



Australian Government
Department of Industry,
Science and Resources

Office of the
Chief Economist

Resources and Energy Quarterly

MARCH 2024

www.industry.gov.au/req

Contents

Executive Summary	4	Resources insights	
Overview	5	Macroeconomic Outlook – Box 2.1	
Macroeconomic Outlook	16	Commodity demand prospects will be underpinned by urbanisation and investment in Australia’s major trading partners	20
Steel	28	Lithium – Box 15.1	
Iron Ore	38	China’s battery and electric vehicle industries lead global rivals	152
Metallurgical Coal	48		
Thermal Coal	57		
Gas	70		
Oil	82		
Uranium	91		
Gold	97		
Aluminium	109		
Copper	124	Principal markets for Australia’s resource and energy exports	162
Nickel	134	Appendix A: Definitions and classifications	170
Zinc	143	Appendix B: Glossary	172
Lithium	150	About the edition	178

Further information

For more information on data or government initiatives please access the report from the Department's website at: www.industry.gov.au/oce

Editor

David Thurtell

Chapter Authors

Resource and energy overview: David Thurtell

Macroeconomic overview: Chris Mornement and Kelly Sun

Gold: Chris Mornement

Steel and iron ore: Colin Clark

Metallurgical coal and thermal coal: Ranjini Palle

Uranium: Sufyan Saleem

Gas: Mark Gibbons

Zinc: Colin Clark

Oil: Sufyan Saleem

Aluminium, alumina and bauxite: Andy Lee

Copper: Eshaq Farahmand

Nickel: Andrew Nash

Lithium: Justin Tang

Acknowledgements

The authors would like to acknowledge the contributions of:

Michelle Dowdell, Silvia Gong, James Hutson, Alfonso Martínez Arranz, and Shevaun Fitzmyers.

Cover image source: Shutterstock, Christoph Schaarschmidt

ISSN 1839-5007

Vol. 14, no. 1

© Commonwealth of Australia 2024

Ownership of intellectual property rights

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

Creative Commons licence



Attribution 4.0 International Licence CC BY 4.0

All material in this publication is licensed under a Creative Commons Attribution 4.0 International Licence, with the exception of:

- the Commonwealth Coat of Arms;
- content supplied by third parties;
- logos; and
- any material protected by trademark or otherwise noted in this publication.

Creative Commons Attribution 4.0 International Licence is a standard form licence agreement that allows you to copy, distribute, transmit and adapt this publication provided you attribute the work. A summary of the licence terms is available from <https://creativecommons.org/licenses/by/4.0/>.

Wherever a third party holds copyright in material contained in this publication, the copyright remains with that party. Their permission may be required to use the material. Please contact them directly.

Attribution

Content contained herein should be attributed as follows:

Department of Industry, Science and Resources, Commonwealth of Australia Resources and Energy Quarterly March 2024.

The Commonwealth of Australia does not necessarily endorse the content of this publication. Requests and inquiries concerning reproduction and rights should be addressed to req@industry.gov.au

Disclaimer

The views expressed in this report are those of the author(s) and do not necessarily reflect those of the Australian Government or the Department of Industry, Science and Resources.

This publication is not legal or professional advice. The Commonwealth of Australia does not guarantee the accuracy or reliability of the information and data in the publication. Third parties rely upon this publication entirely at their own risk.

Executive Summary

Australian resource and energy export earnings are forecast to be \$417 billion in 2023–24. This is broadly consistent with the December 2023 *Resources and Energy Quarterly* (REQ) but down around 10% from a record \$466 billion in 2022–23 following the spike in energy prices due to the fallout from the Russian invasion of Ukraine. In 2024–25, export earnings are forecast to fall further to around \$369 billion, reflecting further bulk commodity price declines and a rise in the AUD/USD. Through the rest of the outlook period (to 2029), export values are expected to level out as commodity price declines slow and the AUD/USD lifts modestly.

World economic growth remains soft, weighed down by relatively tight financial conditions. However, key markets have continued to support commodity demand. US economic growth has been robust despite interest rate hikes in the past 2 years. In China, strong investment in infrastructure and manufacturing capacity has helped resource and energy commodity demand in the face of weak demand from the residential property sector.

Chinese demand is likely to continue to shape commodity markets over the next five years. However, Indian economic growth is currently the strongest in the world, and its growing manufacturing base, strong infrastructure spending and demographics, all suggest rising per capita consumption of resource and energy commodities. By 2029, India will account for a significantly larger share of world commodity demand.

The global energy transition will also be a key factor in resource and energy commodities over the outlook period. While the transition will see increased demand for commodities used in low emission technologies (for example, iron ore, aluminium, copper, nickel and lithium), it will reduce demand for other commodities (such as some fossil fuels). Moreover, the continuing evolution of technologies during the energy transition increases the challenge of forecasting future demand, supply and prices.

