes from the organisation.

New supply is also expected from Guyana. After a series of discoveries from 2008, offshore production in Guyana began in 2019, and projects currently in the pipeline are expected to continue to bring additional capacity online. The IEA forecasts Guyana output will rise by 210 kb/d to about 600 kb/d in 2024. About 66% of Guyana, including much of its oil reserves, is territory disputed by Venezuela. Both Guyana and Venezuela, as well as Brazil, have lifted their military presence along the border after Venezuela raised rhetoric exerting its claim on the territory.

8.4 Prices

Oil market to tighten as OPEC+ cuts back supply and demand recovers

Crude oil prices slid over H1 2023 (Figure 8.5), partly due to weak Chinese demand. China's economy showed weaker than expected growth after pandemic restrictions were dropped in late 2022. The price fall was also driven by slower OECD economic growth as central banks continued to tighten monetary policy. In the June quarter, output cuts by some OPEC+ producers saw price declines slow. Prices rallied in the September quarter on concerns that OPEC+ output cuts would deplete inventories too much, but most of those gains were lost in October as higher-than-expected non-OPEC supply pushed up OECD oil inventories (Figure 8.6).

Since the Russian invasion of Ukraine, the US government has sold close to half the oil held in the Strategic Petroleum Reserve and has delayed plans to restock in H2 2023 while OPEC+ cut back on supply. The US is now seeking 3 million barrels of oil for early 2024 delivery.

The Brent crude price is forecast to fall slightly to average US$83, then to decline to average US$78 a barrel by 2025. Higher than expected production from North America and Latin America, combined with slowing demand growth, is expected drive this price fall.

8.5 Australia

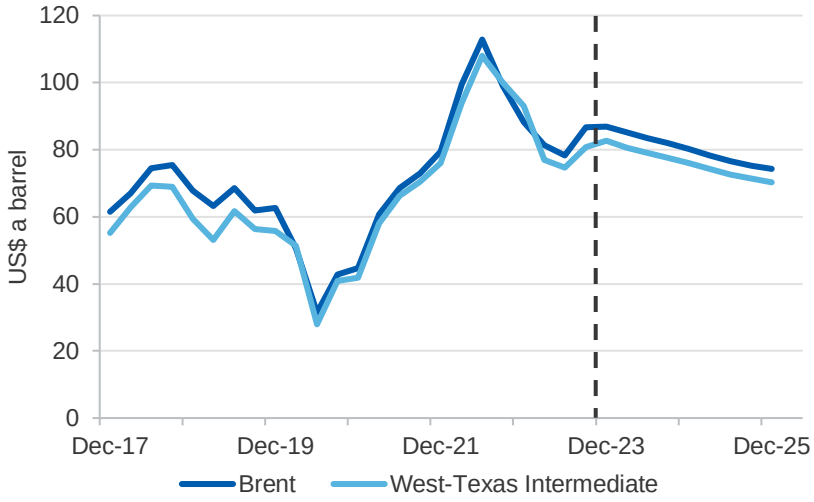
Delays over investment decision causing uncertainty over outlook

Australian crude oil and condensate export earnings fell 15% year-on-year to $3.1 billion in the September quarter 2023, as prices fell back from elevated levels triggered by the Russian invasion of Ukraine in 2022. Export volumes were little changed, despite a fall in domestic production. This is partly due to Australian refineries switching from domestically-sourced feedstock to imported feedstock. Also contributing is a larger than normal discrepancy between available production, import/export and inventory estimates. The top destinations for Australian exports over the quarter were Singapore and China (Figure 8.7).

Australian crude oil and condensate output fell 10% year-on-year to 255 kb/d. The fall was due to lower output in the Carnarvon Basin, which is approaching end of life. This includes fields such as the North-West Shelf and Greater Enfield. Output is forecast to fall further over the outlook period to 280 kb/d in 2024–25, as Carnarvon Basin fields deplete further.

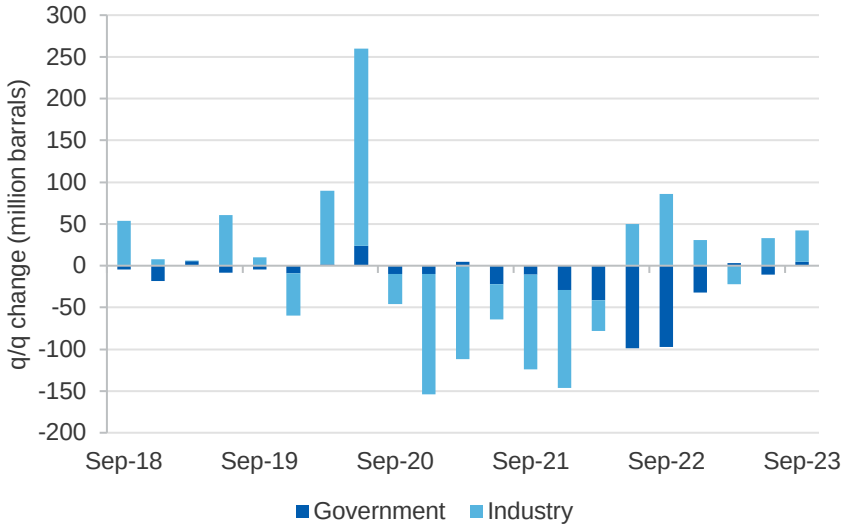
Export earnings are forecast to rise by 4.5% to $13.8 billion in 2023–24 (Figure 8.8), as a weak AUD/USD lifts the average Australian dollar oil price compared to 2022–23. Export earnings are forecast to fall to $11.4 billion in 2024–25, with lower domestic production driving down export volumes, and prices expected to fall as non-OPEC production rises.

Figure 8.4: Price outlook



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

Figure 8.5: Change in OECD Petroleum Stocks



Source: International Energy Agency (2023)

A final investment decision for the Dorado oil and gas field was expected in the second half of 2022, but the decision has been delayed to 2024, with Carnarvon Energy divesting a 10% stake in the project to Taiwan's CPC Corporation in February 2023. If the project proceeds, it could bring around 90 kb/d of additional production capacity online.

Australian refineries to remain open with government support

In 2021, falling demand linked to COVID restrictions resulted in the closure of two of Australia's refineries. The remaining two refineries signed contracts with the Australian Government to remain open until at least 2027, in exchange for a subsidy on each litre of refined product sold.

Australia's two remaining refineries are expected to have their operational life extended, with plans to extend the Lytton plant announced in April 2022 and plans to extend the Geelong plant announced in January 2023. Australian refined production is expected to remain at around 250 kb/d over the outlook period.

Australia's consumption of refined oil products rose by 3.6% year-on-year in the September quarter 2023. The gain was driven by a 32% lift in usage of aviation turbine fuel and reflects the ongoing recovery in air travel since the opening of Australia's international borders in November 2021. Consumption of automotive gasoline fell 2.5% year-on- year. Rising adoption of electric vehicles is expected to reduce demand for petrol.

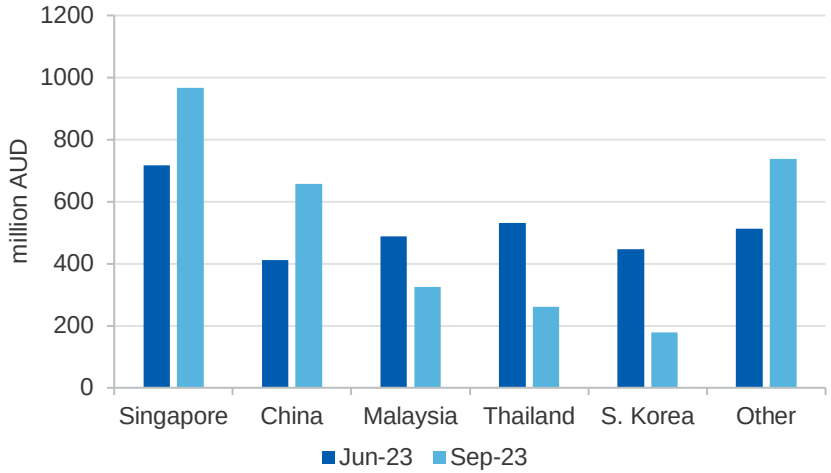
Exploration

Australia's petroleum exploration expenditure was $330 million in the June quarter 2023, up 45% year-on-year (see Figure 7.16 in the Gas chapter). Offshore exploration rose 112% year-on-year to $139 million, while onshore exploration spending rose by 18% year-on-year to $190 million.

Revisions to forecasts

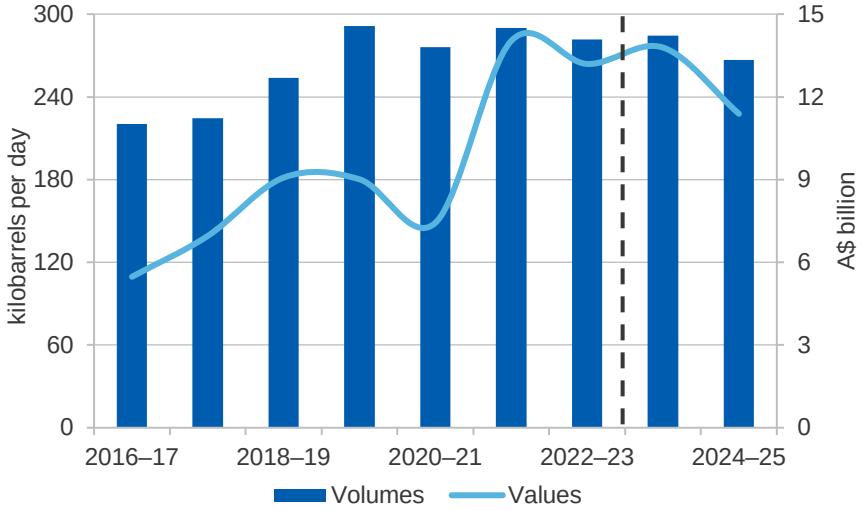
Since the September 2023 *Resources and Energy Quarterly*, the forecast for Australia's crude and condensate export earnings has been revised down 5.4% (to $13.8 billion) in 2023–24 and down 4.3% (to $11.4 billion) in 2024–25. The revisions are due to a weaker outlook for global oil prices and a downward revision to forecasts of Australian production.

Figure 8.7: Australian crude and condensate exports, by destination



Source: Australian Bureau of Statistics (2023)

Figure 8.8: Australian crude oil and condensate exports



Source: Australian Bureau of Statistics (2023); Department of Industry, Science and Resources (2023).

Table 8.1: Oil Outlook

						Percentage changes		
World	**Unit**	**2022**	**2023 [s]**	**2024[f]**	**2025[f]**	**2023[f]**	**2024[f]**	**2025[f]**
Production[a]	mb/d	100	102	103	105	1.7	1.2	1.7
Consumption[a]	mb/d	100	102	103	104	2.4	0.9	1.5
WTI crude oil price								
– nominal	US$/bbl	95	80	78	72	-15.6	-1.9	-7.9
– real[b]	US$/bbl	98	80	76	69	-18.9	-4.6	-10.1
Brent crude oil price								
– nominal	US$/bbl	100	85	83	76	-15.0	-2.7	-8.0
– real[b]	US$/bbl	104	85	80	72	-18.3	-5.4	-10.1
Australia	**Unit**	**2021–22**	**2022–23 [s]**	**2023–24[f]**	**2024–25 [f]**	**2022–23**	**2023–24[f]**	**2024–25 [f]**
Crude and condensate								
Production[ac]	kb/d	337	291	286	277	-13.4	-1.8	-3.3
Export volume[a]	kb/d	290	282	284	267	-2.9	1.0	-6.2
– Nominal value	A$m	14,031	13,192	13,787	11,385	-6.0	4.5	-17.4
– Real value[h]	A$m	15,680	13,774	13,787	11,005	-12.2	0.1	-20.2
Imports[a]	kb/d	180	169	182	188	-5.9	7.4	3.3
LPG production[acd]	kb/d	107	93	95	91	-13.5	2.1	-4.1
Refined products								
– Refinery production[a]	kb/d	266	252	250	247	-5.3	-0.9	-1.4
– Export volume[ae]	kb/d	8	6	5	4	-34.1	-12.9	-18.5
– Import volume[a]	kb/d	743	856	884	884	15.1	3.3	-0.1
– Consumption[ag]	kb/d	934	1,021	1,036	1,038	9.3	1.5	0.2

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 2023 calendar year US dollars; **c** Historical production data was revised in the December quarter 2021 to align with the Australian Petroleum Statistics; **d** Primary products sold as LPG; **e** Excludes LPG; **f** Forecast; **g** Domestic sales of marketable products, including imports; **h** In 2023-24 financial year Australian dollars; **r** Compound annual growth rate (per cent), for the period from 2022 to 2028 or for the equivalent financial years. **s** estimate.

Source: ABS (2023) International Trade in Goods and Services, Australia, Cat. No. 5368.0; International Energy Agency (2023); US Energy Information Administration (2023); Department of Industry, Science and Resources (2023); Department of Climate Change, Energy and Environment (2023).

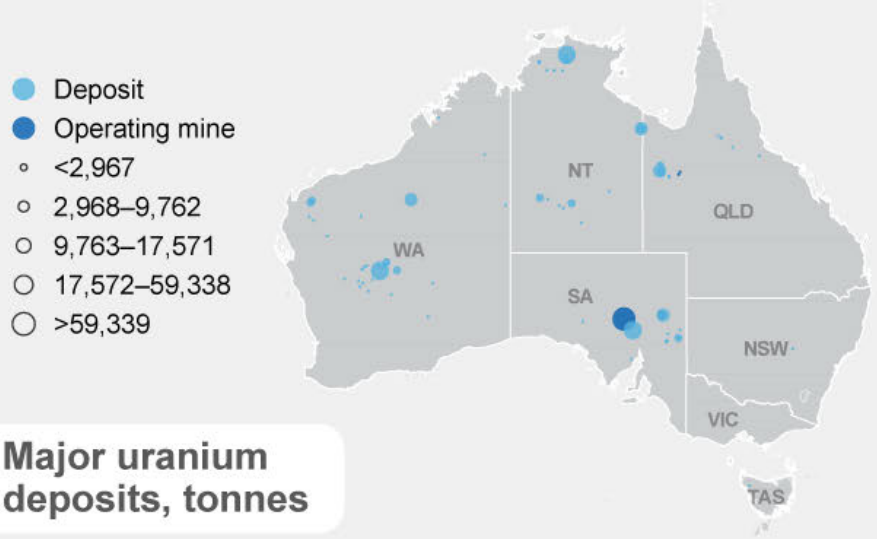
Uranium

Australia's uranium sector

Ranked 1st for uranium **resources, 4th for world supply**

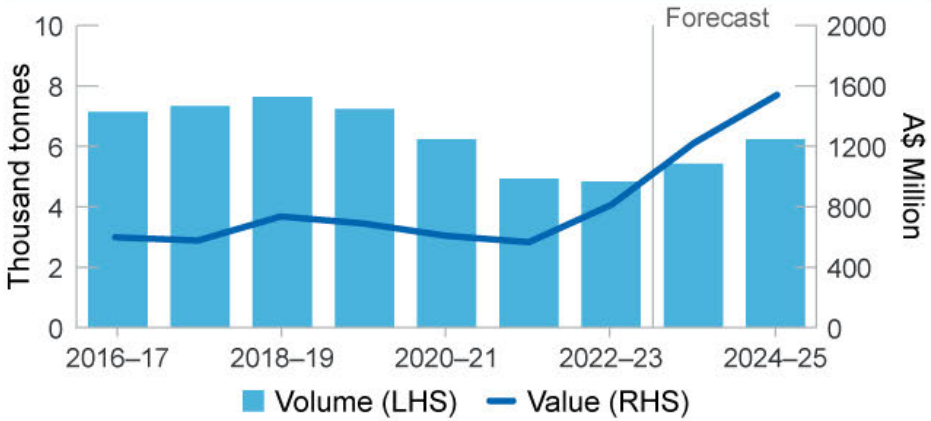
4,809 tonnes exported in 2022–2023

$812 million value of exports 2022–2023



Major uranium deposits, tonnes

Australian uranium exports



Outlook

Prices have been **rising**, with **further growth** expected through the outlook

Earnings **have passed a low point**, with higher prices and volumes in prospect

The opening of the Honeymoon mine in South Australia to **boost exports**

Exploration spending has risen solidly from its low point in 2020 and 2021

SOURCE: DISR; OCE

9.1 Summary

- Supply disruptions and renewed interest in nuclear power have resulted in prices rising to US$81 a pound in the early part of the December quarter, revising up the price and value forecast.
- Prices are now forecast to climb to around US$92 a pound by 2025, driven by a structural market deficit. Australian exports are forecast to increase from around 4800 tonnes in 2022–23 to around 5700 tonnes by 2024–25. This growth reflects the expected opening and ramp-up of production at Boss Energy's Honeymoon mine in South Australia.
- Price and volume growth are expected to lift uranium export values from A$812 million in 2022–23 to A$1,539 million by 2024–25.

9.2 World Consumption

Global appetite for nuclear power is rising

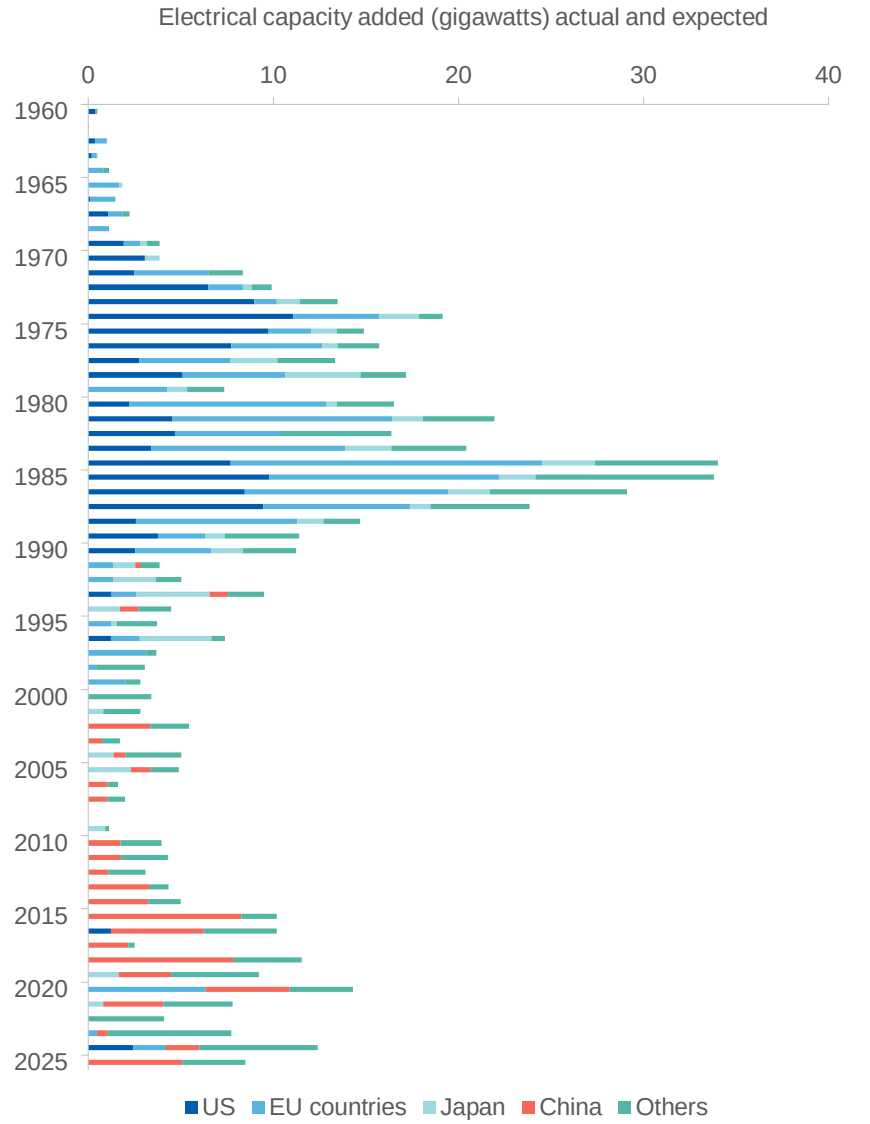
Global uranium demand is primarily driven by nuclear reactors utilising uranium as fuel. Nuclear reactors require regular refuelling and have very long ramp up and ramp down procedures. Therefore, once built a nuclear reactor's consumption generally remains steady over time. Worldwide reactor demand is estimated to reach 88 kilotonnes (kt) in 2023, with the US accounting for 21 kt and China using 14 kt (Figure 9.2).

Total nuclear energy production capacity is rising as nuclear deployments gather pace and countries look to utilise nuclear power to improve energy security and meet their net zero commitments (Figure 9.1). As part of this increased appetite for nuclear power, small modular reactors (SMRs) and microreactors are receiving significant attention. These have advantages over conventional reactor technology in the comparatively short construction timeline and lower absolute capital cost of a typical reactor. Growth in their use could increase demand for uranium relatively quickly.

Increased demand for uranium is underpinned by new reactors in North America, Asia, and Eastern Europe.

In the US, after a long period of low spending, multiple SMR and microreactor projects have recently progressed, with deployment of

Figure 9.1: Growth in world nuclear power generation



Source: International Energy Agency (2023); World Nuclear Association (2023); Department of Industry, Science and Resources (2023)

Xe-100(60MW) reactors in Washington and Texas receiving approval. Three microreactor projects have also received approval. SMRs and microreactors are being examined as a substitute for fossil fuel-based generation in places where traditional reactors are impractical, would have too much capacity or would be too expensive to build — such as in remote or rural communities.

India's Kakrapar 3 reactor has entered commercial generation, with fuel loading underway at Kakrapar 4 (700MW). Both reactors are Indian designed, and their successful deployment represents a substantial expansion of India's nuclear capabilities. India plans to build a further 14 similar reactors.

China has a total of 27.3GWe of capacity under construction across 24 projects. These include the Lianjiang 1 plant, which begun construction in October 2023 after gaining approval from the Chinese State Council. Successful completion of all 24 projects would increase China's total nuclear generation capacity from 53.2GWe to 80.5GWe. Some of these projects are being commissioned or are expected to begin commissioning in the coming months.

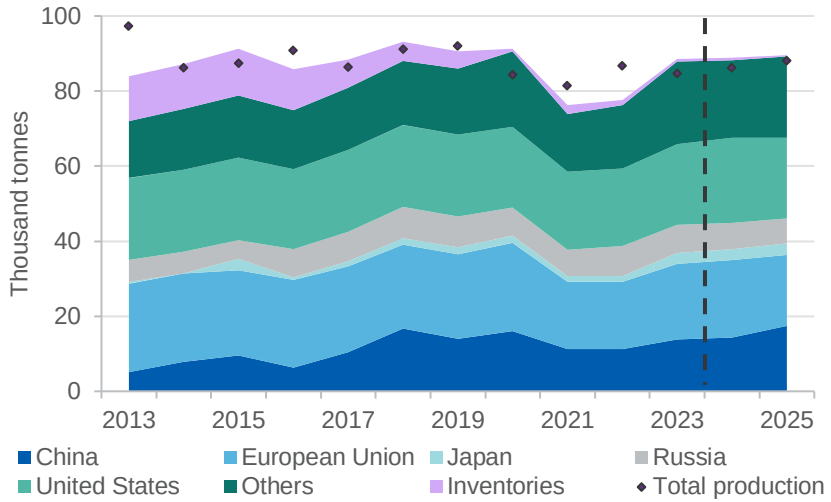
Belarus' second reactor reached commercial production in November 2023. The two reactors, built by Rosatom, are expected to account for 40% of the country's electricity generation. Poland has also made progress, with regional authorities backing the building of three plants in the Pomerania region with a total capacity of 3750 MWe.

9.3 World production

Production is growing, but disruptions could affect short term supply

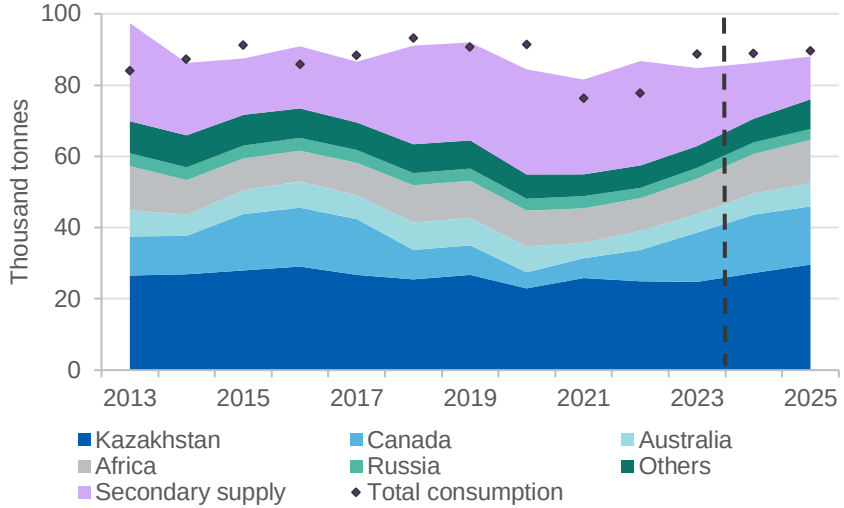
Kazakhstan is the single largest producer of uranium in the world, producing 24.7kt, from a total of 62.7kt mined world-wide in 2023. Australia is on target to produce 5.3kt in 2023, or 8.5% of world mined supply. Inventories and secondary sources (such as depleted uranium reprocessors) provide additional supply to global markets and help to keep overall supply and demand in balance.

Figure 9.2: World uranium consumption and inventories (U3O8)



Source: International Energy Agency (2023); World Nuclear Association (2023); UxConsulting (2023)

Figure 9.3: World uranium output (U3O8)



Source: International Energy Agency (2023); World Nuclear Association (2023); UxConsulting (2023)

World supply is growing slowly, but shortfalls through the middle of this decade are still expected (Figure 9.3). Higher prices have encouraged some large companies to lift production from existing assets. However, equipment issues, lack of personal with appropriate skills and political instability have also disrupted some potential supply.

Higher prices have seen Kazatomprom (the world's largest uranium supplier) revise up its uranium production targets in Kazakhstan. In 2017, Kazatomprom production was scaled down to 80% of the subsoil use agreements. In 2022, Kazatomprom announced an increase in production of up to 90% in 2024. Production targets for 2025 have also been revised up to 100% of subsoil use agreements.

Cameco has revised down its 2023 production forecast after disruptions at two of its Canadian facilities. Cigar Lake (the world's highest-grade uranium mine) experienced disruptions due to 'equipment reliability issues'. McArthur River/Key Lake facility (the world's largest high-grade uranium mine and mill) has also experienced issues in resuming production after three years of care and maintenance. The lack of personnel with the appropriate skills and availability of materials has impacted the restart. Overall, these disruptions are forecast to reduce production at the site from 10000 tonnes to 8800 tonnes.

In July 2023, a coup d'état in Niger added to the risk of potential disruptions to uranium mining, which accounts for 4% of world output. Following the coup d'état, Global Atomic Corporation warned of a potential 6–12-month delay to the project. Niger's new government has shown 'full government support' for the Global Atomic Corporation's Dasa uranium project. However logistical issues remain, and getting supplies to the site has proven difficult.

9.4 Prices

Prices rose sharply in H2 2023

Uranium prices rose sharply in September-November 2023, from US$59 to US$81 a pound (Figure 9.4). The price rise occurred after two events in September: the downward revision of Cameco's output forecast (see

Figure 9.4: Uranium price outlook

Source: Cameco Corporation (2023) Uranium Spot Price; UxConsulting (2023) Uranium Market Outlook

World Production section), and an announcement by the World Nuclear Association that uranium consumption would need to double by 2040 to meet net zero commitments.

The reduction in supply from Cameco adds to pressure on global spot markets. Yellow Cake PLC — a publicly traded uranium holding fund — also purchased 692 tonnes in October. Yellow Cake PLC is one of many financial institutions that have been operating in the uranium market since 2018.

Prices to remain high and will grow further, greater volatility also expected

Exploration and development of new mines is increasing to meet demand. However, new mining capacity typically takes years to come online, and is not expected to close supply shortfalls over the outlook period.

The commercial utilities stockpile is expected to deplete by half by 2024, and to halve again by 2025. Combined with the structural production deficit, this is expected to put further upward pressure on prices over the next two years. As inventories decline, price risks become weighted to the

upside. Risks include the possibility of production shortages and supply constraints affecting large companies such as Kazatomprom.

Growing interest from financial institutions such as holding funds — who buy uranium for speculative purposes — could add volatility to markets over coming years. However, uranium is traditionally contracted off-market many years in advance, with only 11% of total volume traded on the spot market since 2004. Uranium markets thus have some insulation against speculative bubbles.

9.5 Australia

Higher prices and volumes will boost export earnings.

Australia's uranium exports are currently generated from the Four Mile and Olympic Dam mines. However, two additional mines are now under development. One of these is Boss Energy's Honeymoon mine (reactivation project). Boss Energy has announced that the mine will re-commence production by the end of 2023, with work now close to completion. All major wellfield preconditioning tasks are now complete, and the mine is expected to produce 1,100 – 1,200 tonnes of uranium for 9 years after a ramp up period.

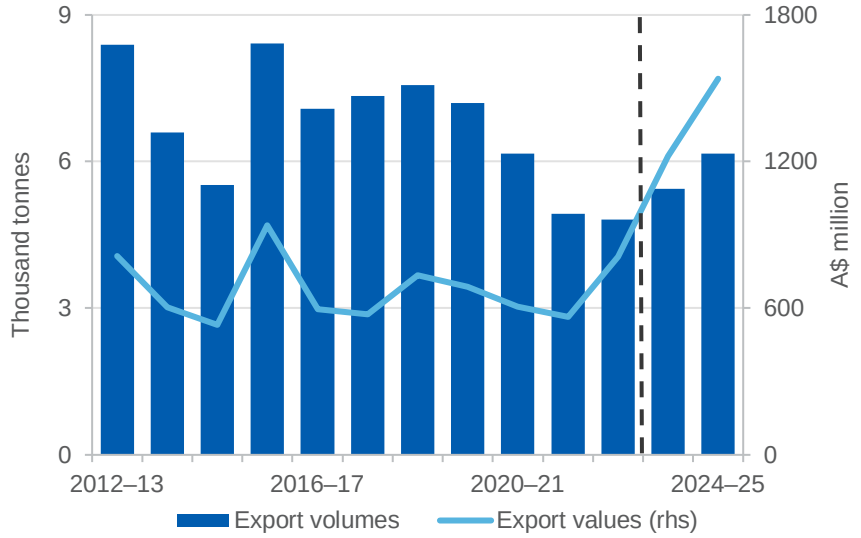
A mine at Mulga Rock is also under development, but commercial production is not expected within the outlook period. Higher prices may also expedite exploration and the development of new mines in Australia. However, given the typical mine development timeline any additional capacity will come online outside the outlook period.

Higher prices and an additional mine opening are expected to push earnings to a decade high in the current financial year (Figure 9.5). Exports are expected to be A$1,222 million in 2023–24, with further growth in subsequent years as Honeymoon ramps up. The rise in the spot price is expected to result in a total revenue of A$1,539 million by 2024–25.

Revisions to the outlook

Export earnings forecasts for 2023–24 and 2024–25 have been revised up by $260 million and $584 million (respectively) since the September *Resources and Energy Quarterly*. This reflects the recent sharp strengthening in the price outlook.

Figure 9.5: Australia's uranium exports



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

Table 9.1: Uranium outlook

						Annual percentage change		
World	Unit	2022	2023[s]	2024[f]	2025[f]	2023[s]	2024[f]	2025[f]
Production	kt	57.4	62.8	70.7	76.0	9.4	12.5	7.6
Africa [b]	kt	9.2	9.8	11.3	12.3	6.8	15.5	8.9
Canada	kt	8.7	13.7	16.3	16.3	58.1	18.8	0.0
Kazakhstan	kt	25.0	24.8	27.3	29.6	-0.9	10.2	8.5
Russia	kt	3.0	3.1	3.1	3.1	3.7	0.0	0.0
Consumption	kt	76.3	87.8	88.2	89.2	15.1	0.5	1.1
China	kt	11.3	13.8	14.4	17.4	22.3	4.1	21.4
European Union 28	kt	17.8	20.1	20.6	18.9	12.7	2.4	-8.0
Japan	kt	1.6	2.9	2.9	2.9	79.0	0.0	0.0
Russia	kt	7.9	7.5	7.0	6.7	-4.6	-7.8	-3.4
United States	kt	20.7	21.5	22.7	21.5	3.7	5.5	-5.3
– nominal	US$/lb	49.8	61.7	84.4	89.7	23.9	36.8	6.4
– real [c]	US$/lb	51.8	61.7	82.1	85.2	19.0	33.0	3.9
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Production	t	4,485	5,409	5,588	6,167	20.6	3.3	10.4
Export volume	t	4,933	4,809	5,441	6,167	-2.5	13.1	13.3
– nominal value	A$m	564	812	1,222	1,539	43.8	50.5	26.0
– real value [d]	A$m	630	847	1,222	1,488	34.4	44.2	21.8
Average price	A$/kg	114.4	168.7	224.5	249.5	47.5	33.1	11.1
– real [d]	A$/kg	127.8	176.2	224.5	241.2	37.9	27.4	7.4

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2023 US dollars; **d** in 2022–23 Australian dollars; **s** estimate; **f** forecast; **r** Annual growth rate
Source: Department of Industry, Science and Resources (2023); Cameco Corporation (2023); Ux Consulting (2023) Uranium Market Outlook

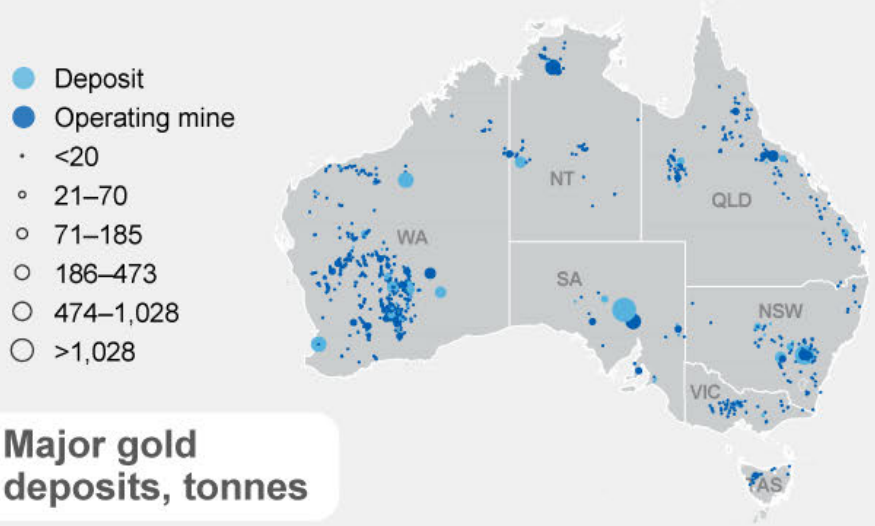
Gold

Australia's gold sector

World's 3rd
largest **producer** of gold, 2022

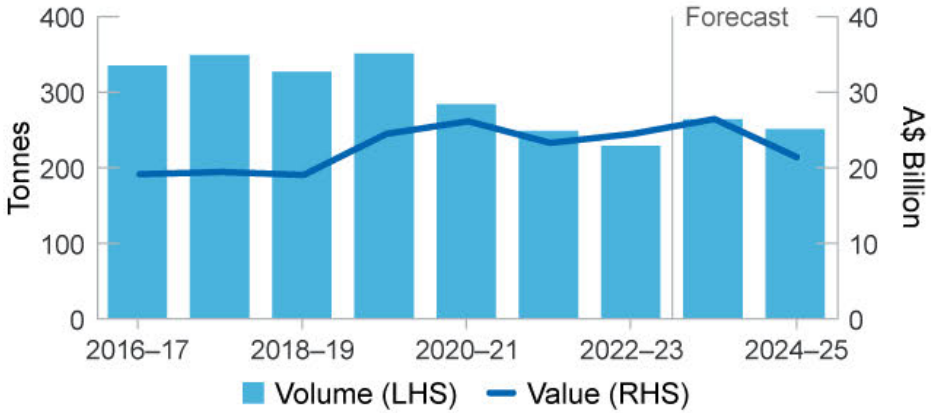
Largest
known share of globally known gold resources, at **22%**

228 tonnes
exported in 2022-23, valued at **$24 billion**



Major gold deposits, tonnes

Australian gold exports



Outlook

Prices likely to remain **elevated** before easing as global inflation, safe-haven buying declines

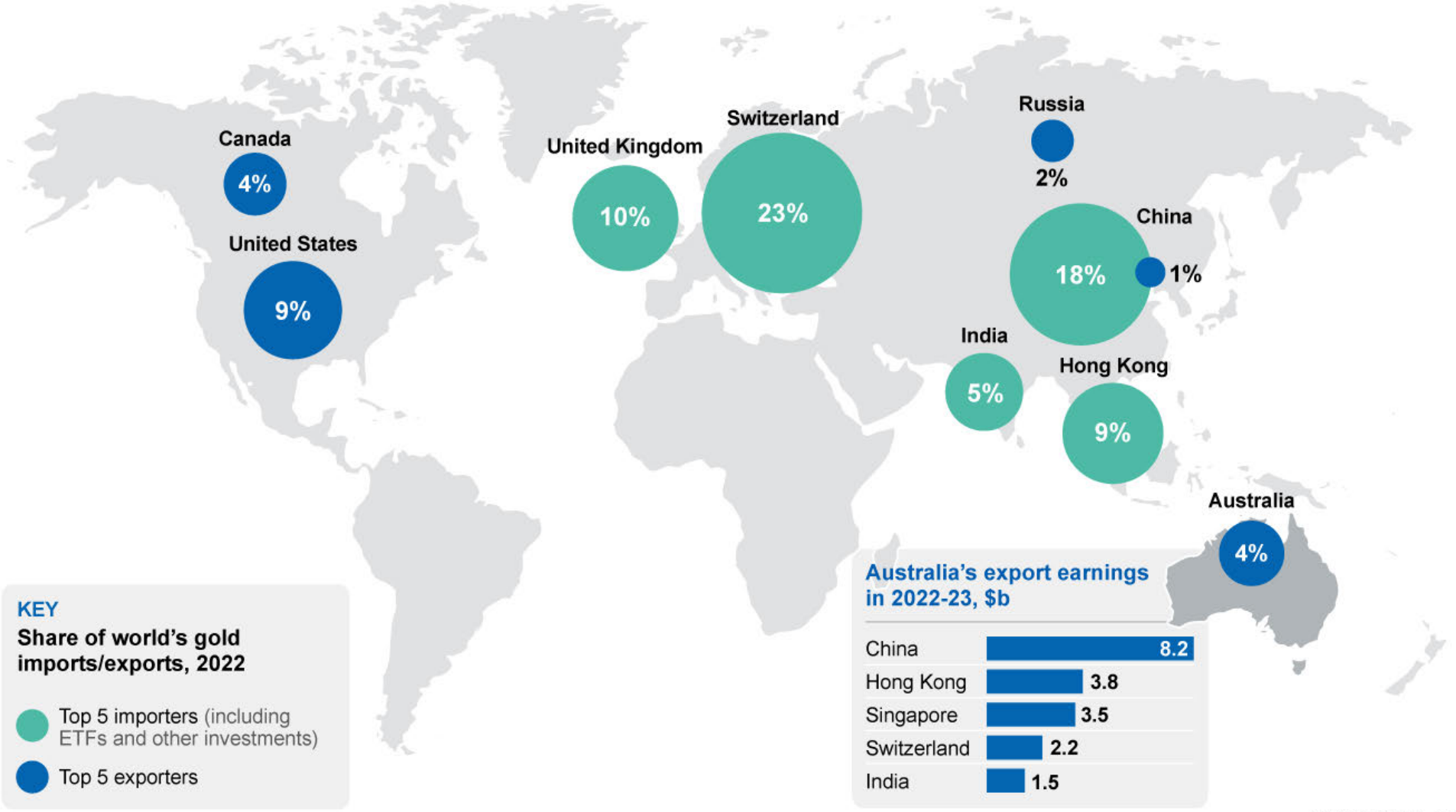
Australian export earnings **forecast to fall**

Production to increase as expansions and new projects come online

Exploration spending at a **3-year low**, following record highs in 2022

SOURCE: GA; DISR; OCE

Gold TRADE MAP



SOURCE: UN ITC; ABS

Note: Reflects trade in HS code 7108 (gold, inc. gold plated with platinum, unwrought or not further worked than semi-manufactured or powder form)

10.1 Summary

- After averaging US$1,930 an ounce in the September quarter 2023, gold rose to above US$2,000 an ounce in November following the onset of conflict in the Middle East. Prices are forecast to remain elevated but soften gradually to average around US$1,830 an ounce in 2025.
- Australian gold production decreased to 72 tonnes in the September quarter 2023 due to lower grades, planned maintenance and several mines put in care and maintenance. Production is forecast to be steady due to project delays.
- Higher volumes will lift exports to $27 billion in 2023–24 from $24 billion in 2022–23. Price falls will then cut exports to $21 billion in 2024–25.

10.2 World consumption

World gold usage declined over the year to September quarter 2023

World gold demand decreased by 5.9% year-on-year to 1,147 tonnes in the September quarter 2023. This was driven by a 27% decline year-on-year in central bank demand, following a record September quarter 2022.

Official sector (central banks and other government financial institutions) buying declined year-on-year to 337 tonnes in the September quarter. Despite the fall, official sector demand was well above the 10-year average (143 tonnes) and year-to-date buying was a record 800 tonnes. Official sector demand has been strong since mid 2022, with purchases dominated by emerging market central banks eager to lift gold reserves.

According to World Gold Council (WGC) data for declared purchases, buying in the September quarter 2023 was again dominated by China (78 tonnes). The National Bank of Poland (NBP) also purchased 57 tonnes, bringing year-to-date purchases to 105 tonnes. The President of the NBP said this gold accumulation makes Poland a more credible country, and stated the central bank intends to continue building its gold reserves. Türkiye reported a return to net purchasing during the quarter (39 tonnes), following a brief period of selling gold domestically in H1 2023 — a result of strong domestic demand and a temporary ban on gold imports. Sales by central banks during the September quarter were comparatively small, with Kazakhstan selling 4 tonnes from its reserves.

Gold purchases by non-government buyers in the September quarter 2023 were slightly higher year-on-year, with weaker demand from consumers (jewellery, gold coins and bars) offset to some extent by lower outflows from gold-backed exchange-traded funds (ETFs).

ETF outflows reached 139 tonnes in the September quarter 2023, an improvement in gold demand compared to 244 tonnes of outflows a year earlier. (ETF outflows are counted as reducing gold demand, while inflows are counted as additional.) Demand for ETF gold was particularly weak in Western markets, due to rising bond yields and a strong US dollar.

Retail investment in gold bars and coins declined by 14% year-on-year in the September quarter 2023. Year-on-year declines were partly driven by weaker demand in the West and by base effects — following strong demand from Türkiye and the Middle East in 2022. Failing to offset these declines, bar and coin investment demand was strong in the larger markets of China (up by 16% year-on-year) and India (up by 20%). Demand in China was supported by economic uncertainty and a weak performance from other asset classes (such as property), with record domestic prices supporting the case for gold as a store of wealth. Physical investment in India was supported by a correction in domestic prices following a peak in the June quarter 2023, with buyers stocking up ahead of the wedding and festive seasons in the December quarter.

Gold jewellery demand declined marginally year-on-year in the September quarter 2023, driven by elevated — in some cases, record — gold prices in many markets as the US dollar rose. Jewellery demand in China fell by 6% year-on-year to 154 tonnes in the September quarter 2023. The year-on-year decline was partly due to high domestic prices, but also a result of a strong September quarter 2022 base. According to the WGC, consumers responded to elevated prices by purchasing jewellery with lower average weight or gold content. Bucking the trend, Indian jewellery demand rose year-on-year in the September quarter 2023 as consumers responded to a correction in prices from record highs.

Weak demand for consumer electronics in the September quarter 2023 also translated to weak demand for gold in electronics — such as in light-emitting diodes (LEDs), memory chips and printed circuit boards. This lowered demand from this sector by 3% year-on-year to 75 tonnes.

Lower investor demand has weakened gold consumption in 2023

After a very strong 2022, world gold consumption in 2023 is estimated to decrease by 5.8% to about 4,400 tonnes. The decline is expected to be mainly driven by lower investment demand, with official sector demand also easing from record levels in 2022 (Figure 10.1).

Investment demand (gold-backed ETFs or bar/coin holdings) is expected to fall by 11% in 2023 as strong ETF outflows through the year outweigh resilient physical gold demand. Physical demand has been supported by ongoing geopolitical and economic uncertainty.

Jewellery consumption in 2023 is estimated to be slightly below last year, as high local gold prices constrain demand in key markets such as India. Despite strong demand in China over H1 2023, recent price rises are expected to weaken that growth leading into the next seasonal peak.

Gold consumption to grow over the medium-term

World gold consumption is forecast to stabilise below recent elevated levels, reaching about 4,450 tonnes by 2025. Demand growth over this time is expected to be largely driven by rising jewellery consumption and a recovery in demand for high tech manufacturing. Official sector demand is forecast to ease from recent record levels but remain relatively high, while investment demand is forecast to steady above 2023 levels (Figure 10.1).

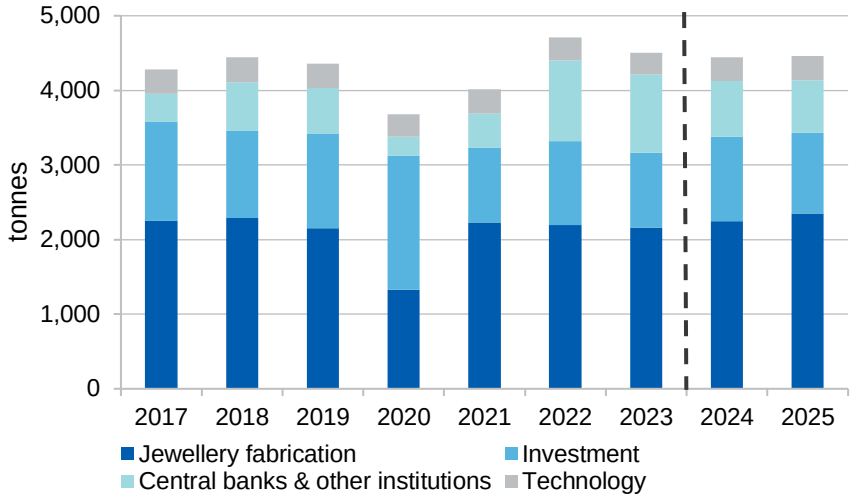
Investment demand is forecast to average about 1,100 tonnes over the forecast period. As inflation eases towards central bank targets, interest rates are assumed to decline over the medium-term. If interest rates are cut faster than inflation declines over the medium-term, this will support institutional investment and retail demand through lower real interest rates.

Jewellery consumption is forecast to grow strongly from 2024 onwards to reach 2,350 tonnes by 2025. Consumption will be supported by an improvement in consumer sentiment and rising incomes, particularly in the key markets of China and India. Lower gold prices and a weaker US dollar are expected to drive a particularly strong recovery in jewellery demand after 2023, with an increase of 7.3% a year.

Physical (bar and coin) demand is expected to remain strong, as ongoing economic uncertainty and forecast price declines support buying activity near — or above — recent elevated volumes.

Official sector demand is forecast to soften to about 700 tonnes a year by 2025. Buying is expected to be driven by emerging market central banks, who will continue their long term aim to diversify their reserves with gold. According to World Gold Council data for declared gold purchases, Russia added 31 tonnes to official reserves in 2022. Given ongoing sanctions on foreign exchange and restricted access to its foreign reserves, it is likely that Russian official sector demand will be strong over the outlook period.

Figure 10.1: World gold demand by sector



Notes: Jewellery fabrication includes jewellery consumption and the change in jewellery inventory. Investment includes ETFs, bars and coins. Technology includes gold used in the electronic, dentistry and other industrial sectors.

Source: World Gold Council (2023); Metals Focus (2023); Department of Industry, Science and Resources (2023)

10.3 World production

World supply increased in the September quarter 2023

World gold supply increased by 6.4% year-on-year to about 1,270 tonnes in the September quarter 2023, driven by both higher mine production and increased recycling.

Global mine production rose to a record 971 tonnes in the September quarter 2023. Growth was led by increased production from the major producers.

Production in China — the world's largest gold producing nation — fell marginally year-on-year to 93 tonnes in the September quarter 2023.

Production in the United States rose by 13% year-on-year to about 48 tonnes in the September quarter 2023, due to increased output from the Carlin, Cortez and Turquoise Ridge operations in Nevada.

Production in Canada fell by 6.8% year-on-year to about 45 tonnes in the September quarter 2023. Lower production was reported across all provinces, for example production was down by 24% year-on-year at the 8.9 tonnes per year Brucejack project and by 13% year-on-year at the 21 tonnes per year Detour Lake project. The 7.6 tonnes per year Eléonore project in Quebec ramped back up to full production during the quarter following a temporary closure due to wildfires in June.

In Australia — the world's third-largest gold producing nation — output decreased by 2.5% year-on-year in the September quarter 2023, to 73 tonnes. Australian mine production fell due to lower mine grades, planned maintenance and several mine closures (see *Australia section*).

Gold recycling in the September quarter 2023 rose year-on-year to 289 tonnes, largely due to stronger gold prices in China and India. Recycling activity was weaker than expected (given high domestic prices) in Egypt and Türkiye, as economic uncertainty and ongoing currency weakness in those countries reduced consumers' willingness to sell gold for recycling.

World supply to stabilise as mine supply growth slows

Global gold supply is forecast to stabilise above 4,800 tonnes in the period to 2025, with increasing world gold mine production offset by decreasing supply from recycling activity (Figure 10.2).

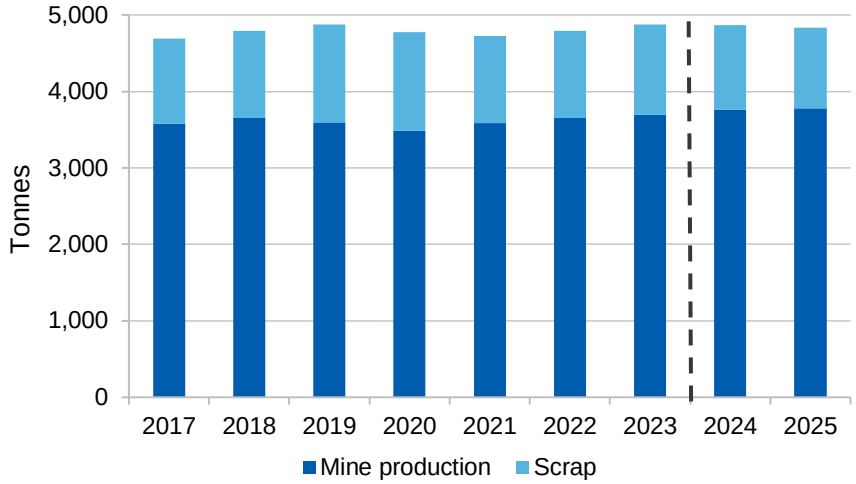
World gold mine production is forecast to rise by 1.4% a year on average by 2025 to 3,780 tonnes, led by gains in Canada, the US, Chile and Brazil.

Canadian mine output is forecast to rise by 24% from 2023 to 2025, to reach 249 tonnes. Gains will include the 11 tonnes per year Côté project and the 10 tonnes per year Blackwater project, both commencing operations in the next two years.

Continued environmental regulations and industry consolidation in China is expected to see production fall over the medium-term, however China is unlikely to lose its seat as the world's largest producer.

Partially offsetting increases in mine production, gold recycling activity is forecast to decline on average by 5.4% a year by 2025, due to lower forecast gold prices.

Figure 10.2: World gold supply



Source: Department of Industry, Science and Resources (2023); Metals Focus (2023); World Gold Council (2023).

10.4 Prices

Gold prices surged in October on geopolitical concerns

Rising bond yields tend to decrease gold's appeal to institutional and retail investors as a secure asset to hedge against inflation or other risks. This is because increases in the yield of a US Treasury (or other credible government bonds) increases the so-called market "risk-free rate", and hence the opportunity cost of holding gold (pushing prices down).

However, the relationship between real bond yields and gold prices weakened sharply following the Russian invasion of Ukraine — as prices were lifted by heightened safe-haven demand for gold (Figure 10.3). This has persisted as a driver since, muting the effect of rising interest rates.

The London Bullion Market Association (LBMA) gold price is estimated to have averaged about US$1950 an ounce over the second half of 2023 — 13% higher than in 2022. Price support has come from ongoing strength in central bank purchasing, economic uncertainty and geopolitical risk.

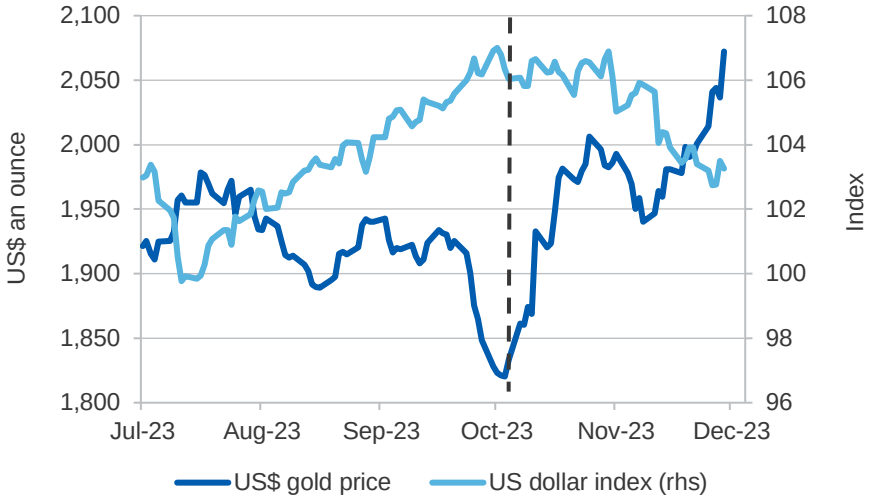
Gold prices averaged about US$1,930 an ounce in the September quarter 2023. Prior to the conflict in the Middle East, pressures from surging bond yields and a strong US dollar were pushing gold prices lower — declining by 6.4% over 2 weeks to a low of US$1,820 an ounce on 5 October (Figure 10.4).

The gold price rose sharply after the Hamas-Israel conflict started, reaching the US$2,000 an ounce mark in late October on strong safe-haven demand. Gold prices were also given a boost by falling US Treasury yields and a weakening US dollar — as markets priced in the completion of the US monetary tightening cycle and commencement of monetary easing in 2024. As at 1 December 2023, gold prices surged to US$2,072 an ounce, a new record high.

Figure 10.3: Gold price and real US 10-Year Treasury yield

Source: Bloomberg (2023); LBMA (2023) Gold price PM

Figure 10.4: Gold price and the US dollar in H2 2023



Notes: The dashed line indicates 6 October 2023

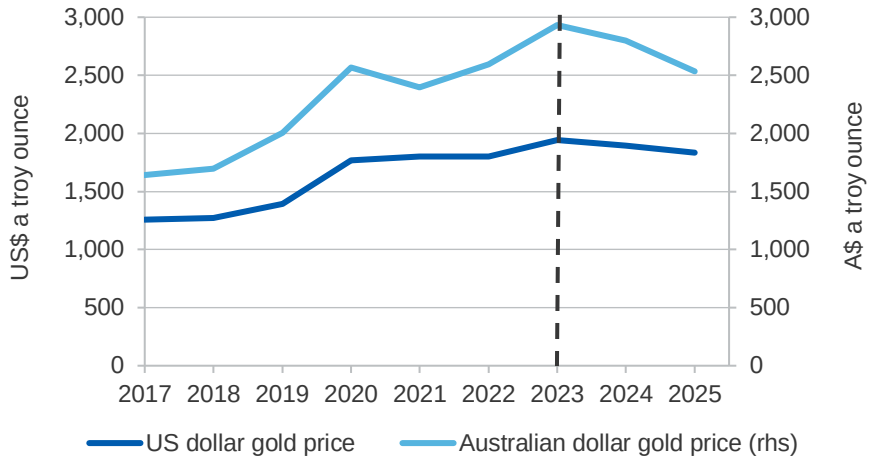
Source: Bloomberg (2023); LBMA (2023) Gold price PM

Gold prices to decline over the forecast period, but remain elevated

Gold prices are estimated to average about US$1,940 an ounce in 2023 — a slight upward revision compared with the September 2023 *Resources and Energy Quarterly*. Prices have gained support from declines in bond yields and a lift in safe-haven demand.