The decarbonisation of steel/aluminium production and supply chains will affect growth and trade patterns over the outlook period to 2029. Overcoming the substantial technological, energy and feedstock

challenges required to achieve this transformation will take both time and substantial capital investment. There are already many pilot steel plants under construction around the world, especially hydrogen-based DRI operations, most of which are expected to begin over the next two years. Aluminium producers are increasingly resorting to renewable power to reduce their emissions, and this trend will accelerate over the outlook period. This will include the use of green hydrogen.

The prices of lithium and nickel reached high levels in 2022 and H1 2023. Combined with strong supply growth since 2020, softer-than-expected (cyclical and structural) demand for both metals has since seen market surpluses develop. Since the last REQ, rising inventories have seen the prices of lithium and nickel hit 5-year lows. The relatively weak price outlook has contributed to announced closures and production cuts by a number of key nickel and lithium producing nations (including Australia) and added to existing supply chain uncertainties associated with Western nations' policy measures to secure future supply.

Some high-cost nickel producers may exit the market permanently. However, nickel's use in a widening array of materials and technologies means a tightening global balance and improved prices in the latter half of the outlook period. Lithium remains a central component of batteries used in numerous technologies. Australian lithium exports are likely to remain substantial, with most lithium producers in Australia likely to remain globally competitive.

There are a number of factors that could quickly outdate some of the forecasts, including:

- a further widening of Western sanctions on Russia to include base metals, which may improve the prospects for Australian metal producers, particularly of nickel and aluminium.
- any further widening in the Hamas-Israel conflict could disrupt Middle East oil/LNG supply and raise prices, hurting world economic growth.
- higher-than-normal odds of a new La Niña episode starting in H2 2024, which raises the risk of wet weather and flooding that heavily impacted mines, transport routes and ports in Australia in 2021-23.

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



Influences on long-term outlook: **global energy transition, geopolitics and infrastructure development**



Commodity prices and earnings expected to **ease** over the outlook period as **energy commodity prices slide**

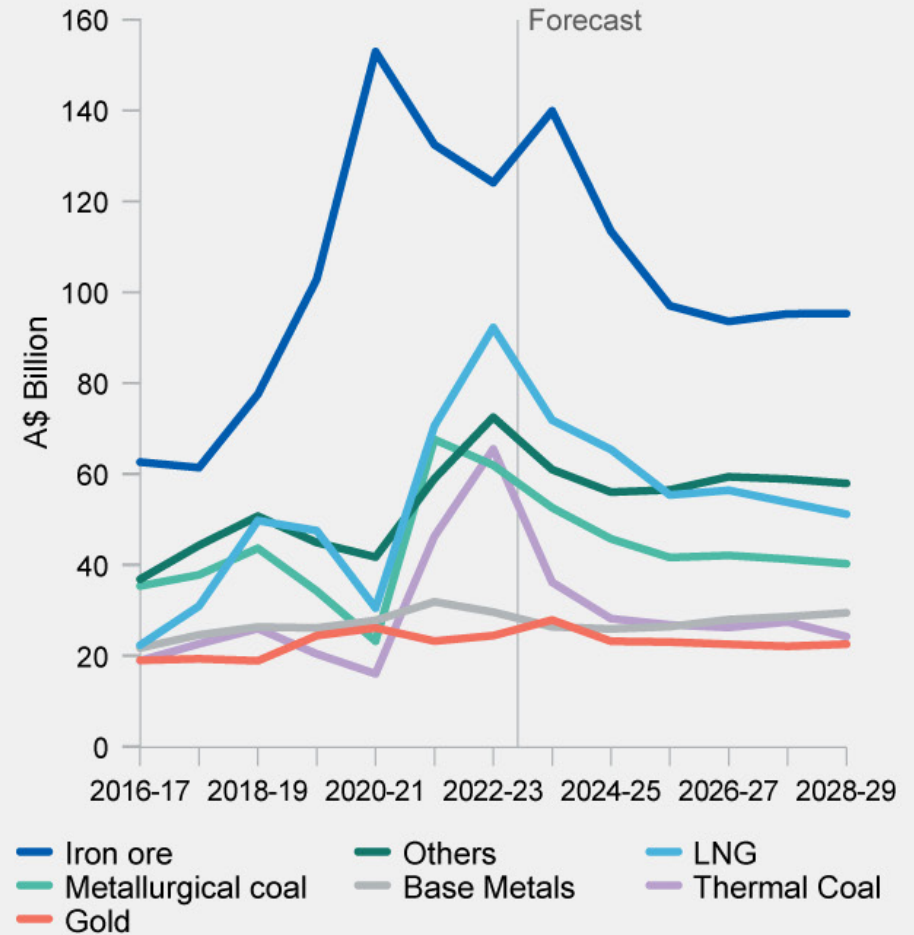


Supply disruptions for energy commodities have reduced, but new risks introduced with **geopolitical conflicts**