Prices are forecast to decline throughout 2024, centred around a scenario where US economic activity slows but does not go into recession (Figure 10.5). In this scenario, real US interest rates will remain high in line with current market expectations, leading to further declines in gold prices.

Figure 10.5: US and Australian dollar gold prices



Source: Department of Industry, Science and Resources (2023); LBMA (2023) Gold price PM

However, price forecasts have been revised up over the short-term, in recognition of ongoing strength from safe-haven and central bank demand. Gold prices have continued to hold up remarkably well despite downward pressure from various sources such as high real yields, a strong US dollar and continued ETF outflows. Official sector buying is expected to continue at strong levels and some degree of geopolitical risk premium is expected to persist, beyond what was expected in the September 2023 *Resources and Energy Quarterly*.

If US (and global) economic activity declines substantially and interest rate cuts — not currently expected by US Fed officials and some market participants — come to fruition in the first half of 2024, this could create a more supportive environment for gold and see a stronger price outcome than forecast. Ongoing support for the gold price would possibly come through lower real interest rates, a weaker US dollar and demand for gold ETFs — as equity markets likely soften.

Gold prices are forecast to fall by 2.9% a year to an average of around US$1,830 an ounce in 2025, due to pressure from high real interest rates (as global inflation eases) and a gradual easing of safe-haven demand.

In combination with a forecast appreciation in the Australian dollar, the lower US dollar gold price is expected to lower Australian dollar prices from A$2,900 an ounce in 2023 to A$2,530 an ounce in 2025.

10.5 Australia's trade, production and exploration

Australian gold exports rose in the September quarter 2023

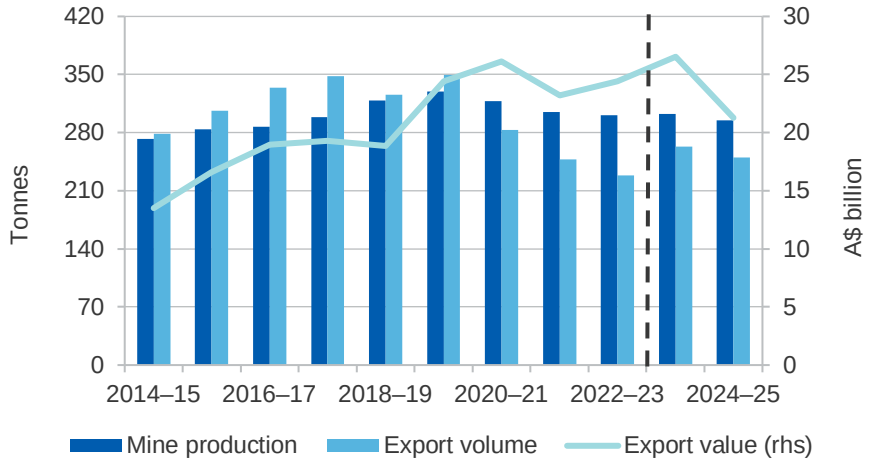
Australia's gold exports rose by 20% year-on-year to $8.0 billion in the September quarter 2023. The gain was driven by higher Australian dollar gold prices (up by 16%) and a lift in export volumes.

Growth in Australian exports was led by a 25% year-on-year increase to the financial hubs (US, UK, Switzerland, Hong Kong and Singapore), which collectively purchased $3.8 billion worth of gold. Within the financial hubs, exports to the United Kingdom increased to $1.2 billion (from zero in September quarter 2022) and exports to Hong Kong doubled year-on-year to $1.8 billion. Gold exports to China fell by 9.1% to $2.0 billion year-on-year, while exports to India more than tripled to $1.5 billion.

Australian gold export earnings to decline over the medium-term

Australian gold export earnings are forecast to increase in 2023–24 by 8.7% to $26.5 billion. Growth will be driven by 15% year-on-year growth in export volumes and a strong September quarter 2023 result. Export earnings are then forecast to decline by 20% to $21.3 billion in 2024–25 due to lower forecast prices and export volumes (Figure 10.6).

Figure 10.6: Australian gold exports and mine production



Sources: ABS (2023); Department of Industry, Science and Resources (2023).

Australian gold mine production decreased in the September quarter 2023

Australia's gold industry produced 73 tonnes of mined gold in the September quarter 2023, down by 2.5% year-on-year. Production was lower in some cases due to lower grades and major planned outages for maintenance. Production was also down year-on-year in some cases due to some mines having entered care and maintenance during the year.

Production at Newmont's (having recently acquired Newcrest) 19 tonnes per year Cadia mine in NSW fell by 14% year-on-year to 3.8 tonnes in the September quarter 2023. Falls in production were driven by lower grade and reduced mill throughput resulting from major planned shutdown activities. Cadia continued ramp up activities from its new panel cave project PC2-3 during the quarter. First renewable power from the Rye Park Wind Farm was achieved in July and early supply has commenced to Cadia under its Power Purchase Agreement.

Production at Northern Star's 13.4 tonnes per year KCGM operation was down by 16% year-on-year in the September quarter 2023, at 2.8 tonnes. Lower production was due to planned increases in waste material movement (rather than ore movement) ahead of the planned transition to the higher-grade Golden Pike North cutback in the first half of 2024. Lower grades and planned mill shutdowns also led to production decreasing by 12% year-on-year at the company's 7.6 tonnes per year Carosue Dam, and by 14% at the 10 tonnes per year Jundee Gold Operation. Meanwhile, the recently expanded Thunderbox mill ramped up to reach nameplate capacity during the quarter, resulting in production more than doubling year-on-year to 1.8 tonnes.

Compensating for lower open pit output at Evolution's Mungari project, production at the 8.6 tonnes per year Cowal operation increased by 22% to 2.1 tonnes in the September quarter, as ore production continued to ramp up from its new underground mine. Operations also returned to normal at Evolution's 2.5 tonnes per year Ernest Henry project, following outages in the first half of 2023 related to heavy rainfall.

BHP's 5.8 tonnes per year Olympic Dam mine continues to set records, delivering 1.6 tonnes of refined gold in the September quarter 2023. Gold production from Olympic Dam has grown as a result of additional concentrate feed in from the recently acquired Prominent Hill and Carrapateena assets — which collectively produced 1.1 tonnes of gold in concentrate.

First gold was poured at the 6.2 tonnes per year Bellevue Gold Project in October 2023, with work now focused on ramping up mining and processing operations towards nameplate capacity.

Genesis Minerals' (having recently acquired Dacian Gold) 2.8 tonnes per year Mt Morgans Gold Operation remained in care and maintenance throughout the quarter, having suspended operations in April. Production also continued to be low over the quarter at Wiluna Mining Corporation's namesake project, which has been processing stockpiles since entering care and maintenance in December 2022.

Australian gold mine production to reach a near-term peak in 2023–24

Australian gold production is forecast to rise marginally over the forecast period, from 301 tonnes in 2022–23 to 302 tonnes in 2024–25. The impact

of significant new projects and mine expansions coming online will be offset by mine closures and project delays.

Production will continue to ramp up for recently commenced projects, such as Pantoro's Norseman project, Calidus' Warrawoona Gold project and Bellevue Gold's namesake gold project.

Genesis Minerals' 2.0 tonnes per year Ulysses project is under construction, with production expected to commence in early 2024. Westgold's 1.4 tonnes per year Great Fingall project is also expected to achieve first production early in 2024–25.

Northern Star Resources' Super Pit (KCGM) gold operation is scheduled to begin long-term expansion in 2024, growing to about 20 tonnes by 2025–26. Northern Star recently committed to a $1.5 billion mill expansion at KCGM to double processing capacity by 2029. This expansion will increase the Super Pit's production to 28 tonnes in 2028–29, compared with 13 tonnes in 2022–23.

Weaker than expected gold prices present a downside risk to the forecasts of Australian gold output. Much weaker prices could see higher-cost Australian producers cease or cut back their operations, or upcoming projects be further delayed.

Gold exploration expenditure declined in the September quarter 2023

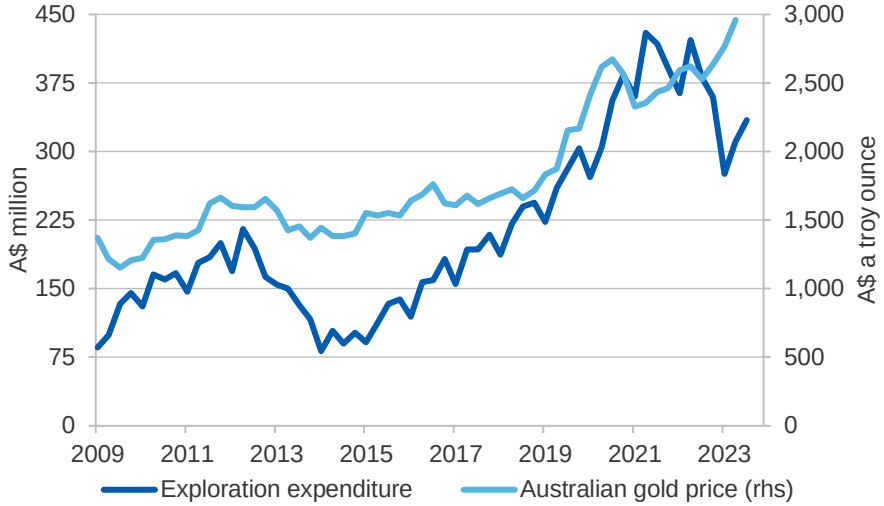
Australia's gold exploration expenditure decreased by 12% year-on-year to $334 million in the September quarter 2023 (Figure 10.7).

As a result, gold's share of Australian mineral exploration expenditure declined to 29% in the September quarter 2023, down from 35% a year earlier. This decline in exploration occurred despite high Australian gold prices, which have historically motivated high exploration expenditure. Western Australia remained the centre of gold exploration activity in Australia, accounting for 72% of total gold exploration expenditure.

Revisions to the outlook

Forecast US dollar gold prices have been revised up across the board, due to persistent strength in prices and a rebalancing of risks towards the upside. Combining this with a slightly weaker than expected AUD/USD, Australian dollar gold prices have been revised up over the outlook period.

Figure 10.7: Australian gold exploration expenditure and prices



Source: ABS, Mineral and Petroleum Exploration (cat. no. 8412.0) (2023)

Australia's forecast gold export earnings in 2023–24 have been revised up by 12% compared with the September 2023 *Resources and Energy Quarterly*. This reflects a strong September quarter 2023 result, alongside upgrades made to forecast prices and a weaker assumed Australian dollar. Forecast earnings have been revised up marginally in 2024–25 as an upward revision in price forecasts is offset by downgrades to export volumes.

Downgrades to production forecasts (underpinning lower forecast export volumes) are the result of project commencements being delayed, following updated guidance from companies. Many of these updates are covered in the 2023 *Resources and Energy Major Projects* report.

Table 10.1: Gold outlook

World	Unit	2022	2023[s]	2024[f]	2025[f]	Annual percentage change 2023[s]	2024[f]	2025[f]
Total demand	tonnes	4,699	4,500	4,445	4,460	-4.2	-1.2	0.3
Fabrication consumption [b]	tonnes	2,504	2,450	2,570	2,680	-2.1	4.9	4.3
Mine production	tonnes	3,625	3,691	3,765	3,776	1.8	2.0	0.3
Price [c]								
– nominal	US$/oz	1,801	1,943	1,893	1,833	7.9	-2.6	-3.2
– real [d]	US$/oz	1,874	1,943	1,841	1,741	3.6	-5.2	-5.4
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23[f]**	**2023–24[f]**	**2024–25[f]**
Mine production	tonnes	305	301	303	295	-1.3	0.7	-2.7
Exports								
– volume	tonnes	248	228	263	250	-7.7	15.2	-4.8
– nominal value	A$m	23,200	24,406	26,531	21,275	5.2	8.7	-19.8
– real value [e]	A$m	25,926	25,483	26,531	20,565	-1.7	4.1	-22.5
Price								
– nominal	A$/oz	2,529	2,721	2,942	2,642	7.6	8.1	-10.2
– real [e]	A$/oz	2,826	2,842	2,942	2,050	0.6	3.5	-30.3

Notes: **b** includes jewellery consumption and industrial applications; **c** London Bullion Market Association PM price; **d** In 2023 US dollars; **e** In 2023–24 Australian dollars; **s** Estimate; **f** Forecast;
Source: ABS (2023); Department of Industry, Science and Resources (2023); London Bullion Market Association (2023) gold price PM; S&P Market Intelligence (2023); World Gold Council (2023).

Aluminium

Australia's aluminium sector

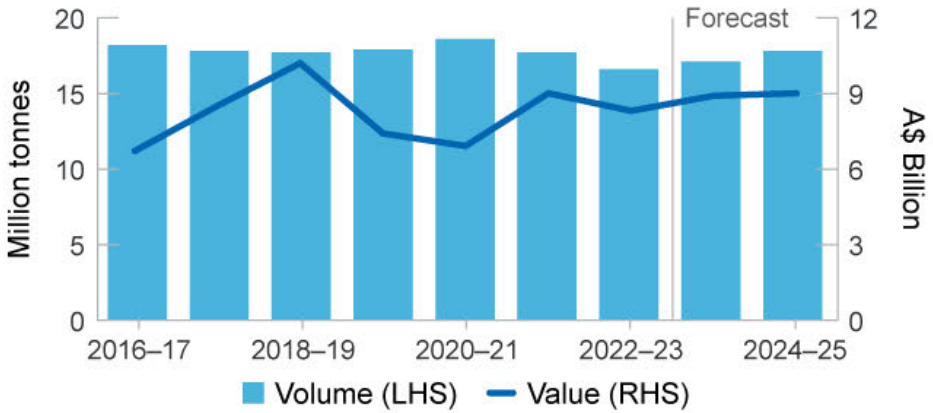
100m tonnes
of **annual bauxite output**, world's 2nd largest producer

$16 billion
primary aluminium, alumina and bauxite **exported,** 2022-23

Around 98%
of Australian bauxite is **exported to China**

Major Australian bauxite deposits, Gt

Australian alumina exports



Outlook

Prices set to rise as energy efficient technology supports aluminimum demand

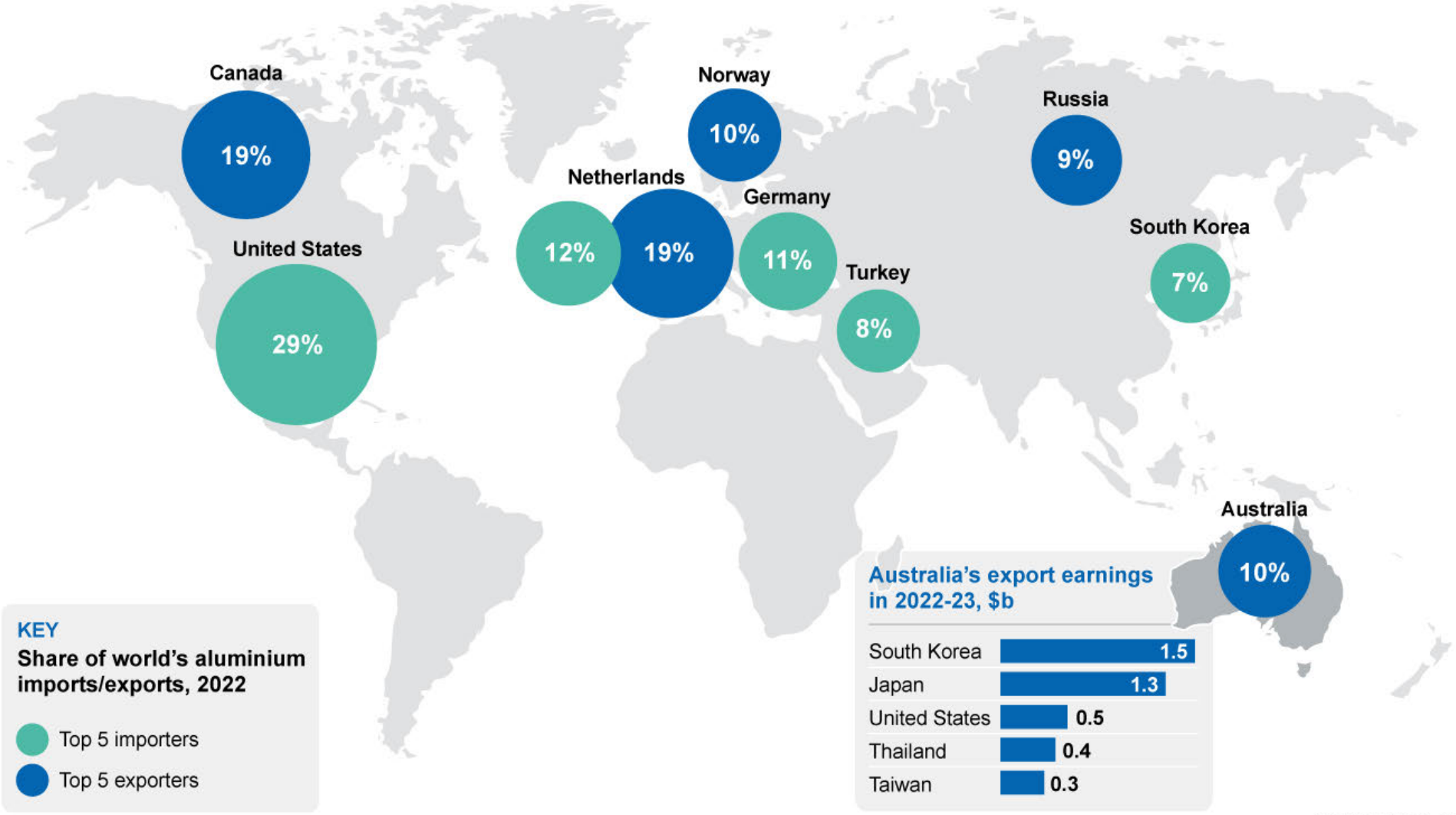
Future earnings for exports of aluminium, alumina and bauxite to **lift as prices rise**

Bauxite export volumes **set to increase** with Indonesia's bauxite export ban on June 10

Alumina export volumes and values to **increase** as global alumina demand rises

SOURCE: DISR; OCE

Aluminium TRADE MAP



SOURCE: WBMS; ABS

11.1 Summary

- The primary aluminium price has increased slightly from the September quarter. The increase comes on the back of a new round of fiscal stimulus from China, and power supply-related smelter production curtailments in China's Yunnan province.
- Earnings for Australian exports of aluminium, alumina and bauxite are expected to rise from $16 billion in 2023–24 to $18 billion in 2024–25, as prices rise over the outlook period.
- Russia's share of world aluminium exports continues to fall as a result of Western nations' sanctions over the invasion of Ukraine.

11.2 World consumption

China led higher primary aluminium consumption in Q3 2023

Strong automotive sales in China helped drive up global primary aluminium demand by 0.7% year-on-year in the September quarter 2023 to 17 million tonnes (Mt). Over this period, China's passenger car sales rose by 3.4% year-on-year to nearly 6.9 million units. As a result, Chinese primary aluminium demand increased by 4.4% year-on-year in the September quarter 2023 to 11 million tonnes.

In the United States (US), the United Auto Workers strike — which commenced on 15 September 2023 and ended on 30 October 2023 — disrupted US automotive production and reduced US primary aluminium demand, which fell by 11% year-on-year in the September quarter 2023. In Europe, sluggish construction activity continued to affect primary aluminium demand. In the September quarter 2023, primary aluminium demand in Europe fell by 10% year-on-year to 1.7 Mt.

Higher global primary aluminium production boosted the demand for alumina by 0.9% year-on-year to 34 Mt in the September quarter 2023. Alumina demand in Canada rose by 3.3% year-on-year in the September quarter 2023, as Canadian aluminium smelters lifted aluminium output.

Lower global alumina production reduced global bauxite usage by 1.3% year-on-year in the September quarter 2023.

Energy-efficient cars to boost aluminium usage over the outlook

Strong global vehicle manufacturing activity is expected to offset weak construction activity to lift global aluminium demand by 0.4% to 68 Mt in 2023. Automakers are seeking to reduce vehicle weight by substituting aluminium for steel. Aluminium is 10-40% lighter than steel in comparable components. Electric vehicle (EV) makers are focused on reducing vehicle weight, since it impacts heavily on a vehicle's driving range.

In China, the government is lifting support for the EV sector. In June 2023, the government's passenger electric vehicle (PEV) subsidy was extended to 2025, then halving until 2027. This measure will support aluminium demand from the Chinese auto sector.

PEV sales in the US are expected to rise in 2023, driven by an improvement in the supply chain. According to AutoForecast Solutions' April 2023 forecasts, North American automotive production is forecast to increase by 9.1% year-on-year in 2023 to 15.6 million units.

Beyond 2023, rising sales of energy-efficient vehicles (which are more aluminium intensive) and lower interest rates in H2 2024 and 2025, are expected to boost global aluminium demand. In the US and Europe, housing and commercial building activity are expected to recover when interest rates fall.

Rising EU imports of Chinese EVs may adversely impact European primary aluminium demand. In the first seven months of 2023, Europe imported US$13 billion of EVs from China compared to US$15 billion during the whole of 2022.

Demand from automotive and construction market participants with decarbonisation targets will boost demand for secondary aluminium consumption over the outlook period, reaching 27 Mt by 2025.

An expected rise in global primary aluminium production is likely to drive higher demand for alumina over the outlook period. World alumina consumption is forecast to grow by 2.3% in 2024 and 1.3% in 2025, up from 1.6% in 2023.

An expected fall in Australia's alumina production is estimated to reduce global bauxite consumption by 0.7% in 2023 to 357 million tonnes. Australia is the world's second largest alumina producer, accounting for around 14% of global alumina production. Beyond 2023, an expected improvement in Australia's alumina refining operations will lift global alumina output, and therefore, global bauxite consumption.

11.3 World production

Aluminium and bauxite output grew in Q3 2023

Faster than expected smelter restarts in China's major aluminium producing cities contributed to a 1.9% year-on-year rise in the global primary aluminium output in the September quarter 2023. In Yunnan Province (the 4th largest producing province), most aluminium smelters have restarted after power restrictions in June 2023 suspended output.

A production ramp-up at Emirates Global Aluminium's Al-Taweelah boosted the United Arab Emirates' primary aluminium output to 637,000 tonnes in the September quarter 2023, up 2.2% year-on-year.

Higher production at Rio Tinto's 150,000 tonnes a year Kitimat aluminium smelter boosted Canadian primary aluminium output to 829,000 tonnes in the September quarter 2023, up 8.5% year-on-year.

Lower Chinese alumina output (down 3.0% year-on-year) drove a 2.3% year-on-year fall in global alumina output in the September quarter 2023 to nearly 35 Mt. Offsetting the fall in Chinese alumina output is higher alumina output in Jamaica and Brazil (up 137% and 4.1% year-on-year in the September quarter 2023, respectively).

Higher output in Guinea — the world's largest bauxite producer — drove increased world bauxite production, which rose by 2.3% year-on-year in the September quarter 2023 to nearly 96 Mt.

World aluminium, alumina and bauxite output rise over the outlook period

Production ramp-ups in China, India and Canada are expected to continue to drive global primary aluminium output higher over the outlook period.

In China, primary aluminium output is forecast to rise from 41 Mt in 2023 to nearly 43 Mt in 2025. The forecast is about 600,000 tonnes less than the previous forecast in the September 2023 *Resources and Energy Quarterly*, due to the hydropower supply issue in Yunnan province. Aluminium smelters in the province are required to curtail aluminium capacity from November 2023 to May 2024. Wood Mackenzie has estimated that around 600,000 tonnes of primary aluminium will be loss from this curtailment.

Primary aluminium production in India is forecast to increase from 4.2 Mt in 2023 to 4.4 Mt in 2025. In Canada, primary aluminium production is forecast to increase from 3.2 Mt in 2023 to 3.3 Mt in 2025, driven by the continued ramp-up of production at the Kitimat aluminium smelter.

Driven by the increasing demand for recycled aluminium, global secondary aluminium output is forecast to rise from 32 Mt in 2023 to 36 Mt in 2025. China accounts for most of this increase, with secondary aluminium production forecast to rise from 12 Mt in 2023 to 14 Mt in 2025.

Lower production guidance for some Australian alumina refineries is expected to see a reduction in global alumina output of 1.2% in 2023. In the June quarter 2023, Rio Tinto revised its 2023 alumina guidance for its Queensland Alumina Limited (QAL) refinery in Queensland down to 7.4 Mt from 7.7 Mt. The downward revision reflects the company's initiatives to improve the QAL refinery's operational stability. Alcoa indicated that its Kwinana alumina refinery in Western Australia (WA) is mining lower grade bauxite. This suggests that lower alumina output from the Kwinana refinery is likely.

Rising output from new/existing refineries in China and Indonesia is expected to lift global alumina output over the outlook period. In China, alumina production is expected to continue to rise, reaching nearly 84 Mt in 2025. In Indonesia, the 2 million tonnes a year Mempawah alumina refinery (a joint-venture between China Aluminium Company and some Indonesian entities), is expected to come online in 2024. It is expected that eight more alumina refineries will be built in Indonesia in the coming years, with a total capacity addition of around 10 Mt.

Trade sanctions imposed on Russia over its invasion of Ukraine in February 2022 have forced Rusal to turn to China and India for alumina supply. Russia consumes 7.7 Mt of alumina a year, of which 39% is from domestic production and 61% is imported. Ukraine, Australia and Ireland were Russia's three largest suppliers of alumina in 2022, together accounting for 78% of Russia total alumina imports (Figure 11.1).

In October 2023, Rusal (Russia's largest aluminium producer) announced the acquisition of a 30% stake in a 4.8 Mt a year Hebei Wenfeng alumina refinery in China. The deal is still waiting approval from China. If approved, Rusal would be able to secure an alumina supply of 1.44 Mt a year.

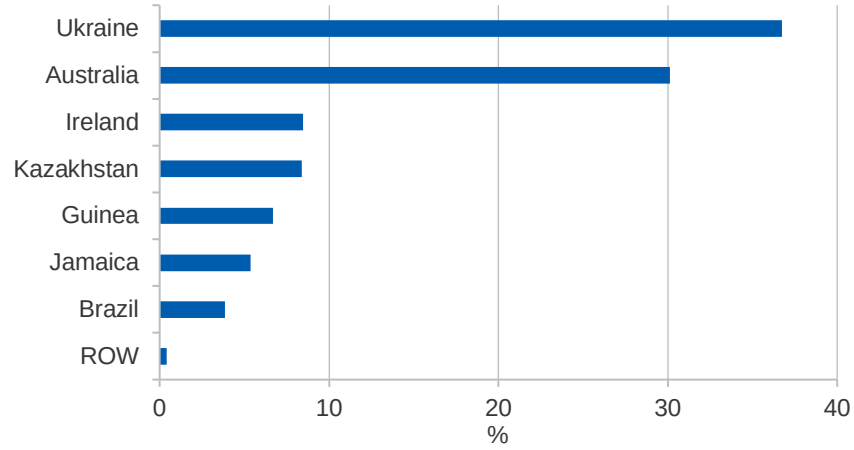
Rising production in Guinea is expected to offset the loss of Indonesian bauxite — due to an export ban which commenced on 10 June 2023 — and help drive global bauxite output up by 3.6% in 2023 to 400 Mt. World bauxite production is expected to grow by 3.8% in 2024 and 3.5% in 2025. Guinea and Australia are expected to contribute most to this rise.

A strong rise in bauxite production capacity in Guinea in the 2017 to 2022 period saw global bauxite yearly output rise by an average 6.6%. Over the same period, global primary aluminium and alumina output grew on average 2.8% and 3.7% a year, respectively (Figure 11.2).

Gains in China's primary aluminium and alumina production drove strong growth in global bauxite consumption in the 2017-22 period: global bauxite consumption rose on average 3.3% a year. Over the same period, global primary aluminium and alumina consumption grew on average 2.5% and 2.5% a year, respectively (Figure 11.2).

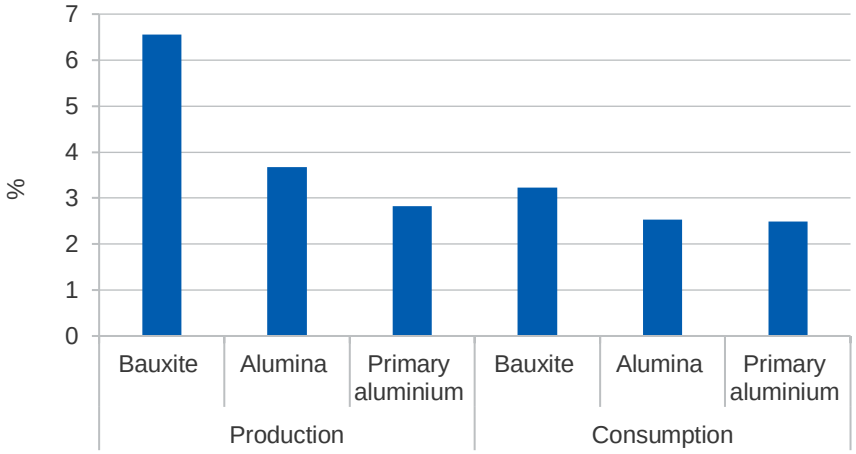
Suriname is hoping to restart the bauxite operations that were stopped in 2015. The Surinamese Government will award an operating licence in November 2024 to develop a bauxite mine in the jungle of western Suriname has a proven bauxite reserve of 324 Mt, which will be used to produce an average 3.7 MT of bauxite a year.

Figure 11.1: Russia's alumina import sources



Source: International Trade Centre (2022)

Figure 11.2: World aluminium, alumina and bauxite production and consumption, average year-on-year growth 2017 to 2022



Source: Bloomberg (2023); World Bureau of Metal Statistics (2023); CRU (2023); Wood Mackenzie (2023); Department of Industry, Science and Resources.

11.4 World trade

Weak primary and secondary aluminium and alumina exports in Q3 2023

Lower exports from Russia reduced global primary aluminium exports by 9.4% year-on-year in the September 2023 to nearly 3.2 Mt. Russia's share of global primary aluminium exports continued to drop, falling from 13% in the September quarter 2022 to just 5.2% in the September quarter 2023. Offsetting the fall in aluminium exports from Russia was higher exports from Canada (up 14% year-on-year in the September quarter 2023) and Australia (up 2.0% year-on-year in the September quarter 2023).

The slower than expected restart of idled primary aluminium capacity in Europe reduced world secondary aluminium exports in the September quarter 2023. European aluminium users turned to secondary aluminium as a substitute for primary aluminium. As a result, less secondary aluminium was available for export, which declined by 2.4% year-on-year.

Lower alumina exports from Brazil — the world's second largest alumina exporter — cut global alumina exports by 7.7% year-on-year in the September quarter 2023 to 9.5 Mt. Over this period, alumina exports from China rose by 39% to 467,000 tonnes.

Higher bauxite exports from Guinea and Australia — the world's two largest bauxite exporters — boosted global bauxite exports by 7.2% year-on-year in the September quarter 2023. Over this period, Guinea exported nearly 27 Mt of bauxite (up 21% year-on-year) and Australia exported 10 Mt of bauxite (up 14% year-on-year).

Lower aluminium and alumina imports, but higher bauxite imports

Weak primary aluminium consumption in Europe and the US reduced global primary aluminium imports by 1.9% year-on-year in the September quarter 2023. In the US, primary aluminium imports fell by 11% year-on-year in the September quarter 2023. Over this period, German and French primary aluminium imports decreased by 11% and 2.9% year-on-year, respectively.

Higher imports by China offset the fall in European and US imports. In the September quarter 2023, China imported 489,000 tonnes of primary aluminium, a rise of 178% year-on-year. Aluminium demand from the automotive and solar energy sectors was the driving force behind China's increased imports.

China's imports of Russian primary aluminium have increased significantly so far in 2023; from 281,937 tonnes in the first nine months of 2022 to 820,560 tonnes in the first nine months of 2023. On a monthly basis, China's primary aluminium imports from Russia reached a record high in September 2023, at 159,642 tonnes.

On 1 November 2023, the US Government announced the continuation of its suspension on import tariffs for European Union (EU) steel and aluminium pending further negotiations. In a move away from the previous US Administration's imposition of a 25% tariff on EU steel and 10% on EU aluminium, the current US Administration initiated a tariff rate quota system in January 2022 which permits 3.3 Mt of EU steel and 845,505 tonnes of EU aluminium to enter the US without tariffs.

Western aluminium consumers have continued to opt out of purchasing Russian primary aluminium, which accounts for around 6.0% of the world's primary aluminium output. In October 2023, Novelis Europe — a subsidiary of the world's leading rolled aluminium products maker, Novelis announced it will exclude Russian aluminium from its 2024 supply tender.

Lower European imports reduced global secondary aluminium imports by 1.5% year-on-year in the September quarter 2023. Many European nations reduced secondary aluminium consumption in response to slowing construction activity. In Spain, secondary aluminium imports in the September quarter 2023 fell by 46% year-on-year to 7,000 tonnes. Over this period, Germany's secondary aluminium imports fell by 6.7% year-on-year to 112,000 tonnes.

Higher alumina production in India reduced global alumina imports by 8.2% year-on-year in the September quarter 2023. Over this period, India imported 578,000 tonnes of alumina (down by 6.2% year-on-year).

Russia's alumina import data is not available and is not included in this assessment.

Higher bauxite imports from China increased global bauxite imports by 7.4% year-on-year in the September quarter 2023. Over this period, China imported 35 Mt of bauxite (up 17% year-on-year).

Green aluminium, alumina and bauxite

The push to lower the industry's carbon footprint continues in all stages of the sector, both in Australia and offshore.

In 2022, 37% of the electricity consumed at Portland Aluminium smelter in Victoria was derived from renewable sources, including electricity from nearby wind farms.

South32's Worsley Alumina refinery in Western Australia successfully transitioned the first of its coal-fired boilers to natural gas in October 2023. This transformation is expected to cut operational greenhouse gas emissions at Worsley Alumina by up to 208,000 tonnes a year of carbon dioxide equivalent. The company is planning to convert a second coal-fired boiler to natural gas at Worsley Alumina in 2024.

In cooperation with Vedanta Aluminium, the Indian Institute of Technology has developed an innovative bauxite refining process to reduce the generation of bauxite residue (known as red mud) by 30%. The process eliminates the iron content at the same time as a higher alumina yield is recovered. The enhances resource efficiency and reduces energy consumption during refining, thereby reducing the carbon footprint in the process.

Rio Tinto Canada is partnering with the Montreal Canadiens to introduce recyclable aluminium cups at the Bell Sporting Centre in Quebec, Canada. The new aluminium cups are produced from low-carbon aluminium and expected to replace 1.5 million plastic cups annually — with around 24 tonnes of plastic removed from the environment.

11.5 Prices

LME aluminium price has rallied from its September quarter average

The prospect of a new round of fiscal stimulus from China and power supply-related smelter production curtailments in China's Yunnan Province in the upcoming dry season have recently boosted the London Metal Exchange (LME) aluminium price. The LME primary aluminium spot price is likely to average around US$2,250 a tonne in the December quarter 2023, up from US$2,154 a tonne in the September quarter 2023. Aluminium is estimated to average US$2,260 a tonne in 2023, down by 16% from 2022 (Figure 11.3).

LME stock changes reflect a recovery in ex-China primary aluminium demand in recent months, falling from 515,750 tonnes in August 2023 to 449,525 in December 2023. Shanghai Future Exchange aluminium stocks rose from 79,194 tonnes in September 2023 to 111,869 tonnes in December 2023, reflecting higher supply from Yunnan. LME off-warrant stocks followed the same trend, rising from 207,056 tonnes in May 2023 to 330,966 tonnes in October 2023 (Figure 11.4).

In line with the fall in the primary aluminium price, the free on board (FOB) Australian alumina price is estimated to fall by 5.3% to an average US$345 a tonne in 2023 (Figure 11.3).

Primary aluminium and alumina prices to rise in 2024 and 2025

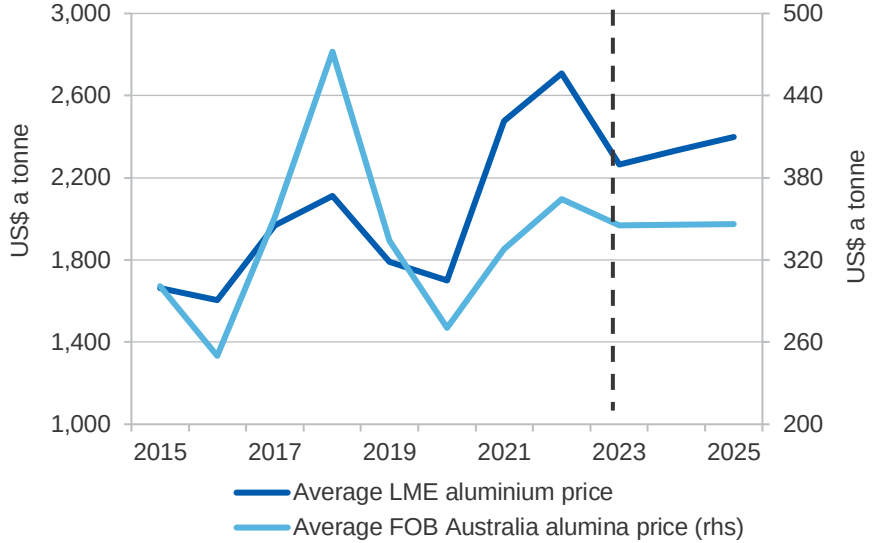
Growing global demand for new and energy-efficient cars and technologies is expected to provide support to aluminium usage and prices over the outlook period. The LME spot price for aluminium is forecast to rise at an average annual rate of 2.9% in 2024 and 2025, reaching about US$2,400 a tonne by 2025.

Like aluminium, the FOB Australian alumina price is forecast to rise in 2024 and 2025, averaging about US$350 a tonne in 2025. Stronger alumina supply from China is expected to be offset by higher alumina demand from China and ex-China' aluminium smelters.

Chinese aluminium producers' expansion into southeast Asia is expected to impact global aluminium supply over the coming years. The nearer China's domestic capacity comes to its 45 Mt a year limit, the more likely Chinese aluminium smelters will build up their operations overseas. Notable development includes the construction of 1 Mt a year Shandong Nanshan aluminium smelter in Indonesia by the end of 2023.

An influx of Russian primary aluminium into the LME warehouses is likely to distort the LME primary aluminium prices. Figure 11.5 shows the LME on-warrant primary aluminium stocks, which were first released in February 2023. Russia's share of the LME on-warrant stock has risen from 41% in January 2023 to nearly 80% in October 2023. As more and more consumers opt not to purchase Russian primary aluminium, a further increase of Russian aluminium in the LME stocks is expected.

Figure 11.3: Primary aluminium and alumina prices

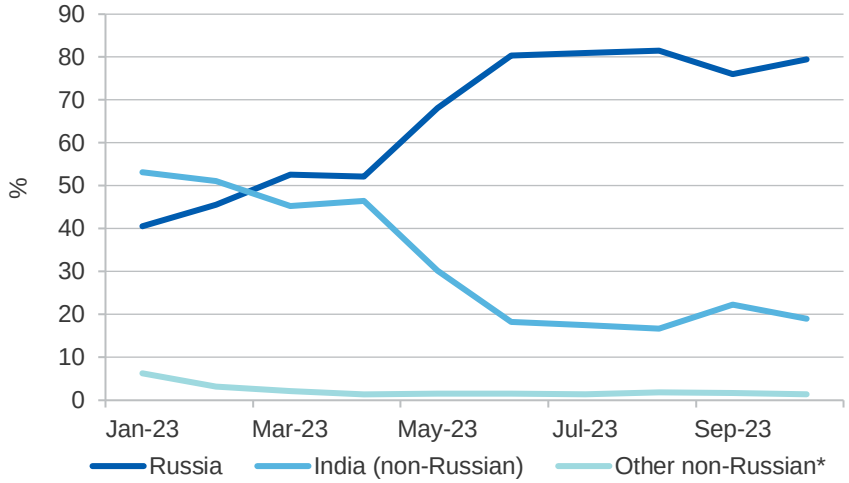


Source: Bloomberg (2023); Department of Industry, Science and Resources (2023)

Figure 11.4: Exchange aluminium stocks

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

Figure 11.5: LME on-warrant primary aluminium stocks, monthly



Notes: Non-Russian includes Australia, Bahrain, Canada, India, Indonesia, Iran, Malaysia, Oman, Saudi Arabia, South Africa, the UAE and the US.

Source: London Metal Exchange (2023)

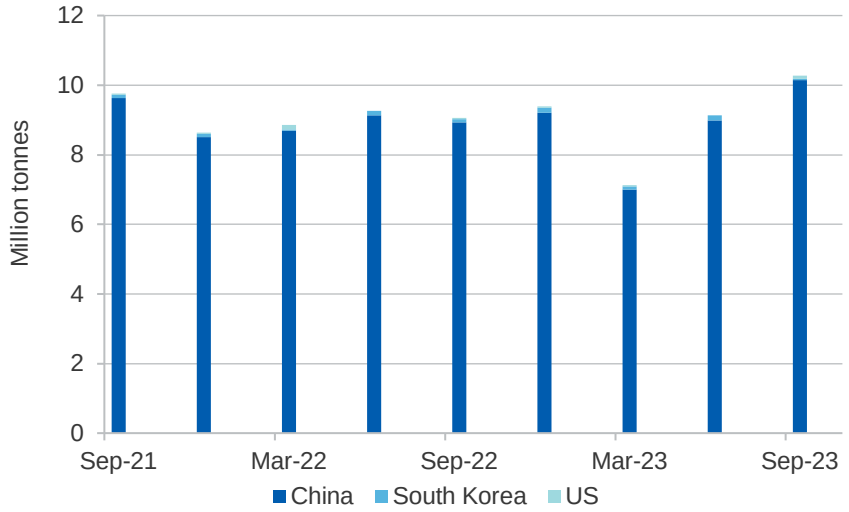
11.6 Australia's exports and production

Strong bauxite exports drove export earnings in September quarter 2023

Higher bauxite export volumes and values boosted Australia's aluminium, alumina and bauxite (AAB) exports up by 2.1% year-on-year in the September quarter 2023 to $4.0 billion.

A ban on bauxite exports by Indonesia — which started on 10 June 2023 — seems to have assisted Australian bauxite exporters. Provisional trade data for the September quarter 2023 shows a 66% year-on-year rise in Australian bauxite export values to China, to 450 million. In the September quarter 2023, Australian bauxite exports reached 10 Mt a quarter for the first time since the September quarter 2020 (Figure 11.6).

Figure 11.6: Australia's bauxite export volumes, quarterly



Source: ABS (2023) International Trade in Goods and Services, 5368.0

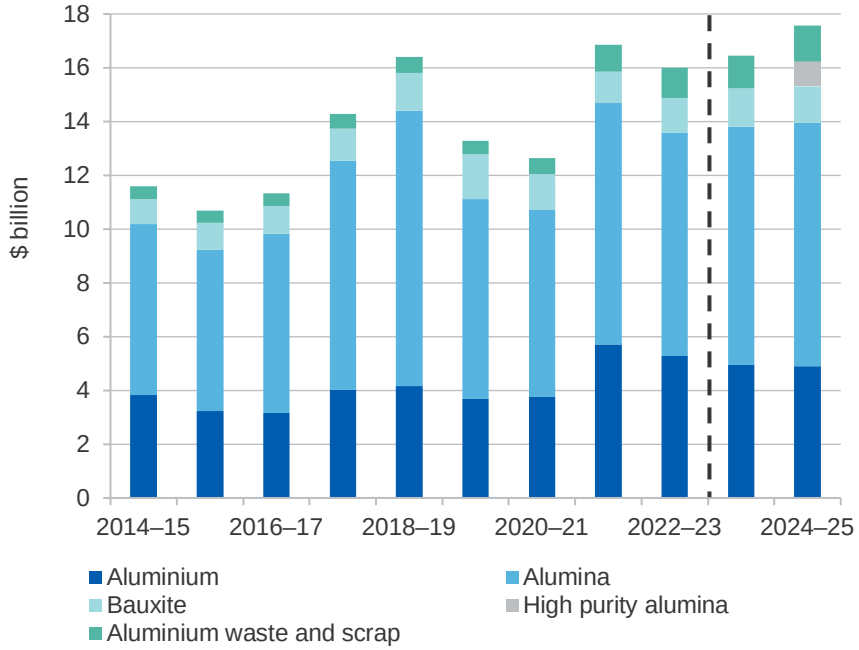
An 8.5% year-on-year fall in the LME aluminium price in the September quarter 2023 reduced Australian primary aluminium export values by 6.4% year-on-year to $1.2 billion in the September quarter 2023. Over this period, primary aluminium exports to Japan and the US fell by 33% and 25% year-on-year to $252 million and $50 million, respectively. Largely offsetting the fall in exports to Japan and the US was a 53% year-on-year rise in exports to South Korea to $402 million.

A 4.0% year-on-year fall in alumina export volumes reduced Australian alumina export values by 0.9% year-on-year to $2.1 billion in the September quarter 2023.

Higher alumina, aluminium and bauxite export earnings in prospect

An expected rise in alumina and bauxite export volumes and values are likely to boost Australian AAB export earnings from $16 billion in 2023–24 to $18 billion in 2024–25 (Figure 11.7).

Figure 11.7: Australian aluminium/alumina/bauxite exports



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources

Australia's aluminium/alumina/bauxite production rose in Q3 2023

Higher output from the Boyne Island aluminium smelter in Queensland helped lift Australian primary aluminium output by 0.9% year-on-year in the September quarter 2023. In mid-March 2023, amid operational instability, Alcoa announced an immediate 25% production cut at Portland Aluminium in Victoria.

Improved operating conditions at Rio Tinto's Queensland Alumina Limited and Yarwun alumina refineries in Queensland lifted Australian alumina output to nearly 5.0 Mt in the September quarter 2023, up 4.2% year-on-year.

Improved weather conditions in Queensland helped drive Australian bauxite output up by 4.9% year-on-year in the September quarter 2023 to nearly 27 Mt.

Higher aluminium/alumina/bauxite output expected over the outlook period

With Portland Aluminium's production cut expected to finish by the end of 2023, Australian primary aluminium output should be back close to normal over the outlook period, at about 1.6 Mt of primary aluminium a year (Figure 11.8).

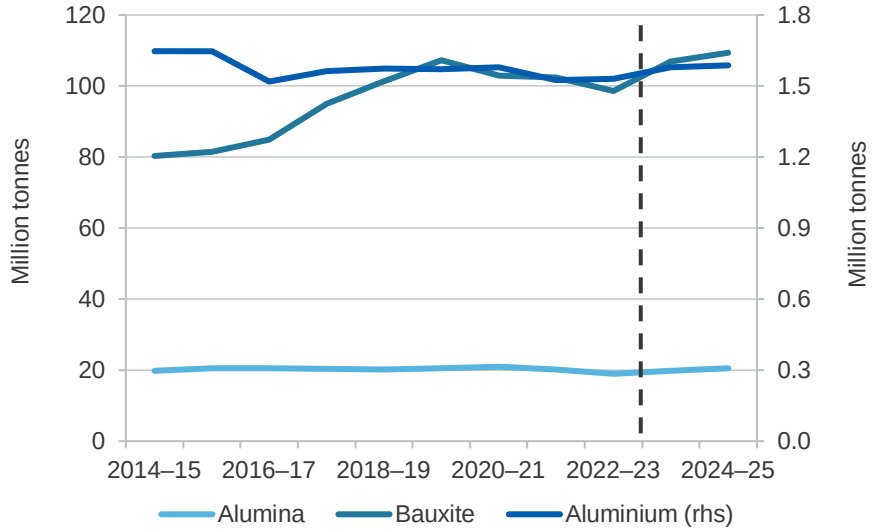
Australia's alumina output is expected to fluctuate around the 20 Mt a year level over the outlook period. At the time of writing, Alcoa is still waiting for approval from the Western Australian Government for its Mine Management Program — usually approved on a 5-year basis (Figure 11.8).

The expansion of Metro Mining's Bauxite Hills mine in Queensland from 3.5 Mt a year to 7 Mt a year is forecast to drive Australian bauxite output up by 4.4% a year to nearly 110 Mt in 2024–25 (Figure 11.8).

In November 2023, Impact Minerals released a scoping study for its 10,000 tonnes a year Lake Hope high purity alumina (HPA) project in Western Australia. The study suggests Lake Hope could possibly deliver the lowest cost HPA anywhere in the world. A preliminary feasibility study is due for completion in 2024.

FYI Resources received a $1.2 million research and development tax incentive rebate from the Australian Government in November 2023 for its HPA project in WA. FYI has developed an innovative process design for the integrated production of high quality HPA.

Figure 11.8: Australian aluminium/alumina/bauxite output



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

Revisions to the outlook

The forecasts for Australia's AAB export earnings in 2023–24 and 2024–25 have been revised up from the September 2023 REQ — by $129 million and $260 million, respectively. The revision reflects forecasts for a lower-than-expected AUD/USD over the outlook period.

Box 11.1: Russia's aluminium/alumina/bauxite production and trade

After Russia invaded Ukraine in February 2022, Australia, the United States, Canada, the European Union and other Western countries imposed sanctions on Russian exports of a number of commodities, including alumina and bauxite. This analysis presents the impacts of international sanctions on Russia's primary aluminium, alumina and bauxite (AAB) production and trade.

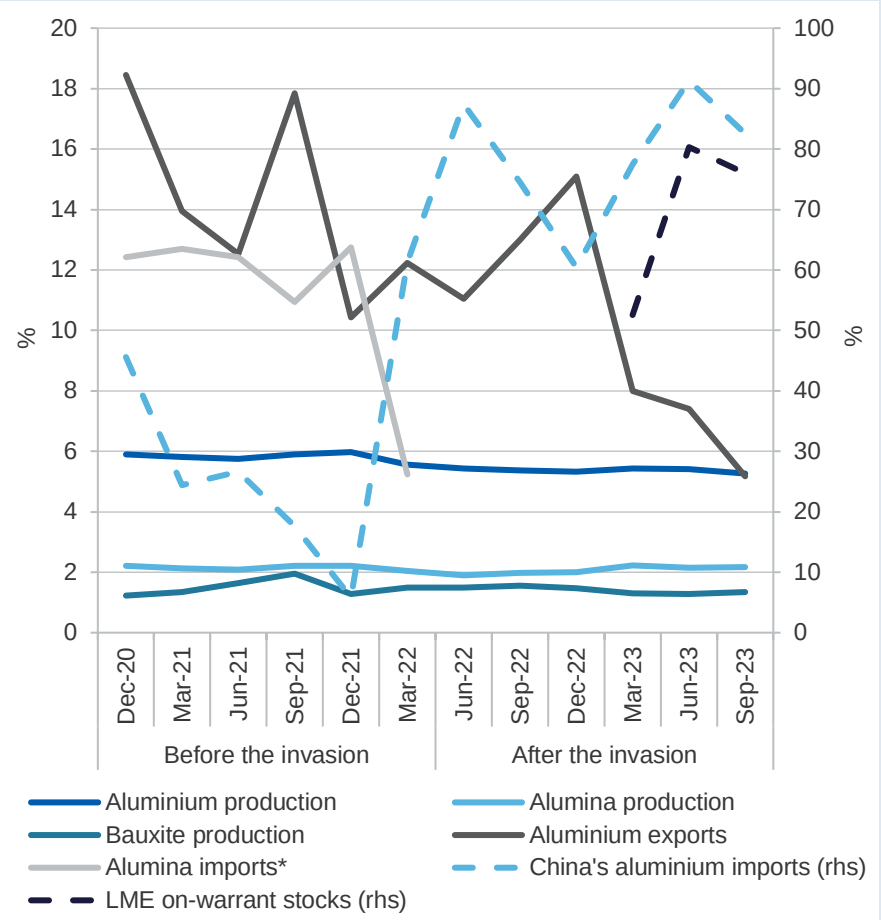
Russia's AAB production is little changed from pre-invasion levels, as is its share of global AAB output (Figure 11.9). After February 2022, Russia lost two crucial sources of alumina supply, as Ukraine suspended production and Australia banned alumina and bauxite supply to Russia. To offset for this lost, Russia has stepped up imports of alumina from China, and recently India.

Despite there being no direct sanctions on Russian aluminium by Western nations, Russia's share of world primary aluminium exports has fallen from 18% in the December quarter 2020 (five quarters before the invasion) to 5.2% in the September quarter 2023 (six quarters after the invasion) (Figure 11.9). Western aluminium consumers have opted not to buy Russian aluminium to avoid being caught up in the fallout from any new sanctions.

Russia has diversified its primary aluminium export markets from the West to China. Russia's share of China's total primary aluminium imports has risen from 5.8% in the December quarter 2021 (one quarter before the invasion) to 83% in the September quarter 2023 (six quarters after the invasion).

Russia has shipped its unsold primary aluminium stocks into the LME aluminium warehouses. Russia's share of the LME on-warrant stocks has risen from 53% in the March quarter 2023 to 76% in the September quarter 2023.

Figure 11.9: Russia's shares of global aluminium/alumina/bauxite production, consumption, exports and imports



Notes: *June quarter 2022 to September quarter 2023 data is not available.

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

Source: China Customs; London Metal Exchange; World Bureau of Metal Statistics; Reuters, Analysis: To cut reliance on China, Russia turns to India for aluminium feedstocks, 15 September 2023; Department of Industry, Science and Resources.

Table 11.1: Aluminium, alumina and bauxite outlook

						Annual percentage change		
World	**Unit**	**2022**	**2023 [s]**	**2024 [f]**	**2025 [f]**	**2023 [s]**	**2024 [f]**	**2025 [f]**
Primary aluminium								
Production	kt	68,529	69,935	71,556	72,516	2.1	2.3	1.3
Consumption	kt	68,050	68,354	72,238	73,385	0.4	5.7	1.6
Prices aluminium[c]								
- nominal	US$/t	2,708	2,264	2,332	2,397	-16.4	3.0	2.8
- real[d]	US$/t	2,818	2,264	2,269	2,277	-19.7	0.2	0.4
Prices alumina spot								
- nominal	US$/t	365	345	346	346	-5.3	0.1	0.1
- real[d]	US$/t	379	345	336	329	-9.0	-2.6	-2.2
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**
Production								
Primary aluminium	kt	1,525	1,532	1,579	1,587	0.5	3.1	0.5
Alumina	kt	20,114	18,971	19,795	20,446	-5.7	4.3	3.3
Bauxite	Mt	102.3	98.5	107.0	109.4	-3.7	8.6	2.2
Consumption								
Primary aluminium	kt	240	151	204	191	-37.1	35.0	-6.5
Exports								
Primary aluminium	kt	1,368	1,440	1,429	1,444	5.3	-0.7	1.0
- nominal value	A$m	5,710	5,282	4,949	4,905	-7.5	-6.3	-0.9
- real value[e]	A$m	6,380	5,515	4,949	4,741	-13.6	-10.3	-4.2
Alumina	kt	17,739	16,566	17,094	17,788	-6.6	3.2	4.1
- nominal value	A$m	8,977	8,308	8,862	9,040	-7.5	6.7	2.0
- real value[e]	A$m	10,032	8,674	8,862	8,738	-13.5	2.2	-1.4
Bauxite	kt	35,957	34,113	38,252	38,325	-5.1	12.1	0.2
- nominal value	A$m	1,177	1,284	1,428	1,366	9.1	11.3	-4.4
- real value[e]	A$m	1,315	1,340	1,428	1,320	1.9	6.6	-7.6
Total value								
- nominal value	A$m	16,854	16,006	16,489	17,562	-5.0	3.0	6.5
- real value[e]	A$m	18,834	16,712	16,489	16,976	-11.3	-1.3	3.0

Notes: Total nominal and real values of Australian exports include primary aluminium, aluminium waste and scrap, alumina, high purity alumina and bauxite. **c** LME cash prices for primary aluminium; **d** In 2023 calendar year US dollars; **e** In 2023–24 financial year Australian dollars; **f** Forecast; **s** Estimate. Sources: ABS (2023) International Trade in Goods and Services, 5368.0; Bloomberg (2023); London Metal Exchange (2023); Department of Industry, Science and Resources (2023); World Bureau of Metals Statistics (2023)

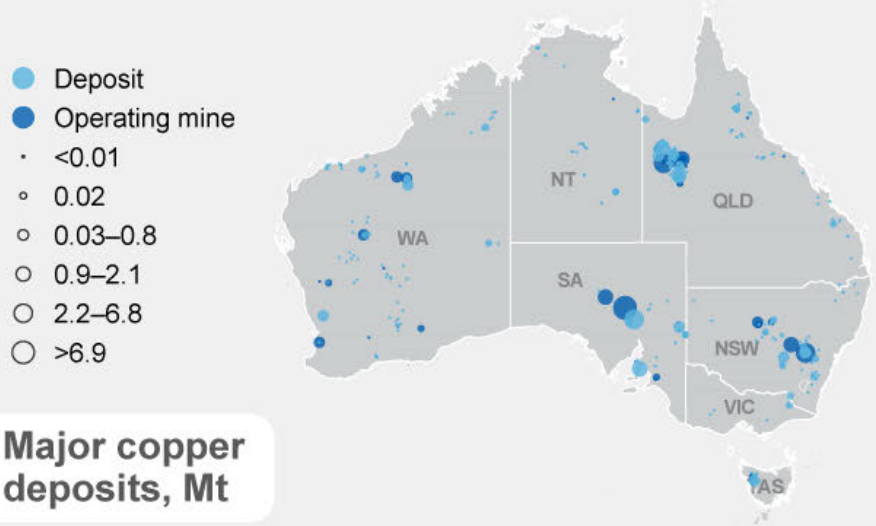
Copper

Australia's copper sector

Ranked 2nd
in the world for copper **resources**

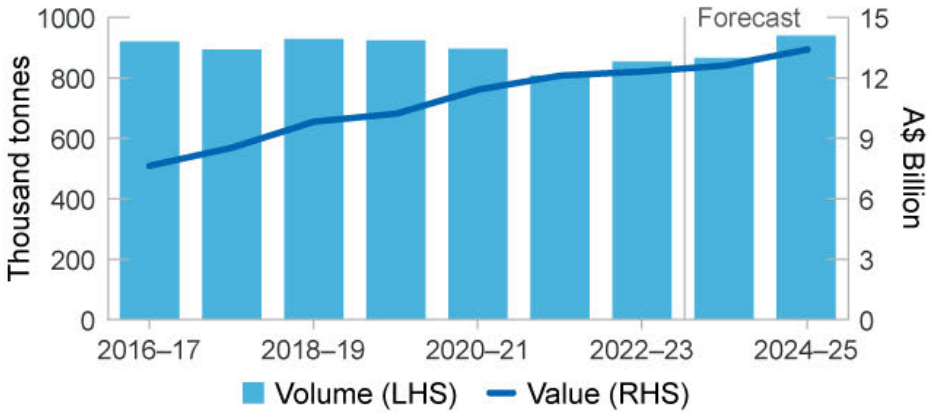
4th largest
exporter and **8th largest producer** globally, 2022

200k tonnes
produced per year at Australia's largest mine, Olympic Mine



Major copper deposits, Mt

Australian copper exports



Outlook

H2 23 prices **weak**, poor construction, manufacturing outlook in world markets ex. China

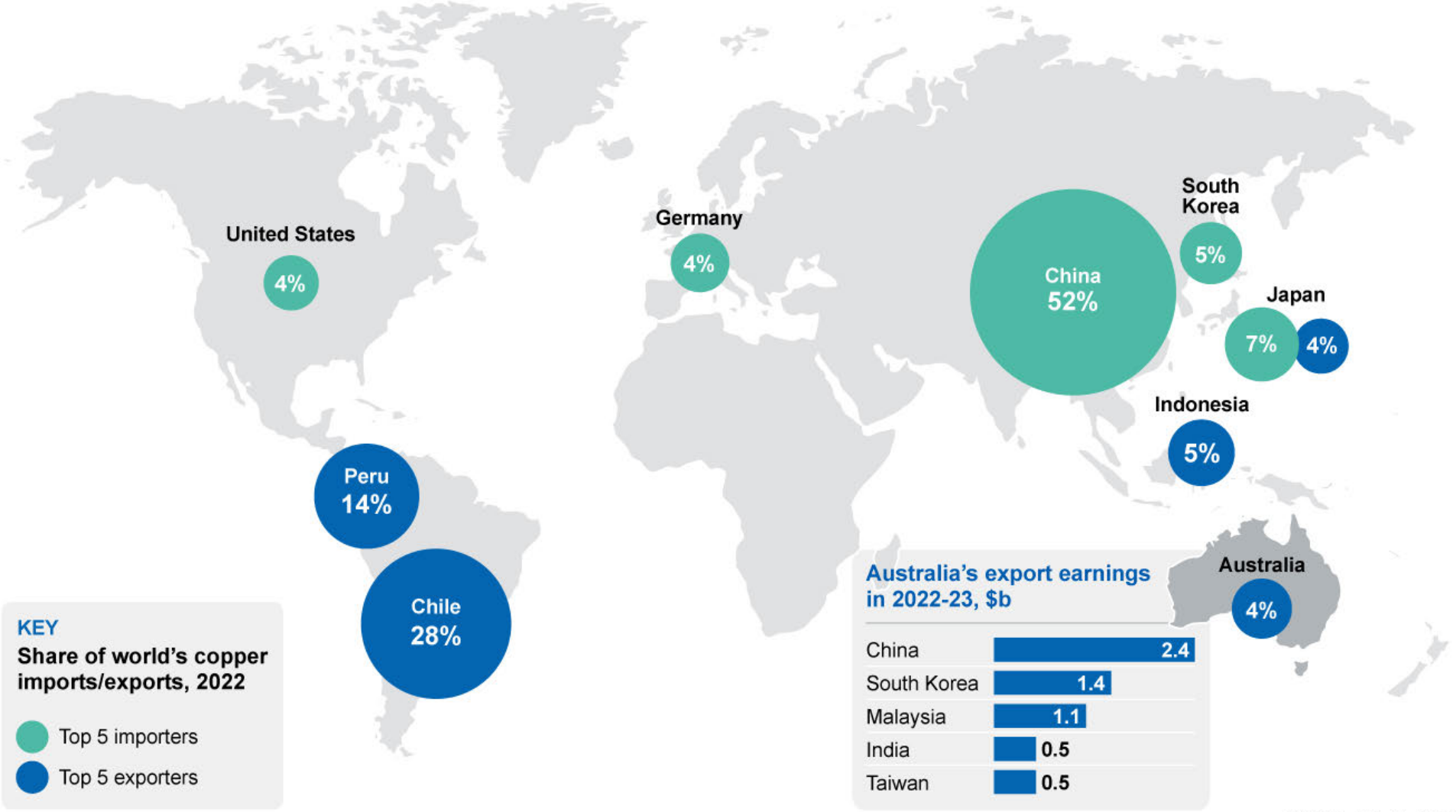
Export earnings stable at **$12 billion** as rising export volumes offset weaker prices

Exports to **increase** as supply disruptions **ease, growing production** from mid-tier producers

Exploration expenditure **continues to trend higher** in June quarter

SOURCE: GA; DISR; OCE

Copper TRADE MAP



SOURCE: ABS; GA; WBMS

Note: Reflects metal content of ores and concentrates and refined metal, export earnings may not be complete due to partial confidentialisation of trade data

12.1 Summary

- Copper prices have trended lower in H2 2023. Despite strong growth in copper demand in China in 2023, the poor near term outlook for construction and manufacturing in major markets such as Europe and Advanced Asia continues to weigh on the copper price.
- The benchmark LME copper is estimated to average about US$8,200 a tonne in H2 2023 (down from US$8,700 a tonne in H1).
- Global copper consumption is estimated to grow by 7.3% in 2023. China is expected to account for the bulk of this growth, driven by increased manufacturing activity and large investments in energy infrastructure.
- Australian copper export earnings are forecast to reach around $12.8 billion in 2023–24. Higher Australian production and export volumes will see export earnings reach $13.4 billion in 2024–25.

12.2 World consumption

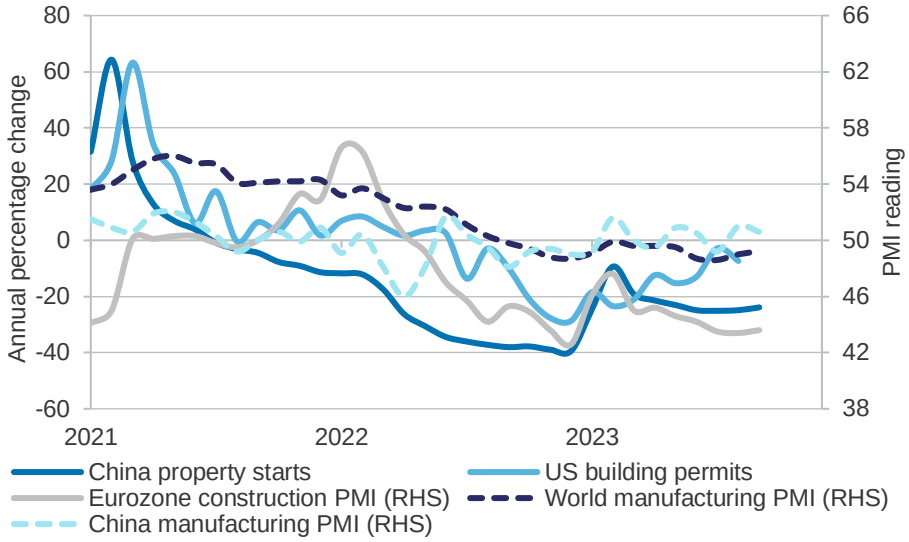
World copper demand growth robust so far in 2023, all due to China

Global refined copper consumption was 8.4% higher (year-on-year) in the first nine months of 2023, reaching 20.7 million tonnes (Figure 12.2). This growth was primarily driven by China (up 12% over the period) and Rest of Asia, helping to offset an almost 12% fall in US consumption.

Despite ongoing challenges faced in its residential property sector, China's demand for copper has remained incredibly strong so far in 2023. A key driver has been the country's infrastructure sector, which has maintained high growth this year. This includes the country's clean energy industry, with the central government continuing to make large investments in energy infrastructure (particularly renewable energy) in 2023. China is estimated to have added around 150GW of additional solar and wind power generation capacity so far this year, equating to around 650,000 tonnes of copper demand (equivalent to 5% of the country's total copper demand over the same period).

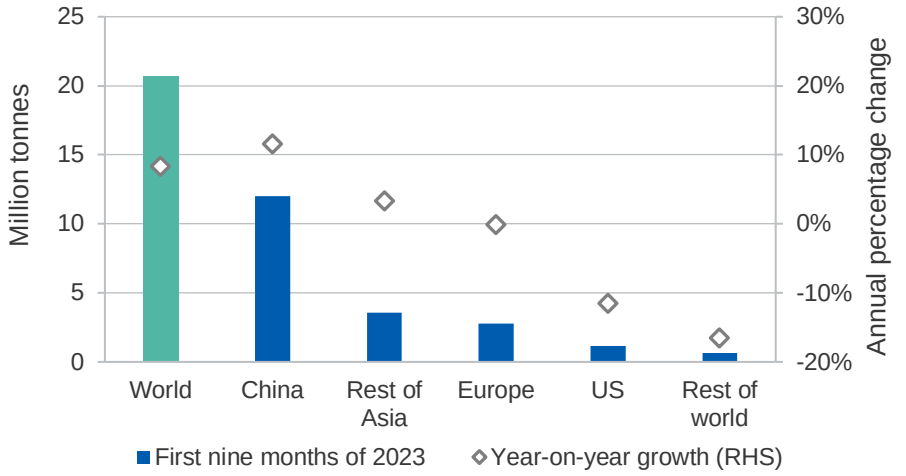
China's electric vehicle (EV) manufacturing sector has also seen further growth in 2023, with pure EV passenger vehicle production in the year-to-September rising 11% year-on-year.

Figure 12.1: Leading global indicators for copper



Source: Bloomberg (2023)

Figure 12.1: Refined copper consumption



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

With pure EVs (also known as battery EVs) requiring close to four times as much copper as conventional internal combustion engine vehicles, EV production is expected to become a growing source of domestic demand for copper in China over the next few years.

These industries have helped to offset continued weakness in the country's property sector (Figure 12.1), which has seen further falls (year-on-year) in new construction starts in H2 2023 (see *Macroeconomic Outlook* and *Steel* chapters).

Weaker outlook for world (ex. China) manufacturing, and construction

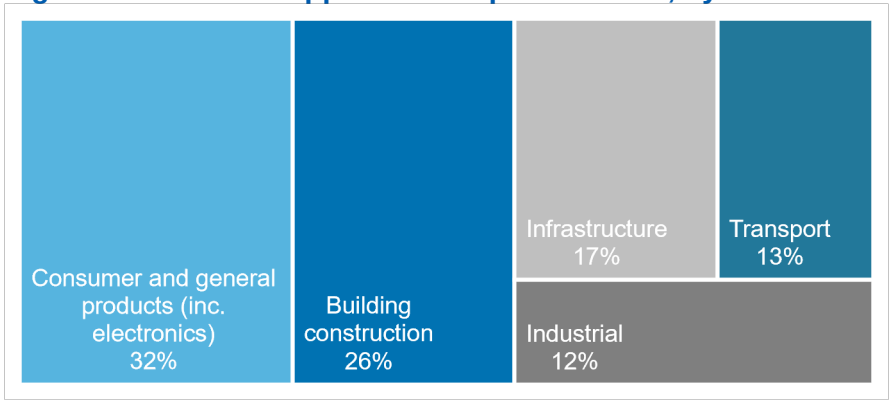
A slowing global economy through 2023 has seen dampened manufacturing activity amongst other major economies. Industrial production fell in August in both the Eurozone and Advanced Asia regions, while US output has been flat (year-on-year) through much of 2023. Manufacturing PMIs in October point to a further contraction for key producers such as Europe, US and Japan heading into 2024 (Figure 12.1).

Global construction activity — which accounted for about 25% of world copper demand in 2022 — has helped to mitigate ongoing weakness in world manufacturing (ex China). By sector, infrastructure continues to drive activity, while tighter financial conditions have discouraged activity in the residential and commercial sectors. By region, the Middle East & Africa, and the Americas continue to see the strongest activity, though growth appears to be slowing in North America. Europe continues to see a noticeable deterioration in both activity and year-ahead expectations, while the outlook for the Asia region remains mixed, with a positive view for India and Philippines offsetting weaker expectations for China.

European manufacturing and construction facing continued challenges

European copper consumption in the nine months to September 2023 was 0.2% lower year-on-year. This follows continued frailty in the region's manufacturing sector, with industrial output in the Eurozone (year-on-year) in September, and the manufacturing PMI in October at a historically weak level. S&P's Global Copper Users survey for October showed the steepest decline in production in the region since May 2020.

Figure 12.3: World copper consumption in 2022, by end use



Notes: Uses categories from the Copper Alliance Global Semis End Use data; **Consumer and general products** inc. appliances, instruments and tools, cooling equipment, electronics and other diverse products; **Building construction** inc. plumbing, telecommunications, air conditioning, electrical power; **Infrastructure** inc. power utility and telecommunications; **Transport** inc. automotive, EV batteries and other transport; **Industrial** inc. transformers and motors, non-electrical fittings and plant.

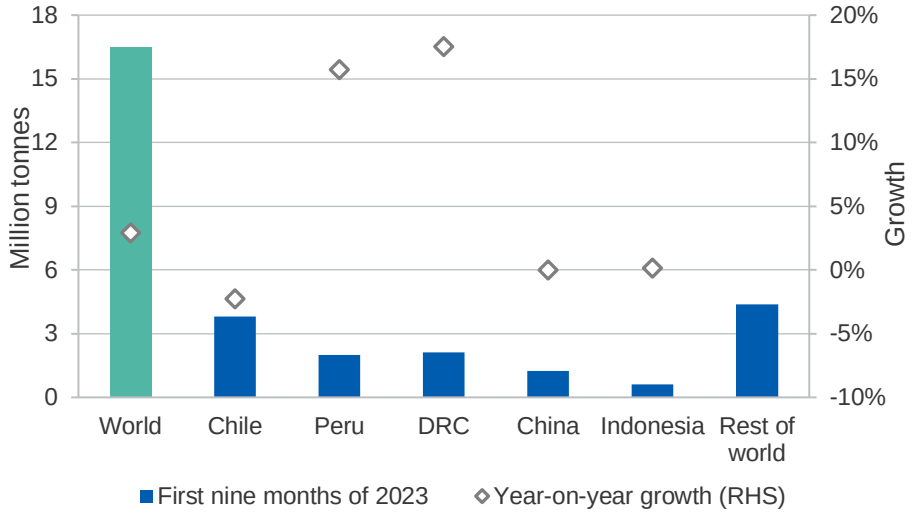
Source: International Copper Study Group (2023)

Despite an ambitious medium-term outlook for the region associated with its NextGenerationEU plan, the European construction sector faces further near-term challenges. The Eurozone construction PMI in October marked its fastest decline in 10 months, while further falls in new orders points to pessimism for the sector heading into 2024.

US manufacturing faces near term challenge, but strong long-term outlook

The US manufacturing PMI returned to a neutral reading in October, after several months of contractionary expectations through the second half of 2023. Rising input costs continue to be a concern for producers, with growth in the country's industrial output remaining flat (year-on- year) through the second half of the year. Despite the near-term challenges, new investment — encouraged by the Inflation Reduction Act — is expected to drive stronger growth in US manufacturing activity over the medium term. This will include a particular concentration of projects in the clean energy sector, with market estimates of as much as $280 billion in new investments in the sector since the passing of the Act.

Figure 12.4: Mined copper production



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

After strong growth in 2023, global copper demand is expected to grow by 0.3% per annum to 2025. World demand will be supported by considerable infrastructure works (planned or underway) in key regions (particularly from the energy sector), as well as continuing penetration of EVs in the global automotive sector.

12.3 World production

Global mined copper output expected to grow modestly in 2023

Global mined copper production grew 2.9% (year-on-year) in the nine months to September 2023, to reach 16.5 million tonnes. Amongst major producers, there were falls in output for Chile, and flat growth for China and Indonesia over the period (Figure 12.4).

World mine production has been affected by a number of concurrent issues so far in 2023, including adverse weather, equipment failure, community action, slower than expected ramp-up of projects, and lower grades from many existing operations.

Codelco — the world's largest copper miner in 2022 — has continued to struggle with operational issues and high debt through 2023. This culminated in the company recently cutting production guidance for 2023 by around 5%. In an effort to safeguard margins, the company recently announced an aim to remove floating premiums in its 2024 contracts and revert to a fixed rate of around US$90 a tonne, down 36% from this year's rate. The company is reported to be exploring replacing its current long-term copper concentrates export contracts with higher value-add products such as blister and anodes.

The fall in output from Chile's (and the world's) largest miner was partially offset by 8% higher (year-on-year) production from the BHP joint venture, Escondida, in the September quarter 2023. Escondida also reported the successful completion of negotiations for a new collective agreement with its supervisor's union.

Peru saw strong growth for the first nine months of 2023, rising 16% year-on-year. This included higher production from Peru's newest major copper mine, Quellaveco — a joint venture between Anglo American and Mitsubishi — with the operation contributing to a 42% increase in quarterly production for Anglo American in the September quarter 2023.

Mined copper to grow by around 2.8% annually to 2025

Mined copper production is expected to grow close to 1.9 million tonnes over the next two years, with the majority of the increase coming from Chile, the Democratic Republic of Congo and Russia.

Chile is expected to add around 500,000 tonnes of mined capacity over the outlook period. This will include ramp up of Teck Resources' Quebrada Blanca Phase 2 operation, which reached a 70% run rate at the end of the September quarter. The company expects to be operating at full capacity (300,000 tonnes per annum) by the start of 2024.

The Democratic Republic of the Congo is expected to add around 450,000 tonnes in new capacity over the outlook period. This expansion reflects significant Chinese investment in many of the country's copper projects, including the 650,000 tonnes per annum Kamoa-Kakula project

(joint owned by Zijin Mining Group), the Deziwa mine (joint owned by China Nonferrous Metal Mining Company), and China Molybdenum Company's Kisanfu project.

Russia is also expected to see two significant copper projects commissioned over the outlook period, with a potential capacity of more than 400,000 tonnes of production per year. This includes the Malmyzh gold-copper project in Far East Russia, and Russia's largest copper mine Udokan in Eastern Siberia.

China and DRC leading global refined copper production in 2023

Refined copper production grew 7.3% year-on-year for the first nine months of 2023, to reach around 20.4 million tonnes (Figure 12.5). This included significant growth in the Democratic Republic of Congo and China — the world's largest producer with almost half of the world's refined output — over the period. These gains helped to offset falls amongst other major producers such as Europe and Chile.

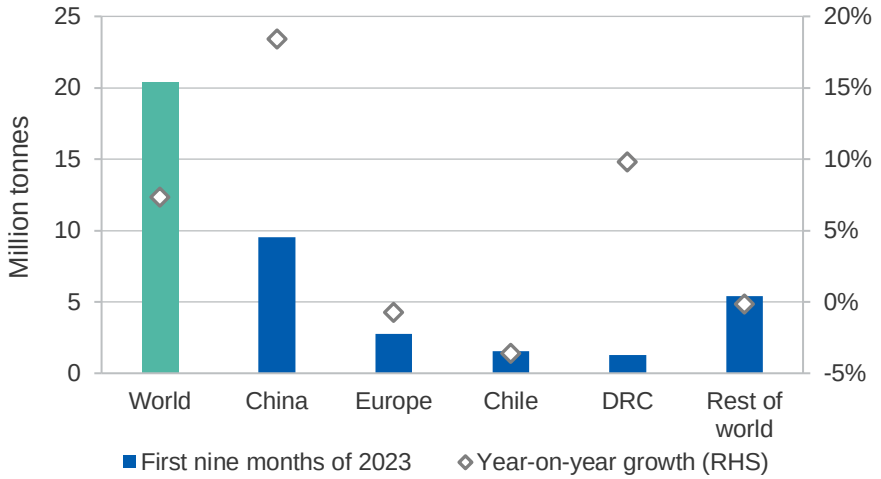
Domestic refiners in China significantly boosted production in the first nine months of 2023, growing 18% year-on-year. While low inventories and stronger refining charges contributed to this increase, the rise was concurrent with a significant fall in China's imports of refined copper over the same period. Rising domestic output in part reflects China's usual seasonal ramp up in inventories to meet the typical construction peak period in September and October.

However, despite the strong rise in Chinese copper output, copper inventories in China (as well as other exchanges) remain at historic lows, and this represents an ongoing upside risk to prices over the outlook period (Figure 12.6).

China, Indonesia and India to drive expansion in refined output to 2025

Global refined copper production in 2023 is estimated at around 27.7 million tonnes in 2023 and grow by around 0.7% annually through to 2025. This is expected to be led by new capacity in China, Indonesia and India.

Figure 12.5: Refined copper production



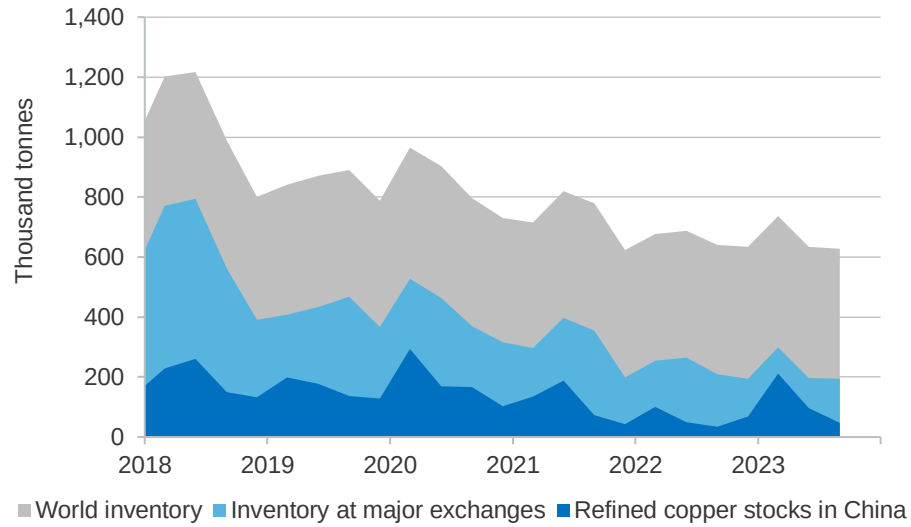
Source: World Bureau of Metal Statistics (2023); Department of Industry, Science and Resources (2023)

China is expected to see more than 1 million tonnes of refining capacity added in the next few years, equivalent to close to 10% of its total production in 2022. This will include a 275,000 tonne expansion of Guangxi's Nanko refinery, and three projects owned by Tongling Nonferrous — and all slated for completion by 2025.

Indonesia is expected to drastically increase copper refining output in the next couple of years, a consequence of a 2018 government policy to process all ores domestically. The country's largest mine PT Freeport currently has construction underway on its new 600,000 tonne per year Manyar Maju refinery, with first production expected in H2 2024.

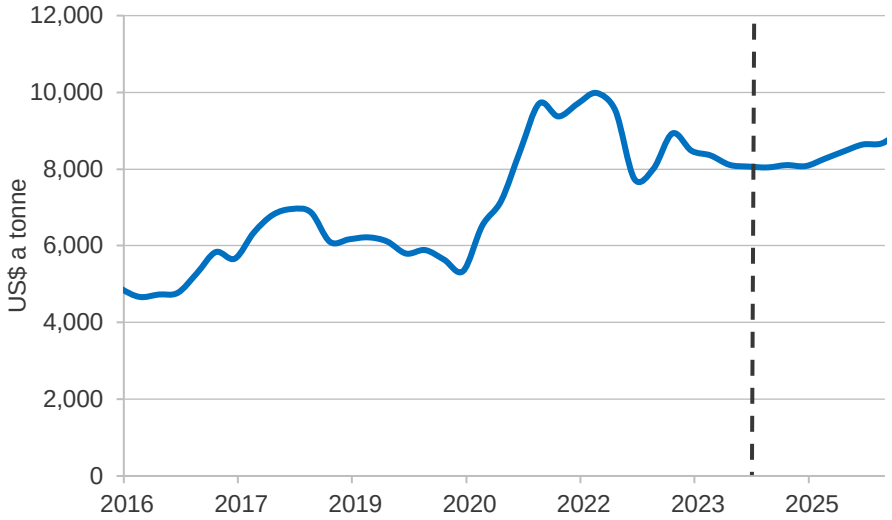
India is also expected to see strong growth in refined copper output over the next few years. This includes Adani Group's Gujarat refinery, expected to be operational in early 2024 — with an initial capacity of 500,000 tonnes per year, and an eventual annual nameplate capacity of 1 million tonnes.

Figure 12.6: Global copper inventories



Source: Bloomberg (2023)

Figure 12.7: Copper price



Source: LME (2023) official cash price, refined

12.4 Prices

Global macro headwinds continuing to weigh on prices heading into 2024

From a peak of US$8,900 a tonne in March, copper prices have continued to trend lower in recent months, averaging US$8,190 a tonne in November. The fall comes despite solid growth in China's refined copper demand through 2023, a consequence of the poorer outlook for construction and manufacturing in other key markets, such as Europe and ex-China Asia.

The weak global outlook (ex China) is expected to put downward pressure on copper prices in the near term. Lead indicators suggest further near-term vulnerability in global manufacturing, and in construction activity in key markets such as Europe. China is also expected to face continued challenges in its construction sector in coming months, though this will be offset by robust activity in its manufacturing and energy infrastructure sectors. Compared to an estimated average of around US$8,200 a tonne in H2 2023, the price is expected to average around $8,100 a tonne in 2024 and rise to $8,500 a tonne in 2025 (Figure 12.7).

Upside risks to prices include the historically low levels of inventories globally (Figure 12.6). Stronger-than-expected demand in coming quarters could be expected to draw inventories further and possibly cause price spikes. Continued expansion of clean energy manufacturing in economies such as China and the US also present upside risks to copper prices over the outlook, with significant public and private investment in manufacturing capacity and infrastructure in both countries in recent years.

12.5 Australia

Falling copper price to offset stronger export volumes to 2024–25

Exports are forecast to be around $12.8 billion in 2023–24, a 4.2% rise year-on-year (Figure 12.8). Moderating prices through late 2023 and projected for 2024 are expected to be offset by stronger export volumes forecast, for both mined and refined copper products.

In 2024–25, continued growth in export volumes and stronger prices are expected to contribute to export earnings of around $13.4 million.

Mine production sees healthy growth over the outlook period

Mined production in the September quarter 2023 was 4.2% lower year-on-year. This follows a 6.4% fall in output from BHP's Copper South Australia over the period, a consequence of planned maintenance undertaken during the September quarter.

Mined production is expected to grow over the outlook period to reach around 868,000 tonnes in 2024–25. These gains are largely due to fewer COVID- and weather-related disruptions (due to the end of the La Niña weather episode), as well as new production from greenfield and brownfield mid-tier producers.

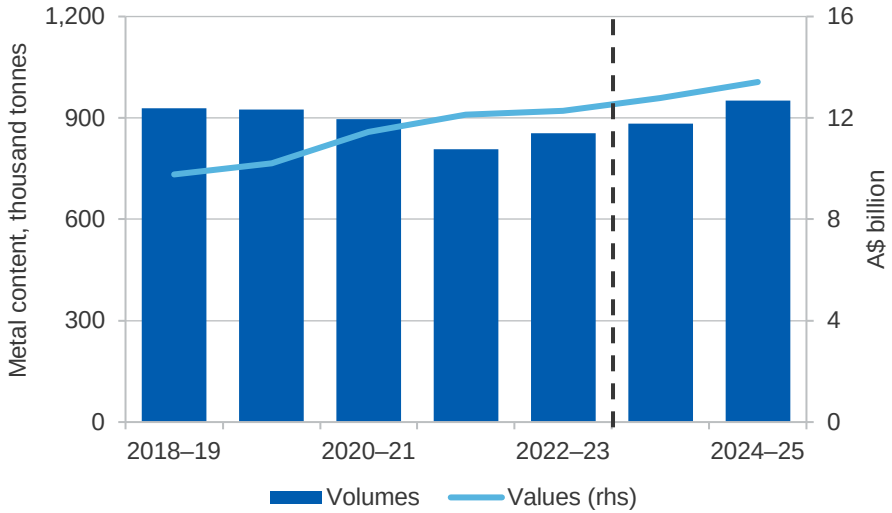
The rise in Australian mined production will come despite the closure of Glencore's Mount Isa copper mines and concentrator in 2025. Despite the mine closure, the company's copper smelter in Mount Isa and refinery in Townsville are expected to continue operating to 2030, subject to approval of additional capital investment.

Australia's refined copper production is also expected to grow by around 1.8% annually to 2024–25, to reach around 471,000 tonnes. BHP's acquisition of OZ Minerals in May this year is expected to significantly increase refined copper output from the company's South Australian operations, now known as Copper South Australia.

Copper exploration very strong through 2023

Copper exploration expenditure rose to $183 million in the September quarter 2023. This was around 10% higher than the comparable quarter in 2022, and continues a general upward trend seen since 2017.

Figure 12.8: Australia's copper export volumes and values



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Revisions to the outlook

Compared to the September *Resources and Energy Quarterly*, the forecast for Australia's copper export earnings in 2023–24 are little changed over the outlook period offset by stronger export volumes. Forecast earnings in 2024–25 have been revised up by $0.7 billion due to stronger export volumes (particularly new ores and concentrates products).

Table 12.1: Copper outlook

						Annual percentage change		
World	**Unit**	**2022**	**2023[s]**	**2024[f]**	**2025[f]**	**2023[s]**	**2024[f]**	**2025[f]**
Production								
– mine	kt	21,586	22,333	23,565	24,248	3.5	5.5	2.9
– refined	kt	25,786	27,585	28,073	28,213	7.0	1.8	0.5
Consumption	kt	25,842	27,729	27,932	28,347	7.3	0.7	1.5
Closing stocks	kt	942	644	526	655	-31.7	-18.3	24.7
– weeks of consumption		1.9	1.3	1.0	1.2	-33.6	-20.2	21.4
Prices LME								
– nominal	US$/t	8,815	8,469	8,072	8,509	-3.9	-4.7	5.4
	USc/lb	400	384	366	386	-3.9	-4.7	5.4
– real[b]	US$/t	9,174	8,469	7,852	8,083	-7.7	-7.3	2.9
	USc/lb	416	384	356	367	-7.7	-7.3	2.9
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23[s]**	**2023–24[f]**	**2024–25[f]**
Mine output	kt	781	808	813	868	3.5	0.6	6.8
Refined output	kt	368	454	469	471	23	3.3	0.5
Exports								
– ores and concs[c]	kt	1,641	1,521	1,491	1,680	-7.3	-2.0	13
– refined	kt	330	415	454	471	26	9.4	3.8
– total metallic content	kt	808	854	882	951	5.7	3.3	7.8
Export value								
– nominal	A$m	12,128	12,271	12,792	13,416	1.2	4.2	4.9
– real[d]	A$m	13,553	12,813	12,792	12,969	-5.5	-0.2	1.4

Notes: **b** In 2023 calendar year US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2023–24 financial year Australian dollars; **f** Forecast; **s** estimate
Source: ABS (2023) International Trade, 5465.0; LME (2023) spot price; World Bureau of Metal Statistics (2023); Department of Industry, Science and Resources (2023).

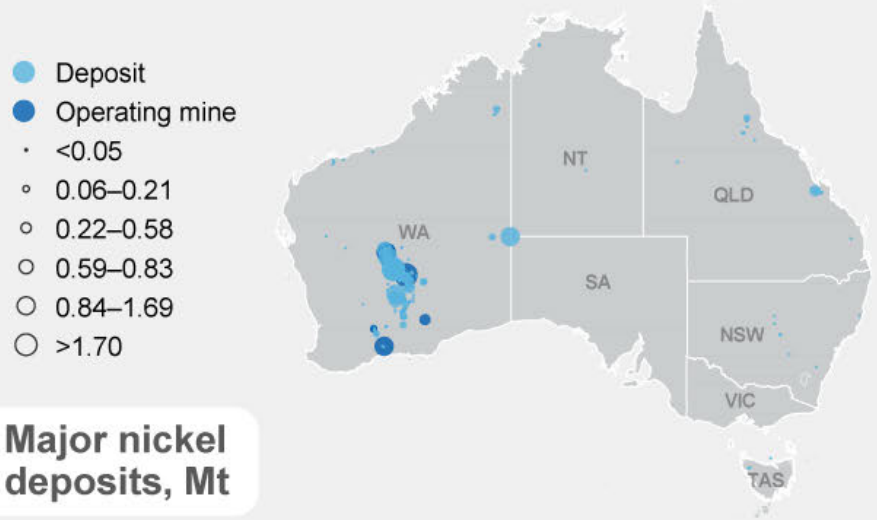
Nickel

Australia's nickel sector

22%
of the world's **resources, largest** global reserve

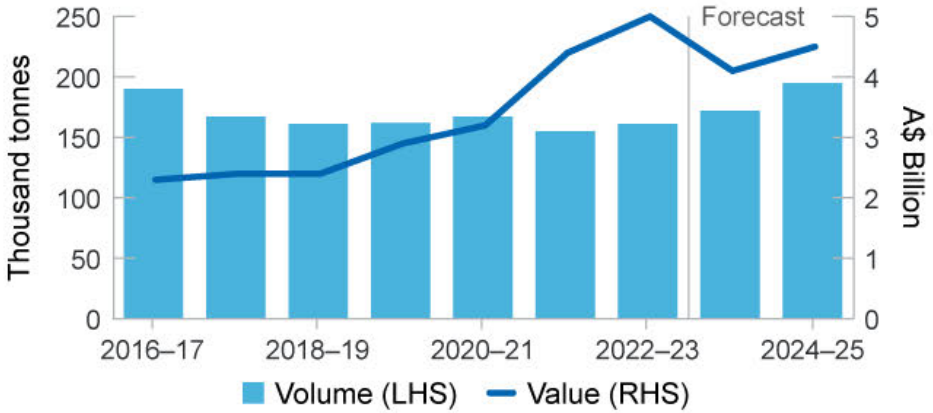
5th largest
nickel **mine and refined producer** globally

16%
of global demand represented by **EV batteries**, other **low emissions tech**



Major nickel deposits, Mt

Australian nickel exports



Outlook

Chinese demand drives global consumption, forecast to **rise 5.5%** year-on-year

Export earnings to fall to **$4.3 billion** in 2023-24 as record prices ease.

Global **oversupply expected to persist** on Indonesian & Chinese supply growth

Exploration expenditure over the past 12 months **highest since 2008**

SOURCE: GA; DISR; OCE

13.1 Summary

- Chinese demand (from end-uses such as stainless steel and EV battery production) continues to drive global nickel consumption, now forecast to rise by 5.5% year-on-year in 2023 and by 7.4% annually to 2025.
- A continuing oversupply in the global nickel market — driven by strong growth in Indonesian and Chinese supply — is expected to peak in 2023, though will remain over the outlook period.
- Weaker prices over the outlook period are expected to push Australian nickel export earnings lower, falling from $5.0 billion in 2022–23 to $3.9 billion in 2023–24, before recovering to $4.3 billion in 2024–25.

13.2 World consumption

World nickel demand continues to expand in 2023 due to China

Global refined nickel consumption continues to strengthen, with 5.8% year-on-year growth in the year to September (Figure 13.1). While most major markets have seen declining demand this year, China usage has seen a significant rebound, rising 16 year-on-year over the period.

Global stainless steel output — which represented around 70% of refined nickel demand in 2021 — continues to be a significant driver of growth in Chinese nickel demand. In the September quarter 2023, China has seen a 28% year-on-year increase in stainless steel production, with output expanding due to increased infrastructure spending by China's central government in recent years (see Steel chapter).

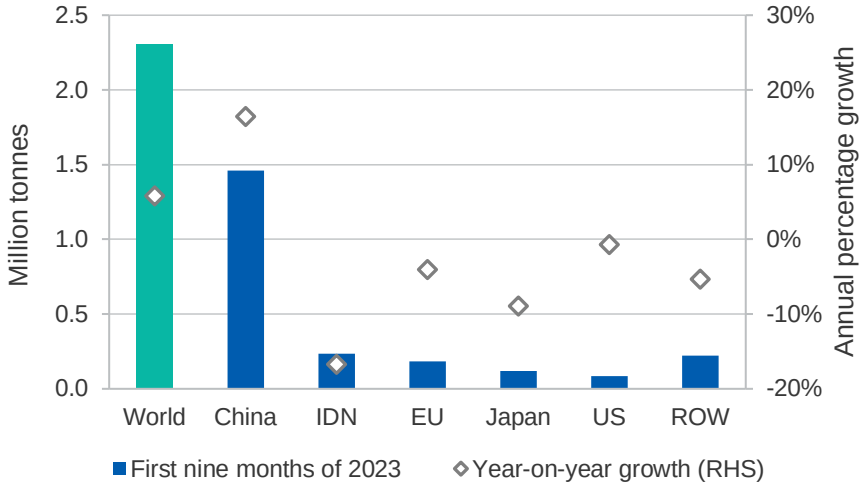
Electric vehicle demand to continue to drive nickel consumption to 2025

Despite growing global macroeconomic uncertainty, electric vehicle demand has continued to grow through 2023, with world sales of full electric vehicles rising close to 40% in the year to August. Nickel chemistries continue to dominate the global battery market with nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminium (NCA) accounting for close to 75% of market EV sales over the same period. However, non-nickel lithium battery chemistries have remained on the rise in 2023, with lithium-iron-phosphate (LFP) accounting for 25% of the market and growing more than 50% year-on-year over in the year to August.

This trend is being driven by the Chinese market. With electric vehicle batteries making up about a third of the cost of an EV, Chinese consumers have shown a strong preference for lower-cost EVs, favouring LFP chemistries. For example, in 2022, almost 95% of LFP batteries produced globally for light duty vehicles were used to produce vehicles in China. Demand for non-nickel batteries such as LFP grew in 2023, but short-term growth has been revised down due to softer-than-expected EV sales.

EV-related nickel demand is expected to be the main driver of nickel consumption from 2025 onwards, with nickel demand growth expected to remain the strongest out of the base metals.

Figure 13.1: World nickel consumption



Note: IDN ~ Indonesia; ROW ~ Rest of World

Source: International Nickel Study Group (INSG); Department of Industry, Science and Resources (2023)

Global refined nickel usage is estimated to grow to 3.1 million tonnes in 2023 — an increase of 5.5% year-on-year. Global refined nickel consumption is forecast to grow to 3.6 million tonnes by 2025. This growth is expected to be driven by continued growth in global stainless steel output and nickel-intensive battery demand from rising EV sales.

13.3 World production

Indonesia leads global nickel output through 2023

Global mined nickel production is expected to rise by 16% year-on-year to reach 3.7 million tonnes in 2023, as Indonesia continues to drastically increase global supply, as well as a ramp-up in production for several other key regions.

World mined nickel production is forecast to reach 4.1 million tonnes by 2025. Indonesian output is expected to continue to expand, from 2 million tonnes in 2023 to 2.5 million tonnes in 2025, representing 56% of global supply. However, with the Indonesian government enforcing a slow-down of 2023 mining permits — and planning on stricter permitting (in terms of ESG and other requirements) from 2024 — there are downside risks to growth in global production over the outlook period.

Shifting supply of battery grade nickel

Chinese production and consumption of battery grade material was weaker than expected. This was due to supply chain destocking caused by falling nickel prices.

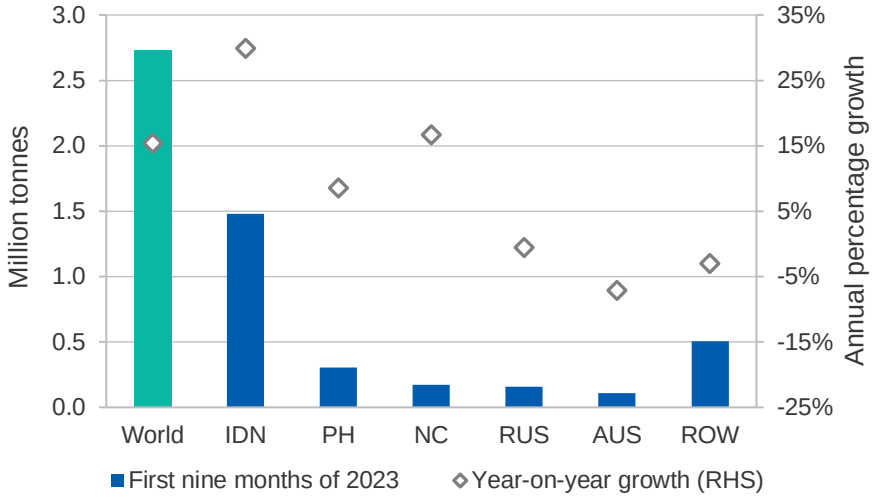
The main source of global supply growth is Indonesia, with future growth focused on nickel matte and mixed hydroxide precipitate (MHP) production to feed battery and class 1 nickel supply chains. High-pressure acid leach (HPAL) plants are expected to drive production of MHP from 2024 on.

Growth of Indonesian nickel pig iron (NPI) is expected to slow in coming months as large stockpiles built through 2022 and 2023 are drawn down. Indonesia has also announced that some NPI furnaces will be converted to produce nickel matte. This is in addition to new nickel matte furnace capacity that will be used to meet demand for batteries and class 1 nickel.

Global refined production to grow 5.6% annually to 2025

Global refined nickel output is forecast to rise to 3.7 million tonnes in 2025. China and Indonesia are expected to continue to dominate refined nickel production, with each expected to increase capacity by approximately 300,000 tonnes by 2025.

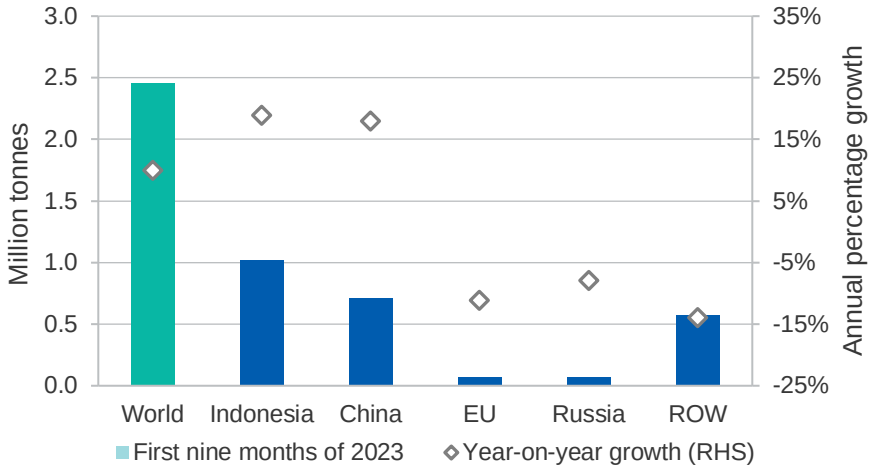
Figure 13.2: World mined nickel production



Note: IDN ~ Indonesia; PH ~ Philippines; NC ~ New Caledonia; RUS ~ Russia

Source: International Nickel Study Group (2023); Department of Industry, Science and Resources (2023)

Figure 13.3: World refined nickel production



Source: International Nickel Study Group (2023); Department of Industry, Science and Resources (2023)

13.4 Prices

LME price continues decline throughout 2023

From a peak of just over US$30,000 a tonne in January, the LME nickel price has continued to fall during 2023. After averaging just over US$20,000 a tonne in the September quarter 2023, nickel prices have declined further in the December quarter 2023, to average around US$17,600/t. In addition to softening world industrial production (IP) and manufacturing activity, the nickel market is watching the surge in output in Indonesian — both current and prospective — for a rise in inventories.

The global macroeconomic environment continues to be weighed down by tighter fiscal and monetary conditions. This has seen a persistent weakness in global IP and manufacturing activity in recent months, with a continued contraction in activity in Europe and Asia (excluding China) offsetting an ongoing modest recovery in Chinese industrial production.

Global construction displayed modest growth through 2023, however there were pockets of weakness: activity continues to deteriorate in Europe (due to aggressive monetary policy) and in the Chinese property market.

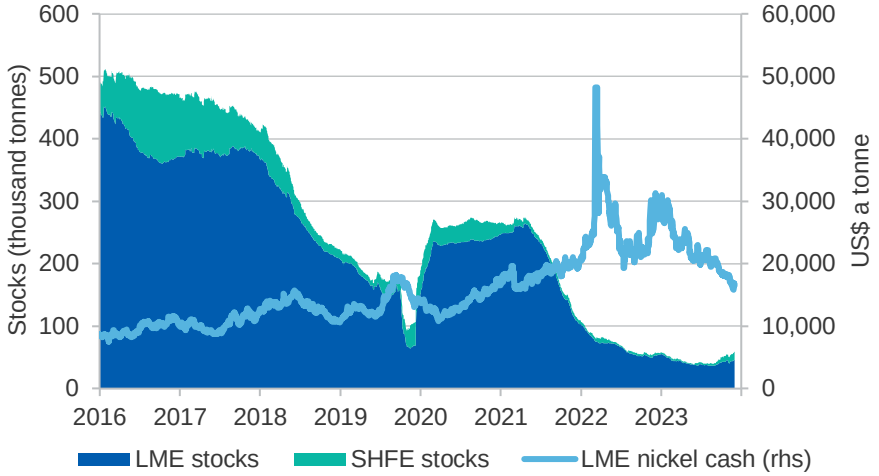
With significant growth in mined and refined supply projected over the outlook period, weak demand from key sectors — such as manufacturing and construction — is expected to put further downward pressure on nickel prices in 2024. Demand could pick up in 2025 if falling inflation allows Western central banks move to a less restrictive monetary stance.

Robust growth in refined output in 2023 keeps market in surplus

The surplus seen in the global nickel market since 2022 is expected to reach its peak in 2023, at about 230,000 tonnes. This follows the recent expansion of nickel refining capacity in China and Indonesia.

The oversupply in class II nickel products — such as nickel pig iron and ferronickel — seen in the last 18 months now appears to be carrying over into class I 'battery grade' products (on which exchange-traded contracts such as LME are based). This is being driven by the continued expansion of nickel smelting and refining capacity, especially in Indonesia. New HPAL projects are expected to continue being brought online over the

Figure 13.4 Nickel spot price and stock at exchanges



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

outlook period, with these facilities capable of processing lower grade ores into products such as Mixed Hydroxide Precipitate (MHP), which is capable of being processed into refined nickel. The projected lift in nickel refining capacity in China and Indonesia may thus maintain the global nickel market in surplus in the outlook period.

Class 1 inventories to remain low in 2024 and 2025

While healthy growth in mined and refined nickel supply is expected to create a moderate (but reducing) oversupply to 2025, the low levels of inventories seen at major exchanges such as LME and Shanghai Futures Exchange remain a key upside risk to prices in the near term. LME inventories have seen a modest recovery so far in the December quarter, reaching 44,000 tonnes in mid-November, after hitting a 10-year low of 37,000 tonnes in the June quarter 2023 (Figure 13.4). However, LME inventories remain at decade-lows. After falling below US$16,000 a tonne in November, the LME nickel price is estimated to average about US$21,200 a tonne in 2023. A global surplus is expected to stretch into 2024, with prices forecast to average around US$18,000 a tonne.

13.5 Australia

Export earnings to be impacted by falling nickel prices

Stronger production and export volumes are expected over the outlook period, though this is initially expected to be outweighed by falling global prices. Export earnings are expected to fall to $3.9 billion in 2023–24, before increasing to $4.3 billion 2024–25. Export volumes are forecast to rise from 161,000 tonnes in 2022–23 to 172,000 in 2023–24 (7.1% growth) and 195,000 in 2024–25 (14% growth).

Australian production to grow over the outlook period

Following flat growth in 2022–23, Australian mined nickel production is forecast to grow to 159,000 tonnes in 2023–24 and 186,000 tonnes in 2024–25 (both figures have been revised down from the September *Resources and Energy Quarterly*). Contributing to this increase in mine production will be IGO's Cosmos project, a further ramp up at Kambalda (Wyloo Metals) and a restart of Black Swan (Poseidon Nickel).

Australian refined nickel production (including refined and intermediate products) is expected to grow from 134,000 tonnes in 2022–23 to 151,000 tonnes in 2024–25. This growth in output is expected to be driven by a ramp up in production at BHP's Nickel West operations.

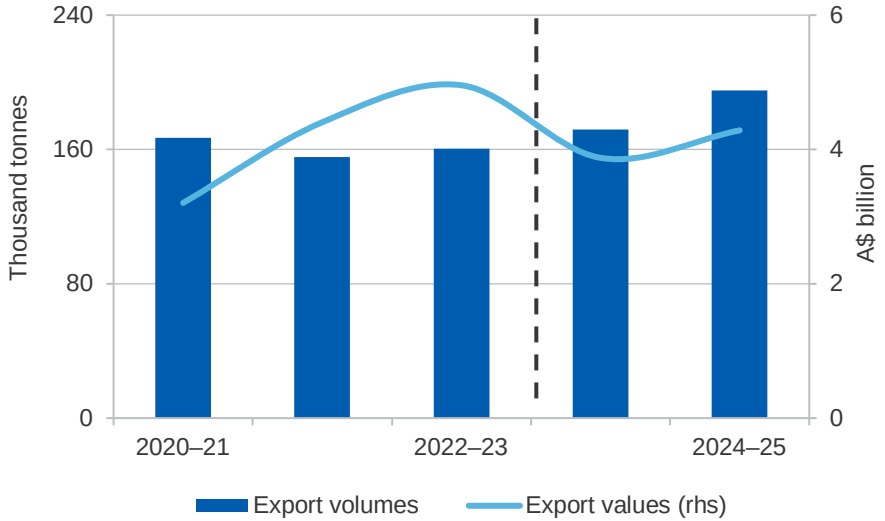
Exploration expenditure remains near decade highs

Nickel and cobalt exploration expenditure for the September quarter 2023 was around $88 million. This was 5.7% higher/lower than the previous quarter, and 11% higher than the comparable period in 2022. Exploration for the 12 months to September 2023 was $341 million, and continues a general upward trend seen since 2016.

Revisions to the outlook

Compared to the September 2023 *Resources and Energy Quarterly*, nickel exports earnings have been revised down by $0.4 billion in 2023–24. This is a result of slight downward revision to price forecasts for the period.

Figure 13.5: Nickel export volumes and values



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 13.1: Nickel outlook

						Annual percentage change		
World	**Unit**	**2022**	**2023[s]**	**2024[f]**	**2025[f]**	**2023[s]**	**2024[f]**	**2025[f]**
Production								
– mine	kt	3,203	3,729	3,908	4,090	16	4.8	4.7
– refined	kt	3,059	3,344	3,529	3,728	9.3	5.6	5.6
Consumption	kt	2,956	3,119	3,381	3,601	5.5	8.4	6.5
Closing stocks	kt	691	916	1 065	1 191	33	16	12
– weeks of consumption		12.2	15.3	16.4	17.2	26	7.2	5.1
Prices LME								
– nominal	US$/t	25,696	21,477	17,875	18,875	-16	-17	5.6
	USc/lb	1 166	974	811	856	-16	-17	5.6
– real [b]	US$/t	26,744	21,477	17,388	17,931	-20	-19	3.1
	USc/lb	1,213	974	789	813	-20	-19	3.1
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24[f]**	**2024–25[f]**	**2022–23**	**2023–24[f]**	**2024–25[f]**
Production								
– mine [c]	kt	154	152	159	186	-1.4	4.9	16
– refined	kt	98	97	94	104	-1.7	-3.1	11
– intermediate		31	38	45	46	20	19	3.5
Export volume [dg]	kt	155	161	172	195	3.3	7.1	14
Export value[g]								
– nominal value	A$m	4,405	4,956	3,875	4,285	13	-22	11
– real value [e]	A$m	4,923	5,175	3,875	4,142	5.1	-25	7

Notes: **b** In 2023 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 2023–24 financial year Australian dollars; **f** Forecast; **g** OCE estimates based on publicly available data; **s** Estimate.

Source: ABS (2023) International Trade, 5465.0; LME (2023) spot price; International Nickel Study Group (2023); Company reports; Department of Industry, Science and Resources (2023).

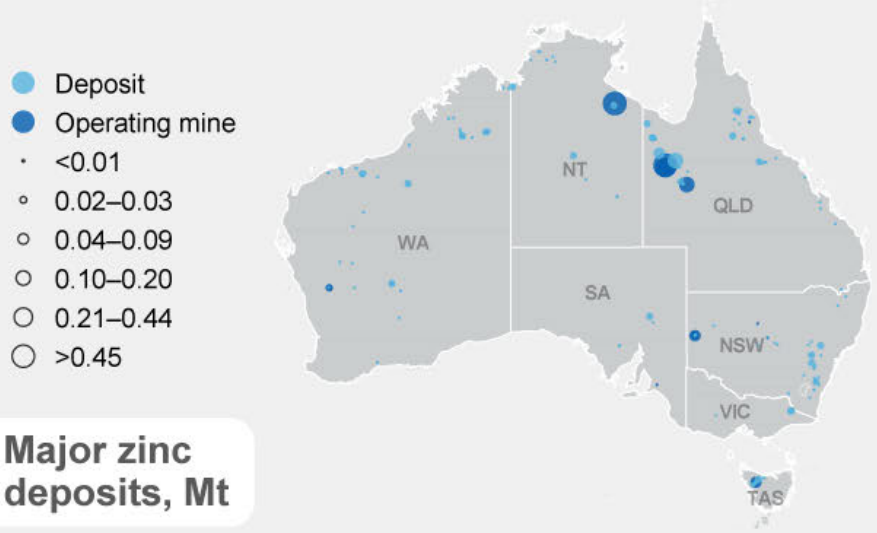
Zinc

Australia's Zinc sector

About 1/3
ores & concentrate production **refined domestically**

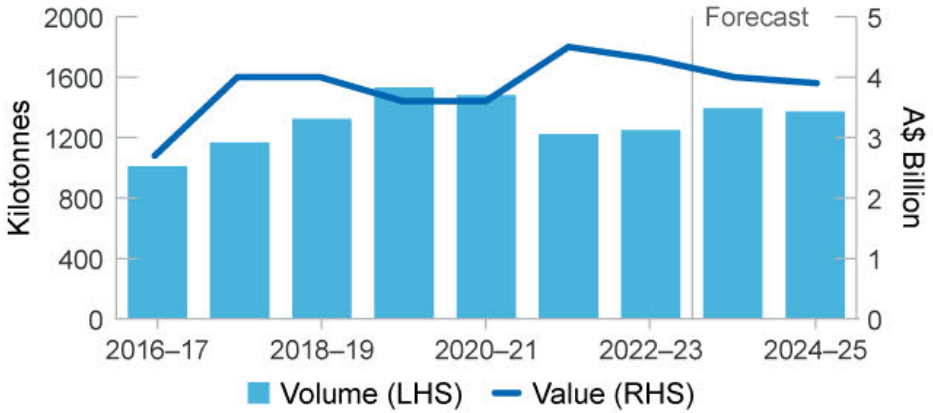
27%
of the world's known **zinc resources**

3rd largest
zinc producer globally in 2022



Major zinc deposits, Mt

Australian zinc exports



Outlook

Zinc prices fell underpinned by weakness in Chinese demand

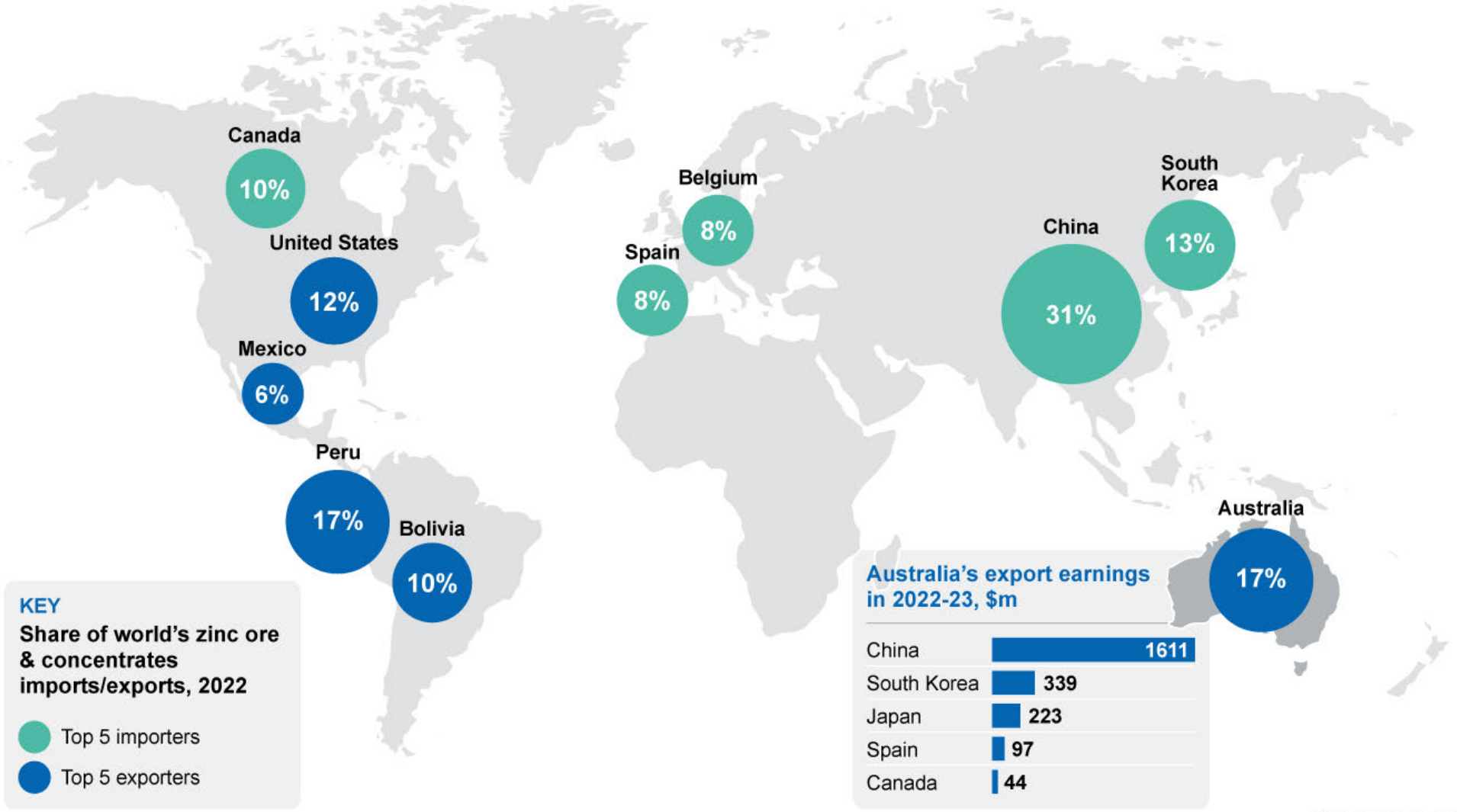
Future earnings to fall as price remains subdued

Australian production outlook **expected to rise** from higher output from existing mines

Zinc **exploration expenditure falls** as global price falls

SOURCE: GA; DISR; OCE

Zinc TRADE MAP



SOURCE: ILZSG; ABS

14.1 Summary

- The outlook for zinc demand remains subdued due to both increased supply and ongoing weakness in China's property market. The zinc price is forecast to average US$2,600 a tonne in 2024 and then rise to US$2,700 a tonne in 2025.
- Australia's zinc output has fallen in 2023, as some small mines closed. But output is expected to rise over the outlook period due to the Century mine expansion and higher Golden Grove mine output.
- Australia's zinc exports are forecast to fall to $3.9-4.0 billion in 2023–24 and 2024–25, with higher volumes partially offsetting the impact of lower prices.

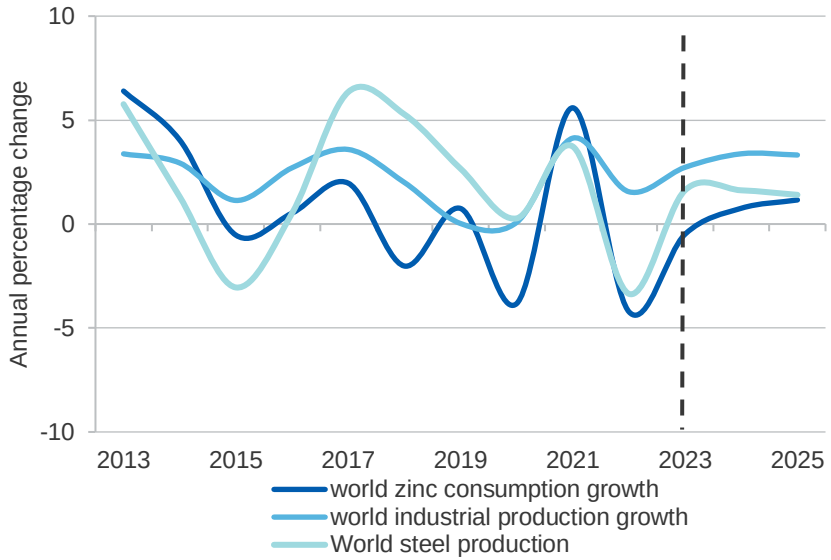
14.2 World consumption

Global zinc consumption strengthens as China's property market stabilises

Zinc consumption tends to follow the global industrial production cycle, given its primary role in galvanising steel (Figure 14.1) and its heavy use in manufacturing, construction and automotive sectors. The International Lead and Zinc Study Group (ILZSG) estimates that world demand rose 0.5% year-on-year in the September quarter 2023. China is the world's largest consumer of zinc, and China's consumption recovered in the September quarter to rise 2.8% year-on-year. Consumption in the US is estimated to have fallen 10% year-on-year, while the EU fell 4.4% year-on-year.

There are signs that China's residential property sector is stabilising. China is prioritising the delivery of its existing construction pipeline, after worries that liquidity constrained developers had been forced to abandon projects already started. China's National Bureau of Statistics reported that residential floor space completed from January to September 2023 is up 20% year-on-year. This is an improvement compared to the January to June period, which was up 18.5% year-on-year. However, sales remain weak, with residential floor space sold from January to September 2023, down 6.3% year-on-year. This is weaker than the data reported for January to June, which was down 2.8% year-on-year.

Figure 14.1: Zinc consumption vs industrial and steel production



Source: International Lead Zinc Study Group (2023); CPB Netherlands Bureau for Economic Policy Analysis (2023); World Steel Association (2023); Department of Industry, Science and Resources (2023).

China's passenger vehicle production fell 2.8% year-on-year in the September quarter 2023 but remains 10% higher than China's average quarterly production in 2022. China is emerging as a leading manufacturer of electrical vehicles, which are often less expensive than comparable models from international competitors. China overtook Japan as the world's largest exporter of passenger motor vehicles in H1 2023.

Other major passenger vehicle producers posted production gains in 2023, as chip shortages affected production over much of 2022. In the September quarter, Japanese passenger vehicle output rose by 7.5% year-on-year, while production in Germany rose by 5.9% year-on-year.

Despite the estimated fall in US and EU zinc usage, indicators of related construction activity have been positive. US construction spending rose 4.3% in the September quarter 2023 in nominal terms. A large rise in non-residential construction spending, up 21% year-on-year, was offset by a decline in spending on residential construction, down 5.5% year-on-year. The rise in non-residential construction spending was driven by manufacturing (up 65% year-on-year) and computer/electronics (up 146% year-on-year). US motor vehicle assemblies — the majority of which are commercial vehicles — rose 3.8% year-on-year in the September quarter.

The EU's construction production (volume) index rose 1.0% year-on-year in the September quarter 2023. This was largely due to a low September quarter 2022 result, when high energy prices — following the Russian invasion of Ukraine — impacted adversely on economic activity. Prices have since settled with Europe's 2022/23 winter the warmest on record.

Demand outlook for zinc faces headwinds

Growth in world zinc consumption is forecast to average 1.0% per year over 2024 and 2025. This is much slower than the 2009 to 2019 period when zinc consumption grew by an average of 2.4% per year. China's housing market faces much slower growth than at any time over the past twenty years, with a weak demand outlook due to high levels of building stock and slowing urban population growth. Residential construction activity will likely stabilise at a lower level, reducing zinc demand. Offsetting some of this decline is higher infrastructure spending in China as the government seeks to support the economy. In October 2023, China issued 1 trillion yuan in bonds to fund new infrastructure spending.

The global energy transition will increase demand for zinc in some sectors but may also see zinc usage reduced for other applications. Globally, the rollout of renewable energy infrastructure is expected to support demand for zinc due to its role as a key input to wind turbines, solar panels and transmission towers. However, growing electric vehicle adoption could also weaken demand for zinc as automakers prefer lighter materials to steel (in particular, aluminium) to raise the interval between EV recharges.

14.3 World production

Zinc concentrate market tightens as mines closure reduces supply

World mine production fell by 2.2% year-on-year in the September quarter 2023. About a third of global zinc mine production is in China, where mine production fell 2.6% year-on-year.

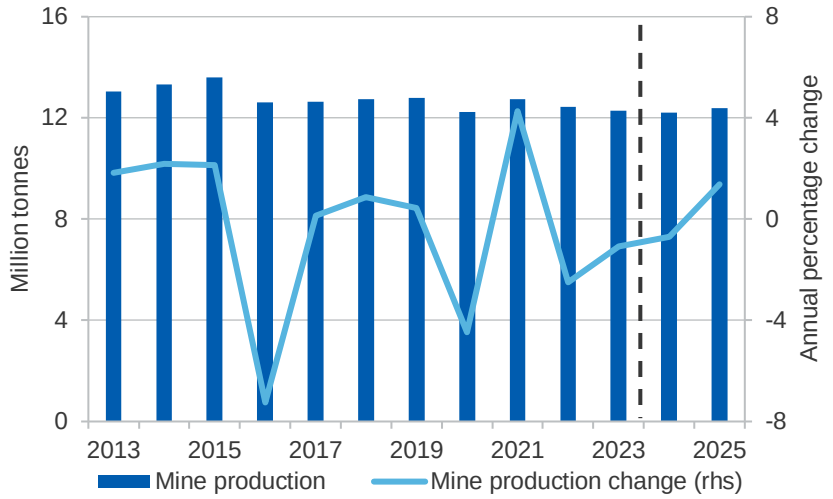
The sharp fall in zinc prices since April 2022 has led to the closure of several zinc mines. European production fell 14% year-on-year in the September quarter 2023. The Tara mine in Ireland — the largest zinc mine in Europe — closed in June, and the Aljustrel mine in Portugal closed in September. Australian production fell 6.1% year-on-year. The unlisted Australian mining company Aurora Metals entered into administration in July, resulting in the closure of the Mount Garnet and King Vol mines in Australia. The Jaguar mine operated by Aeris Resources was placed on care and maintenance in August.

World refining production rose 8.0% year-on-year in the September quarter 2023. Output in China — the world's largest zinc refiner — rose by 15% year-on-year in the September quarter 2023. The surge in refining capacity in China resulted in a rapid decline in the spot treatment price for zinc ore imported to China. The price fell to US$95 a tonne in October 2023 from an average of US$263 a tonne in the March quarter 2023, when the closure of some European zinc smelters (due to high energy prices) resulted in a crunch in global zinc refining capacity.

Projects delayed as outlook for zinc demand remains weak

Over the outlook period, world mine output is forecast to average annual growth of 1.1% (Figure 14.3). The fall in mine production and rise in refining production over the past year has eliminated much of the surplus in the concentrate market from earlier this year. The weak demand outlook suggests growth in zinc production will be slow over the outlook period, and the opening of new mines expected from Mexico and Russia have already been delayed. Refined production is expected to rise by 1.0% a year on average. Most of the new capacity is expected to be in China.

Figure 14.3: World zinc mine production, metallic content



Source: International Lead Zinc Study Group (2023); Department of Industry, Science and Resources (2023).

14.4 Prices

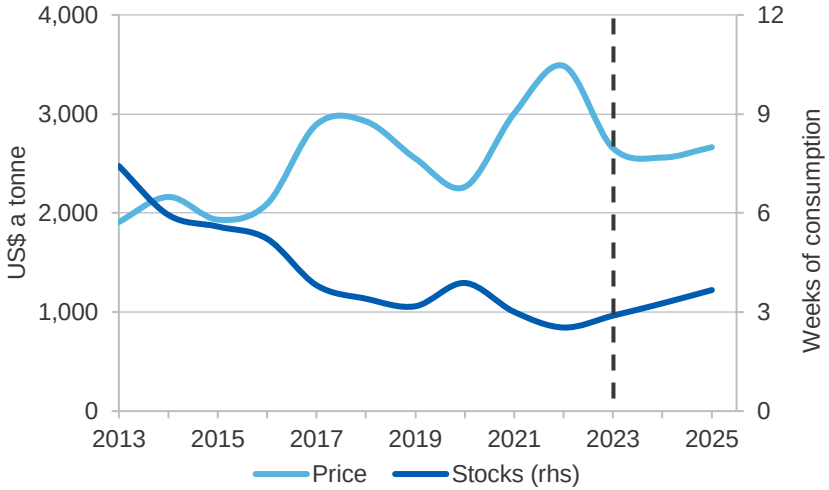
Prices weaken on growing concerns over the demand outlook

The London Metal Exchange (LME) zinc spot price declined slightly in the September quarter 2023 to around US$2,400 a tonne. This compared to an average of about US$3,100 a tonne in the March quarter, when worries over shortages of zinc refining capacity kept prices high. The price falls were triggered by the reopening of some European zinc smelters and was sustained by the underlying weakness in demand — as China's reopening from COVID lockdowns had failed to deliver the widely expected recovery in demand.

Zinc inventories have whipped around in 2023. Weak demand over the H1 2023 saw LME zinc stocks rise rapidly over the June quarter to reach 81 thousand tonnes. Stocks then jumped to 148 thousand tonnes by the end of August. However, consumption strengthened over the September quarter 2023 and LME zinc stocks have since been drawn down to 69 thousand tonnes as at mid-November.

The LME (spot) zinc price is forecast to stay relatively low through 2024, due to the soft demand outlook. The price should average about US$2,600 a tonne before recovering to US$2,700 a tonne in 2025 as growth in the world economy picks up. (Figure 14.4).

Figure 14.4: Zinc prices and stocks



Source: LME (2023); International Lead Zinc Study Group (2023); Department of Industry, Science and Resources (2023).

14.5 Australia's exports and production

Export earnings to fall as price declines outweigh growing domestic output

Australia's export earnings for both zinc concentrates and refined zinc (combined) rose 6.8% year-on-year to $1.1 billion in the September quarter 2023. The rise was driven by a lift in export volumes, while the fall in the zinc price was partially offset by the impact of a weaker AUD/USD.

The increase in export volumes (of both zinc ores and concentrates and also refined zinc metal) in the quarter exceeded the increase in production, and was likely due to the timing of shipments. Export volumes of zinc ore rose 36% year-on-year, while export volume of refined zinc metal rose 76% year-on-year.

Higher refined zinc production helped increase refined metal exports, with Australian production of refined zinc rising 8.6% year-on-year in the September quarter 2023. The Townsville refinery completed an expansion project in the March quarter 2023, and is now operating at a higher capacity. Delays with commissioning this project disrupted production in 2022.

Australian mine output fell 8.1% year-on-year in the September quarter 2023, as the fall in global zinc price resulted in the closure of several small mines. The Jaguar mine operated by Aeris Resources was placed on care and maintenance in August 2023. The unlisted company Aurora Metals entered into administration in the July 2023, and two zinc mines owned by the company have closed as a result. Additionally, the Hera mine, owed by Aurelia metals, closed early at the end of March 2023.

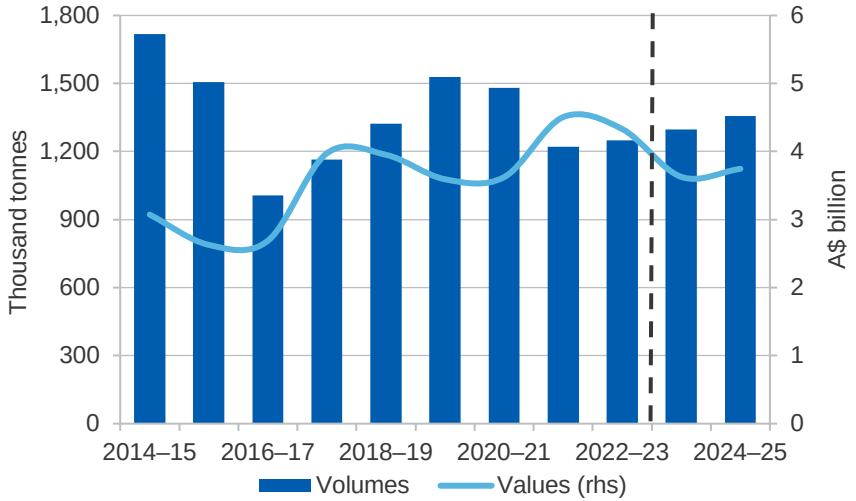
Australian mine output is expected to grow by an average 4.8% per year over the outlook period. Output growth over the next two years will be driven by an expansion of the Century mine, as well as increases in production from the Golden Grove mine (following the completion of ventilation upgrades).

From $4.3 billion in 2022–23, Australia's export earnings for concentrates and refined zinc (combined) are forecast to fall to $4.0 and $3.9 billion in 2023–24 and 2024–25, respectively. The fall in earnings is due to relatively low prices and mine closures (Figure 14.5).

Exploration expenditure softens in the September quarter

Exploration expenditure for silver, lead and zinc fell 5.7% year-on-year in the September quarter 2023. Exploration expenditure slumped in 2020 — due to the COVID pandemic — but recovered as zinc prices rose over 2021 and 2022. Exploration expenditure is moderating with zinc prices returning to a lower level.

Figure 14.5: Australia's zinc exports, metallic content



Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023).

Revisions to the outlook

Compared to the September 2023 *Resources and Energy Quarterly*, export earnings for 2023–24 have been revised up by 8.9%. The upward revision is due to stronger than expected export volume data for H2 2023, as well as a weaker forecast for the AUS/USD than envisaged in the September quarter 2023 REQ.

Export earnings for 2024–25 have been revised up by 4.2% due to a higher zinc price forecast.

Table 14.1: Zinc outlook

World	Unit	2022	2023 [s]	2024 [f]	2025 [f]	Annual percentage change 2023 [f]	2024 [f]	2025 [f]
Production								
– mine	kt	12,428	12,338	12,436	12,592	-0.7	0.8	1.3
– refined [a]	kt	13,353	13,478	13,592	13,762	0.9	0.8	1.2
Consumption	kt	13,454	13,389	13,490	13,646	-0.5	0.8	1.2
Closing stocks	kt	653	742	844	960	13.7	13.7	13.7
– weeks of consumption		2.5	2.9	3.3	3.7	14.3	12.85	12.6
Price								
– nominal	US$/t	3,485	2,654	2,559	2,665	-23.8	-3.6	4.1
	USc/lb	158	120	116	121	-23.8	-3.6	4.1
– real [b]	US$/t	3,627	2,654	2,490	2,531	-26.8	-6.2	1.7
	USc/lb	165	120	113	115	-26.8	-6.2	1.7
Australia	**Unit**	**2021–22**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**	**2022–23**	**2023–24 [f]**	**2024–25 [f]**
Mine output	kt	1,257	1,165	1,190	1,280	-7.3	2.1	7.6
Refined output	kt	435	410	444	505	-5.8	8.4	13.7
Export volume								
– ore and concentrate [c]	kt	2,033	1,886	2,133	1,985	-7.2	13.1	-7.0
– refined	kt	313	388	431	476	23.9	11.1	10.3
– total metallic content	kt	1,220	1,247	1,392	1,370	2.3	11.6	-1.6
Export value								
– nominal	A$m	4,506	4,315	3,951	3,903	-4.2	-8.4	-1.2
– real [d]	A$m	5,036	4,506	3,951	3,773	-10.5	-12.3	-4.5

Notes: **a** Includes secondary refined zinc; **b** In 2023 US dollars; **c** Quantities refer to the gross weight of all ores and concentrates; **d** In 2023–24 Australian dollars; **f** Forecast; **s** Estimated.

Source: ABS (2023) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Science and Resources (2023); International Lead Zinc Study Group (2023); Wood Mackenzie (2023); LME (2023).

Lithium

Australia's lithium sector

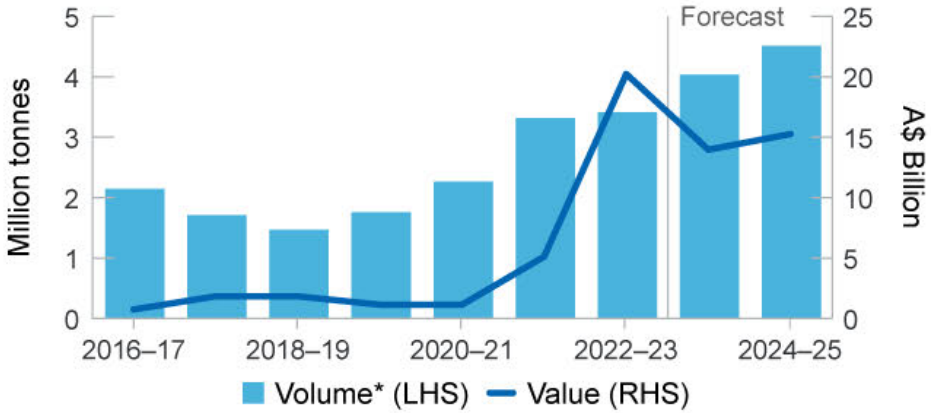
98%
of spodumeme **exported to China**, 2022-23

50%
of global lithium **extraction,** with **2nd** most resources

6%
of refining could be in **Australia by 2025**, ranking **4th**

Major lithium deposits, Kt

Australian lithium exports



Outlook

Falling prices result in **future earnings decreasing** from record levels

The market is entering a period of **surplus supply**

Mine production in Australia to **keep growing** due to new mines and expansions

Australia to **refine lithium domestically** as lithium hydroxide takes off

SOURCE: ABS; GA; Wood Mackenzie; WA DMIRS; DISR; OCE

*Volume of spodumene concentrates exported, plus the volume of spodumene concentrate used to produce lithium hydroxide for export

15.1 Summary

- Lithium export earnings are forecast to fall as lower prices more than offset higher export volumes. Exports will be $14-15 billion in 2023–24 and 2024–25, down from record levels ($20 billion) in 2022–23.
- Price declines since the September quarter reflect rising lithium inventories. High-cost producers have become unprofitable and have cut output. Australia's Greenbushes lithium mine (the world's largest) reported stockpiling of surplus production and flagged the prospect of future output cuts if weakness in prices and demand persists. However, most producers remain profitable at current prices.
- Three Australian lithium hydroxide refineries are either operating or under construction, targeting a total capacity of 198 thousand tonnes (kt) of lithium hydroxide. By 2030, close to 20% of Australian spodumene could be refined domestically. Investments have also been made in low-emissions refining technology including a lithium phosphate refinery.

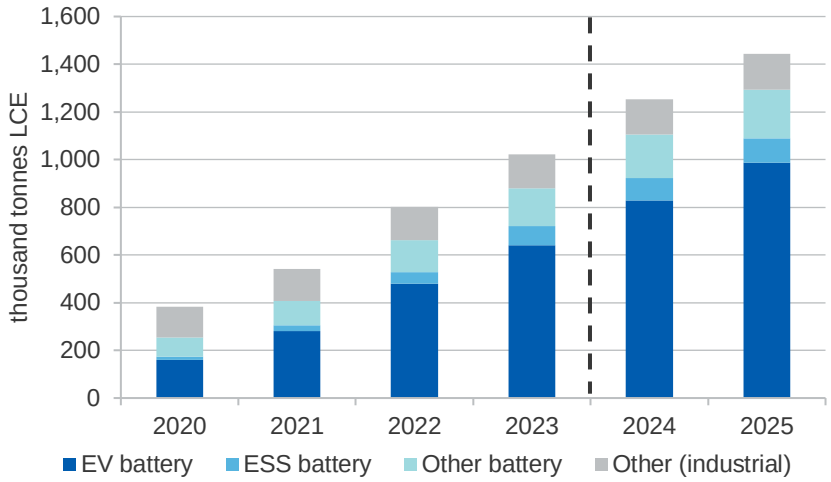
15.2 World demand

High growth outlook for lithium demand, but some near term challenges for downstream markets such as the EV sector

The high growth trajectory consensus forecast for global lithium demand is driven by government policies to increase electrification and decarbonise the global economy. Lithium is a key input to the global energy transition, making up a sizeable share of the cost of the most popular batteries (expected to be) used in electric vehicles (EVs) and stationary energy storage systems (ESS). In lithium carbonate equivalent (LCE) terms, global lithium consumption is forecast to increase from 797 kt in 2022 to 1,428 kt in 2025 (Figure 15.1).

Since the September REQ, there have been reports highlighting weakness in the EV sector, particularly in the United States. EV manufacturers including General Motors, Ford and Tesla have delayed some investments in factories in response to disappointing EV sales growth and the broader economic slowdown.

Figure 15.1: World lithium consumption, by demand source



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

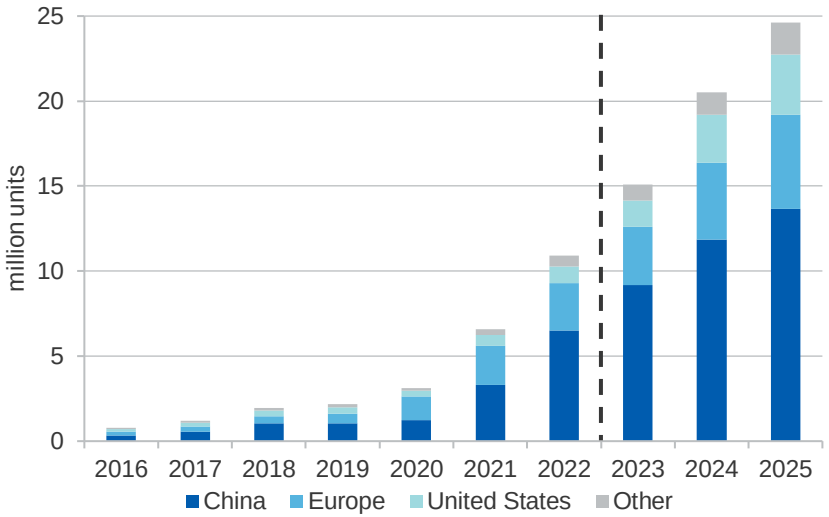
One reason why US EV sales appear to have been below expectations is the relatively high prices for EVs in the US compared to other markets such as China. Since 2022, some EV manufacturers (such as Tesla) have engaged in a price war in the Chinese market. For example, it is estimated Tesla's Model Y SUV costs 40% less in China than in the US (as of January 2023). More broadly, Chinese EV carmakers have focused on smaller and more affordable models, cutting down costs. The IEA reports the two best selling EVs in China in 2022 were the Wuling Mini BEV (US$6,500) and the BYD Dolphin (US$16,000). In contrast, EV carmakers in Europe and the US have prioritised larger and more luxurious models to date. In 2022, the Tesla Model Y was the best selling EV in Europe (US$65,000) and the United States (US$50,000).

Recently, some US EV makers are reported to have begun making price cuts. However, this appears to largely be in response to the recent slowdown in sales as opposed to a broader shift to better affordability by EV makers in the US and Europe.

To achieve the ambitious targets set by governments for EV uptake by 2030, it is necessary for EVs to become more cost competitive with internal combustion engine vehicles. In China, the country's National Action Plan sets a target of 40% sales share for 'new energy vehicles' (includes electric and fuel cell vehicles) by 2030. In the European Union (EU), the 'Fit for 55' package requires new car sales to have 55% lower emissions from 2030 and zero CO2 emissions from 2035. The US is targeting 'clean energy vehicles' including EVs to make up a 50–52% share of vehicle sales by 2030.

The outlook for EV demand is largely determined by government targets and the high levels of policy support directed to the sector. Global EV sales are projected to more than double between 2022 and 2025 (11 million to almost 25 million cars per annum) (Figure 15.2). EVs are the dominant source of demand for lithium (and batteries), making up 60% of lithium consumption in 2022.

Figure 15.2: Global electric vehicles sales



Note: Electric vehicles (EVs) are defined to be battery EVs and plug-in hybrid EVs.
Source: Wood Mackenzie (2023)

Other sources of lithium demand to maintain growth outlook

Other sources of battery demand for lithium will also experience strong growth, largely driven by efforts to spur the energy transition. This will reflect higher uptake of ESS, electrification of tools and products (such as electric scooters), and growth in portable electronics. ESS demand for lithium is expected to more than double between 2022 and 2025, driven by demand growth from major economies including China, the EU, and the US. The demand for lithium for non-EV battery usage is expected to increase by 68% between 2022 and 2025.

The use of lithium is also underpinned by stable growth in areas of industrial demand that are well established, including ceramics, glass-ceramics, and greases. Industrial demand for lithium is expected to grow by 2-3% per annum, in line with historical growth trends.

15.3 World production

Growing global lithium extraction leading to a short-term surplus of supply

Reflecting surplus supply, global lithium inventories are rising following a prolonged deficit in the last few years. The surplus is due to higher extraction of lithium from mineral concentrate (e.g. spodumene and lepidolite) and brine sources. Higher extraction is largely in response to a recovery in lithium prices in 2021 and the record highs set in 2022.

Increased extraction of lithium resources reflects higher production across all major producer nations, as well as the emergence of a number of new, smaller producers (Figure 15.3). Prices are expected to remain above pre-2021 levels, enabling higher cost producers and projects to enter the market.

Australia leads the world in lithium extraction, accounting for 50% of global output in 2022. Spodumene production is forecast to increase from 386 kt in 2022 to 633 kt LCE in 2025 period (see Australia section). Most Australian spodumene is exported and processed into lithium hydroxide or carbonate overseas (mostly China). However, investments in domestic

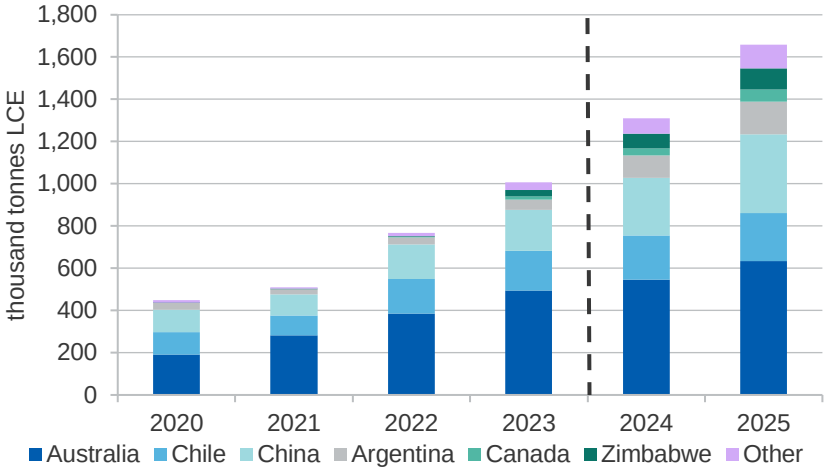
refineries will result in a rising share of spodumene being processed domestically.

Amongst other major producers, Chile and China are the two largest sources of lithium extraction. Chile is expected to see further growth in lithium extraction (from brine sources) over the outlook period, rising from 162 kt in 2022 to 227 kt LCE in 2025. Brine is refined into lithium carbonate which is typically exported to other markets.

China is also forecast to increase lithium extraction (from brine and mine sources) from 166 kt LCE in 2022 to 373 kt LCE by 2025. Notwithstanding its own production, China is a net importer of lithium resources, buying lithium from countries such as Australia and Chile.

Among other countries, Argentina, Canada and Zimbabwe are expected to significantly increase lithium extraction, and account for a combined 19% share of global production by 2025 (from 5.1% in 2022).

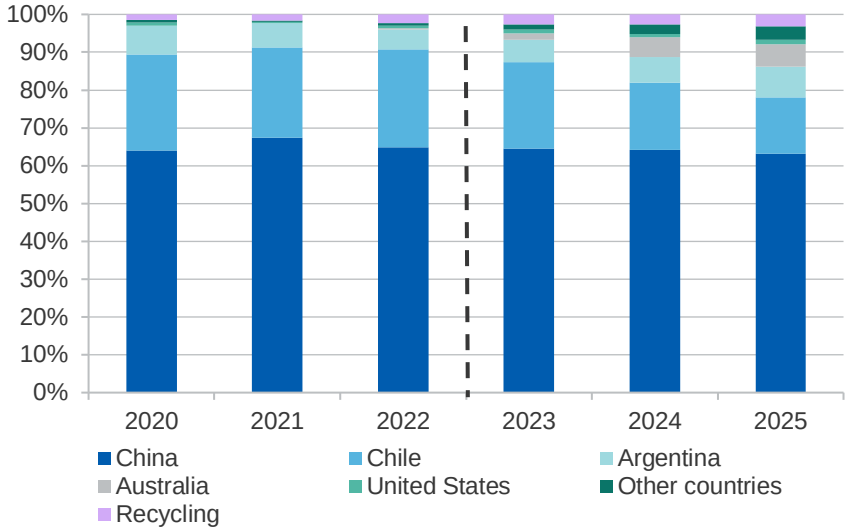
Figure 15.3: Global lithium extraction by country



Notes: Global lithium extraction differs from the measure of world lithium production in this report. Lithium production is defined to reflect refined production of lithium chemicals such as lithium hydroxide and lithium carbonate. In contrast, lithium extraction includes lithium resources extracted from brines or mines.

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

Figure 15.4: Share of global lithium refining



Note: This figure reflects the production of global refined lithium, not lithium refining capacity.

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

Global supply of refined lithium products to diversify over outlook period

Lithium bearing ores/brines are processed into a product for downstream applications. Refined lithium products include lithium hydroxide (often used in NMC batteries) and lithium carbonate (favoured in LFP batteries). Refined lithium chemicals are used in the production of active materials that are part of the cathode of the battery. Batteries need high purity materials, so making battery-grade lithium is a complex chemical process.

The global supply of refined lithium products is highly concentrated, with the top three producers having around a 90% market share (Figure 15.4). China is the dominant producer of refined lithium and is expected to maintain its share at about 60% of global refining capacity by 2025. China's high market share is supported by the cost competitiveness of its refineries and a dominant share in downstream markets in the battery supply chain that use refined lithium products. Other major refined lithium producers include Argentina and Chile which extract lithium from brine.

By 2025, investments to develop lithium refining in Australia and the US are expected to lead to market shares of 6.0% and 1.2% respectively. Recycling is expected to maintain a 2–3% share over the outlook period.

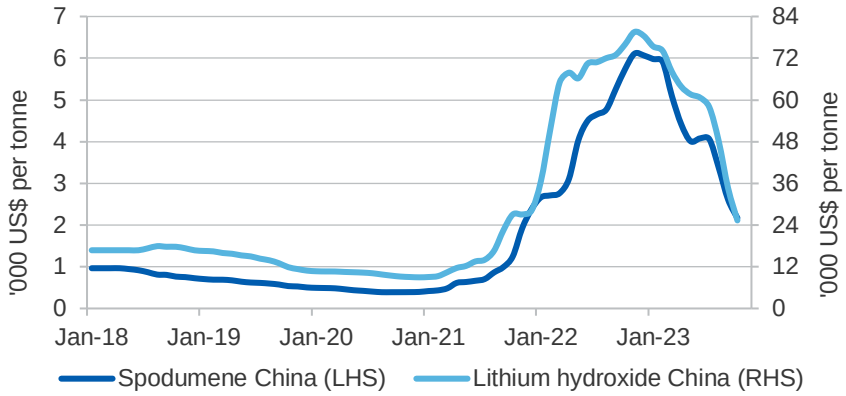
15.4 Prices

Lithium prices to decrease as market enters a period of surplus production

During 2022 and early 2023, prices for lithium reached levels well above previous records as the market moved to a large deficit. In 2022, spot prices for spodumene (concentrated ore) averaged US$4,364 per tonne, well above the average level of US$663 per tonne over the 3 years to 2021 (Figure 15.5). The spot price of lithium hydroxide (a refined lithium product) averaged US$67,279 per tonne in 2022, dramatically higher than the average price of US$13,656 per tonne over the 3 years to 2021.

In 2023, prices have fallen significantly as the market has swung from deficit to surplus. The high prices in 2021 and 2022 incentivised more investment in lithium production, resulting in growth in supply outpacing demand. Adding to this, lithium consumers destocked during the period of high prices to lower the cost of carrying inventory.

Figure 15.5: Average monthly lithium spot prices



Notes: The spodumene price is CIF (cost including freight), with an average grade of 5-6%. The lithium hydroxide price is FOB (free on board). Price series are smoothed.

Source: Bloomberg (2023)

In the near-term, the demand for lithium is facing headwinds due to slower than expected growth in EV uptake in recent months, especially in the US.

The average price over the month of October 2023 was US$2,168 and US$25,327 per tonne for spodumene and lithium hydroxide, respectively.

To account for recent further price falls, lithium price forecasts have been revised downward compared to the September REQ, especially for lithium hydroxide. For spodumene, the average spot price has been revised down by 5-10% for each year of the outlook period. For lithium hydroxide, the average price has been revised downward by 10-30% for each year of the outlook period. These revisions are line with consensus forecasts.

Notably, prices are not expected to return to previous high levels (such as during 2022 and early 2023) before 2025, due to the forecast surplus in supply over the outlook period. This appears to have already incentivised some production cuts, with reports that some higher-cost producers, such as lepidolite miners in China, have become unprofitable and cut production. However, most lithium producers will remain profitable at current prices and continue to produce. In Australia, the five largest lithium mines (covering 99% of Australian spodumene production) reported their average costs of production per tonne over the 2022–23 financial year to range from A$670 to A$1225. Notably, these estimates are based on costs reported by mines and does not account for differences in the lithium content spodumene.

The spot price of spodumene is estimated to average US$3,840 per tonne in 2023 and forecast to fall to US$2,200 in 2025. The spot price of lithium hydroxide is estimated to average US$52,450 in 2023 but is forecast to decline to average around US$30,000 per tonne in 2025.

In terms of risks for the price forecasts, there is an unusually high degree of uncertainty. The lithium market has undergone significant structural change in recent years due to new producers entering the market and the rapid pace of EV demand growth.

Prices received by lithium mines typically reflect falling spot prices with a lag due to the use of offtake agreements with specified pricing terms. Albemarle reports that only 20% of sales are via spot markets, with the remainder based on contract sales typically linked to a price index with a 3-month lag, alongside some floors and ceilings for prices. Pilbara Minerals report a 2-month pricing period (including month of shipment) so that prices are better aligned with the time of delivery to the consumer.

15.5 Australia

Lithium mines expected to continue to increase production over outlook

Australia is the leading global source of lithium (50% share of extraction in 2022), and mine output is expected to lift further after recent capital expenditure. The output of spodumene is forecast to rise to 3.4 million tonnes (Mt) in 2023–24 and 4.0 Mt in 2024–25, up from to 3.1 Mt in 2022–23 (Figure 15.6).

Rising mine production will be driven by the expansion of existing mines, including Greenbushes, Finniss, Wodgina, Pilgangoora, Mt Marion and Mt Cattlin. Over the outlook period, greenfield production is also due to commence at Mt Holland and Kathleen Valley.

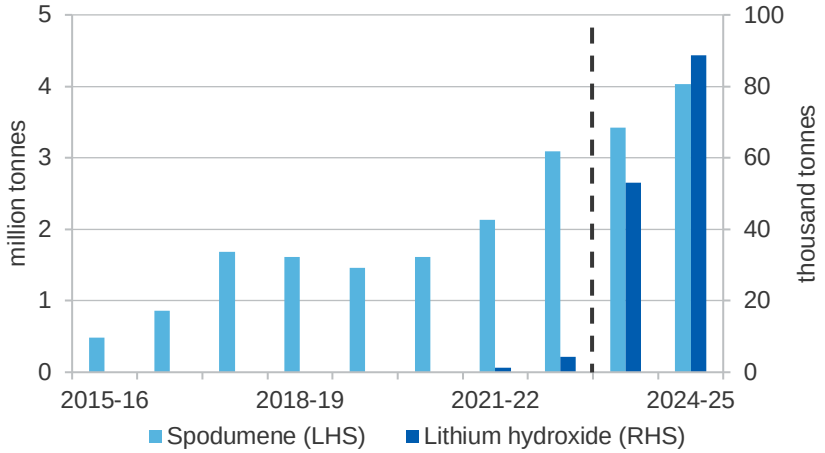
Since the September REQ, falls in lithium prices have led to some mines reporting stockpiling and the prospect of production cuts. Greenbushes (the world's largest lithium mine, based in Australia) reported it was stockpiling spodumene output, and flagged future production cuts if weakness in prices and demand persists.

Growing domestic processing as Australian lithium refineries to ramp up

Australia is continuing to develop new lithium refining capacity. There are three lithium hydroxide refineries either operating or under development (two based in Kwinana and one in Kemerton) with a combined target capacity of 198 kt of lithium hydroxide. This suggests Australia could refine close to 20% of spodumene mined in Australia domestically.

The first is Tianqi Lithium Corporation (51%) and IGO's (49%) Kwinana refinery. Technical challenges (primarily debottlenecking) have meant a slower than expected ramp up of production at this new facility. Total output was 0.6 kt in the September quarter, and the facility is expected to be at 50% of capacity by the end of this year.

Figure 15.6: Australian output of lithium ores and chemicals



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

The second Kwinana refinery — owned by Wesfarmers (50%) and SQM (50%) — remains under construction, with first production expected in 2024 and an eventual capacity of 50 kt per year.

The Kemerton lithium hydroxide refinery — owned by Albemarle — is reported to be in operation. In May 2023, a commitment was made to an expansion to double capacity to 100 kt and this expansion is currently under construction.

In August 2023, Pilbara Minerals and Calix Limited committed to the construction of a lithium phosphate refinery at Pilgangoora. This plant will use a patented electric kiln technology that can reduce emission intensity if powered by renewable energy (up to 80% reduction compared to conventional coal/gas kiln). This facility is only expected to produce over 3 kt of lithium phosphate at full capacity, to demonstrate the viability of this type of low emissions refining technology.

Record lithium export earnings to decrease as prices decline

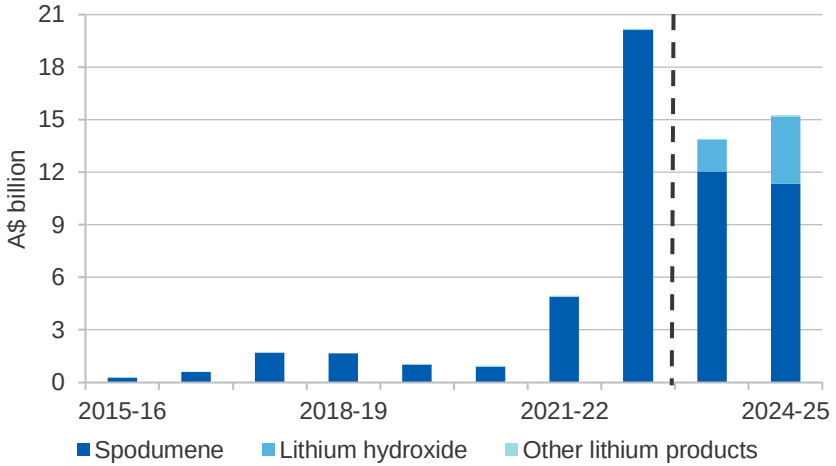
Lithium exports reached a record $20 billion in 2022–23, a significant increase from the previous record of $5.0 billion in 2021–22 (Figure 15.7). The increase was driven by a near-tripling in prices over the period, as well as a 46% lift in the volume of spodumene exports. In 2022–23, 98% of spodumene by volume was exported to China, with the rest exported to nations such as Belgium (1.2%), South Korea (0.5%), and the US (0.1%).

The value of lithium exports is forecast to decline to around $14 billion in 2023–24, reflecting the lower prices compared to the previous financial year. Total lithium export earnings are then forecast to increase to $15 billion in 2024–25, as volumes rise with prices forecast to be little changed year on year.

Revisions to the outlook

Significant revisions have been made to the forecasts for Australian lithium export earnings compared to the September 2023 *Resources and Energy Quarterly.* In 2023–24 and 2024–25, the value of exports has been revised downward by 23% and 6% respectively. These revisions are driven by revisions to price forecasts (see Prices section).

Figure 15.7: Value of Australian lithium exports



Note: Before January 2021, ABS spodumene exports data was subject to confidentiality. Data before this date comes from WA Department of Mines, Industry Regulation and Safety.

Source: ABS (2023), Department of Industry, Science and Resources (2023), WA Department of Mines, Industry Regulation and Safety (2023).

Table 15.1: Lithium outlook

						Annual percentage change		
World	**Unit**	**2022**	**2023[f]**	**2024[f]**	**2025[f]**	**2023[f]**	**2024[f]**	**2025[f]**
Production [a b]	kt	737	985	1 271	1 528	33.6	29.0	20.2
Demand [a]	kt	802	1,022	1,252	1,444	27.6	22.5	15.4
Spodumene price								
– nominal	US$/t	4 364	3 842	2 300	2 200	-12.0	-40.1	-4.3
– real [c]	US$/t	4,542	3,842	2,237	2,090	-15.4	-41.8	-6.6
Lithium hydroxide price								
– nominal	US$/t	67,279	52,437	31,066	29,715	-22.1	-40.8	-4.3
– real [c]	US$/t	70,022	52,437	30,220	28,228	-25.1	-42.4	-6.6
Australia	**Unit**	**2021–22**	**2022–23[s]**	**2023–24[f]**	**2024–25[f]**	**2022–23[s]**	**2023–24[f]**	**2024–25[f]**
Production								
– Mine (spodumene)	kt	2,130	3,088	3,420	4,031	45.0	10.8	17.9
Export volume								
– Ore and concentrate (spodumene) [d]	kt	2,248	3,282	3,050	3,432	46.0	-7.1	12.5
– Refined (lithium hydroxide)	kt	0	0	40	89	-100.0	NA	122.1
Export value								
– Ore and concentrate (spodumene) [d]	A$m	4,899	20,110	12,040	11,345	310.5	-40.1	-5.8
– Refined (lithium hydroxide)	A$m	0	0	1,829	3,851	-100.0	NA	110.5
– Total (nominal) [d g]	A$m	4,972	20,194	13,918	15,242	306.2	-31.1	9.5
– Total (real) [d g h]	A$m	5,556	21,085	13,918	14,734	279.5	-34.0	5.9

Notes: **a** Lithium carbonate equivalent: this is a measure of the quantity of refined product; **b** Refined lithium products include lithium hydroxide and lithium carbonate; **c** In current calendar year US dollars; **d** Prior to January 2021, ABS reported spodumene exports value and volume data was confidential. Data over this period instead sourced from the Western Australia Department of Mines; **g** Revenue from spodumene concentrate, lithium hydroxide and other lithium products; **h** In current financial year Australian dollars; **f** Forecast; **s** Estimate.

Source: ABS (2023), Company reports; Department of Industry, Science and Resources (2023); Government of Western Australia Department of Mines, Industry Regulation and Safety (2023); Wood Mackenzie (2023).

Trade summary tables

Table 17.1: Principal markets for Australia's total resource and energy exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23	*Share (2022-23)*
China	$m	111,167	126,595	148,787	149,538	165,102	*35%*
Japan	$m	50,605	45,539	34,223	75,941	98,962	*21%*
Other Asia [a]	$m	34,648	29,546	33,491	46,261	51,523	*11%*
Korea, Rep. of	$m	21,746	21,423	23,042	43,210	45,066	*10%*
India	$m	14,427	9,449	11,612	26,418	21,265	*5%*
EU28	$m	11,616	18,633	15,546	13,711	14,386	*3%*
Other [b]	*$m*	*35,862*	*38,304*	*41,793*	*66,612*	*70,007*	*15%*
Total	**$m**	**280,071**	**289,489**	**308,494**	**421,691**	**466,310**	**-**

Notes: **a** Other Asia excludes China, Japan, South Korea and India **b** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.2: Principal markets for Australia's iron ore exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
China	$m	63,467	84,786	124,820	108,307	104,783
Japan	$m	5,757	7,038	9,080	10,257	8,077
Korea, Rep. of	$m	4,667	6,222	9,033	8,293	6,887
Taiwan	$m	1,768	1,876	3,070	2,793	1,978
India	$m	237	21	9	34	67
Indonesia	$m	44	27	40	38	38
Other [a]	*$m*	*1,614*	*2,891*	*6,922*	*2,766*	*2,270*
Total	**$m**	**77,553**	**102,861**	**152,975**	**132,489**	**124,101**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.3: Principal markets for Australia's LNG exports[a]

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
Japan	$m	21,210	19,928	11,649	24,800	34,508
China	$m	17,482	16,277	11,377	21,420	19,833
South Korea	$m	5,307	5,161	3,343	11,473	18,310
Taiwan	$m	2,343	2,593	2,237	7,521	12,070
Singapore	$m	1,237	1,039	175	2,377	3,165
Malaysia	$m	872	1,456	499	559	2,121
Other [b]	*$m*	*1,276*	*1,071*	*1,198*	*2,421*	*2,232*
Total	**$m**	**49,727**	**47,525**	**30,477**	**70,571**	**92,238**

Note: **a** Department of Industry, Science and Resources estimates based on International Trade Centre data. **b** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; International Trade Centre (2023); Department of Industry, Science and Resources (2023)

Table 17.4: Principal markets for Australia's thermal coal exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
Japan	$m	11,630	8,347	7,009	23,819	37,724
Taiwan	$m	3,162	2,386	2,060	6,636	9,456
Korea, Rep. of	$m	3,812	2,843	2,568	6,819	4,774
China	$m	4,230	3,930	487	0	3,505
Malaysia	$m	905	534	560	1,432	2,363
Vietnam	$m	664	1,041	711	1,688	2,205
Other [a]	*$m*	*1,555*	*1,295*	*2,613*	*5,863*	*5,495*
Total	**$m**	**25,958**	**20,376**	**16,009**	**46,258**	**65,522**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.5: Principal markets for Australia's metallurgical coal exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
India	$m	11,242	7,489	7,580	20,889	17,078
Japan	$m	7,657	6,084	4,744	14,131	15,630
Korea, Rep. of	$m	4,023	3,033	2,732	9,430	8,249
Taiwan	$m	2,597	1,993	1,332	3,967	3,752
Netherlands	$m	1,792	1,242	885	4,102	3,609
China	$m	9,890	9,777	1,668	0	492
Other [a]	*$m*	*6,436*	*4,626*	*4,246*	*15,070*	*13,092*
Total	**$m**	**43,637**	**34,245**	**23,187**	**67,588**	**61,901**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.6: Principal markets for Australia's gold exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
China	$m	5,072	824	2,028	8,179	8,141
Hong Kong	$m	4,370	3,341	1,410	4,893	3,778
Singapore	$m	1,589	1,423	2,933	1,607	3,480
Switzerland	$m	1,161	1,899	1,889	1,878	2,239
India	$m	578	66	1,474	1,928	1,508
United States	$m	127	3,079	3,937	1,382	1,251
Other [a]	*$m*	*5,969*	*13,762*	*12,433*	*3,334*	*4,008*
Total	**$m**	**18,867**	**24,394**	**26,105**	**23,200**	**24,406**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.7: Principal markets for Australia's lithium exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
China	$m	na	na	na	4,725	19,828
Belgium	$m	na	na	na	85	169
Korea, Rep. of	$m	na	na	na	46	90
United States	$m	na	na	na	37	15
Other [a]	*$m*	*na*	*na*	*na*	*7*	*8*
Total	**$m**	**na**	**na**	**na**	**4,899**	**20,110**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.8: Principal markets for Australia's crude oil and refinery feedstocks exports[a]

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
Singapore	$m	1,946	1,360	1,661	1,512	1,470
Korea, Rep. of	$m	694	337	89	649	1,093
China	$m	1,008	1,033	161	158	1,015
Thailand	$m	1,120	618	365	0	898
Malaysia	$m	1,640	1,013	658	47	948
Japan	$m	301	137	91	219	222
Other [b]	*$m*	*2,362*	*4,510*	*4,409*	*11,447*	*7,547*
Total	**$m**	**9,071**	**9,009**	**7,434**	**14,031**	**13,192**

Note: Department of Industry, Science and Resources estimates based on International Trade Centre data; **b** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; International Trade Centre (2023); Department of Industry, Science and Resources (2023)

Table 17.9: Principal markets for Australia's copper exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
China	$m	3,606	3,787	2,747	1,958	2,351
Korea, Rep. of	$m	683	651	1,315	1,375	1,415
Malaysia	$m	1,241	824	850	961	1,084
India	$m	444	463	626	941	457
Japan	$m	1,833	2,126	17	18	1
Other [a]	$m	*1,962*	*2,357*	*5,885*	*6,875*	*6,964*
Total	**$m**	**9,770**	**10,208**	**11,440**	**12,128**	**12,271**

Notes: **a** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2023)

Table 17.10: Principal markets for Australia's alumina exports[a]

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
Bahrain	$m	0	0	0	923	1,559
UAE	$m	29	0	0	747	1,075
South Africa	$m	921	577	na	433	660
Canada	$m	17	0	0	424	638
Mozambique	$m	644	453	54	431	573
Other[b]	*$m*	*8,633*	*6,401*	*6,894*	*6,019*	*3,804*
Total	**$m**	**10,245**	**7,431**	**6,948**	**8,977**	**8,308**

Note: Department of Industry, Science and Resources estimates based on International Trade Centre data; **b** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; International Trade Centre (2023); Department of Industry, Science and Resources (2023)

Table 17.11: Principal markets for Australia's aluminium exports[a]

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
Korea, Rep. of	$m	768	1,138	905	1,029	1,538
Japan	$m	1,320	1,016	956	1,505	1,319
United States	$m	841	247	256	596	533
Thailand	$m	392	290	349	521	347
Taiwan	$m	293	360	417	618	319
China	$m	17	29	118	132	78
Other [b]	*$m*	*535*	*612*	*762*	*1,309*	*1,147*
Total	**$m**	**4,166**	**3,692**	**3,763**	**5,710**	**5,282**

Note: Department of Industry, Science and Resources estimates based on International Trade Centre data; **b** may include 'No Country Detail' where various confidentiality restrictions may apply, see *International Merchandise Trade, Australia: Concepts, Sources and Methods 2018 Data confidentiality* for more information.
Source: ABS (2023) International Trade in Goods and Services, 5368.0; International Trade Centre (2023); Department of Industry, Science and Resources (2023)

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 and Resources' Office of the Chief Economist (DISR 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 and Resources (2022)

A.4 Commodity classifications

The DISR 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 and Resources (2022)

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.
DISR	Department of Industry, Science 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

About this edition

The *Resources and Energy Quarterly* (REQ) contains 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 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* factors in these changes and makes alterations to the forecasts and projections by estimating the impact on Australian producers and the value of their exports.

The *Resources and Energy Quarterly* uses IMF economic growth forecasts as the basis of its world growth forecasts.

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 12 December 2023.

Resources and Energy Quarterly publication schedule

Publication	Expected release date	Outlook period final year
March 2024	27 March 2024	Australian data: 2028–29 World data: 2029
June 2024	1 July 2024	Australian data: 2025–26 World data: 2026
September 2024	30 September 2024	Australian data: 2025–26 World data: 2026
December 2024	20 December 2024	Australian data: 2025–26 World data: 2026

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