Investment in **new deposits and mines** is on the rise

Australia's resource and energy exports



SOURCE: ABS; DISR; OCE

1.1 Summary

- The near-term outlook for Australian resource and energy commodity exports has improved slightly in net terms since the December 2023 REQ. Major economies have avoided a recession, and the outlook is for an improvement in world economic growth in 2025 once monetary policy becomes less restrictive in major Western economies. The global energy transition and firm growth in China and India will maintain the demand for minerals over the rest of the outlook period.
- Relatively weak growth in world demand and rising world commodity supply will see Australia's resource and energy exports decline to \$417 billion in 2023–24 from \$466 billion in 2022–23. Another decline is likely in 2024–25, as commodity prices drift down and the AUD/USD lifts. Further out, lower bulk commodity prices will dampen export earnings.
- Recent falls in nickel and lithium prices have been driven by supply continuing to outpace demand, and iron ore prices have softened as worries persist over the real estate sector in China.

1.2 Macroeconomic, geopolitical and policy factors

Inflation is declining, opening the way for less restrictive monetary policies

Since the last REQ, labour markets in the major Western economies have lost some tightness and inflation has continued to moderate. Western central banks are expected to start withdrawing their restrictive monetary stance in H2 2024. Moves towards a more neutral monetary stance by the world's major central banks will support a rise in world economic growth over the next five years.

Over the same time, world economic growth will be boosted by the ongoing investment needed for the global energy transition. Demographic factors will keep labour markets relatively tight over the forecast period, maintaining relatively high household spending on goods and services, and improving government budgets.

Investment in manufacturing capacity has helped support Chinese growth as the property sector shake out continues. China's government continues to roll out new measures to put local government finances on a more

sustainable footing and support economic growth: the focus of support measures has been on fiscal rather than monetary policy, including infrastructure spending. Consumer spending has been slower with confidence hurt from property price declines.

Chinese economic growth is forecast to fall to 3-4% in the latter part of the outlook period. While this is much lower than growth averaged in the 2000-2020 period, it comes off a higher base — suggesting still high demand in absolute terms. Chinese commodity demand is thus likely to (still) be highly influential over the next five years. However, India is likely to account for a much larger share of world demand by the end of the outlook period with a growing manufacturing base, strong infrastructure spending and favourable demographics.

Low emission technologies will be key driver of future supply and demand

Government policies to drive 'net zero' and geostrategic interests are set to continue to impact both the supply and demand for commodities used in low emission technologies. Under the US Inflation Reduction Act, graduated changes to content requirements are set to impact supply chains (right back to mine level) of EVs and other low emission technologies.

Climate drivers have shifted since the last REQ: the current El Niño weather event has peaked and is now forecast to end in H1 2024. Some weather forecasters attach a higher-than-normal chance of the start of a La Niña episode in H2 2024. Should this eventuate, Australian miners may experience a repeat of the wet weather and the associated flooding of mines, transport routes and ports that hampered output in 2021-2023.

Like other sectors of the economy, the increased use of AI could boost resource and energy commodity supply by lowering the cost of exploration, production and transportation and increasing the efficiency of inventory management. Demand may also be increased through the broader impact of AI on economic growth.

Geopolitical risks continue to challenge commodity markets

Geopolitical developments continue to pose risks to the outlook for commodity markets. The widening of the Hamas-Israel conflict has already

had an impact on energy markets: attacks on shipping in the Red Sea have forced cargo ships to take alternate routes, adding to voyage time and thus shipping costs. The ongoing Russia invasion of Ukraine will continue to harm Russia's ability to produce/export resource and energy commodities; Russian miners face rising borrowing costs, impacting on their ability to develop new projects and expand existing ones. Potential investment in Russia by Chinese and Indian interests will likely only partly replace Western investment/participation.

More broadly, risks to the aggregate revenue forecasts appear evenly balanced. The impact of current relatively low prices for lithium and nickel being sustained for longer than we expect could easily be offset by iron ore prices holding up better than expected. Unemployment may rise as the impact of official interest rate hikes peaks. A widening of the Hamas–Israel conflict poses a significant risk to energy commodity and financial markets. A further widening of sanctions against Russia to include base metals may benefit Australian producers in the medium term.

AUD has attracted some support

The AUD/USD has risen slightly in recent months. This reflects market optimism over Chinese government efforts to stabilise the nation's property sector, and currency market expectations that moves in Australian-US interest rate differentials will encourage AUD buying. The consensus forecast adopted is for the AUD/USD to lift modestly in the outlook period.

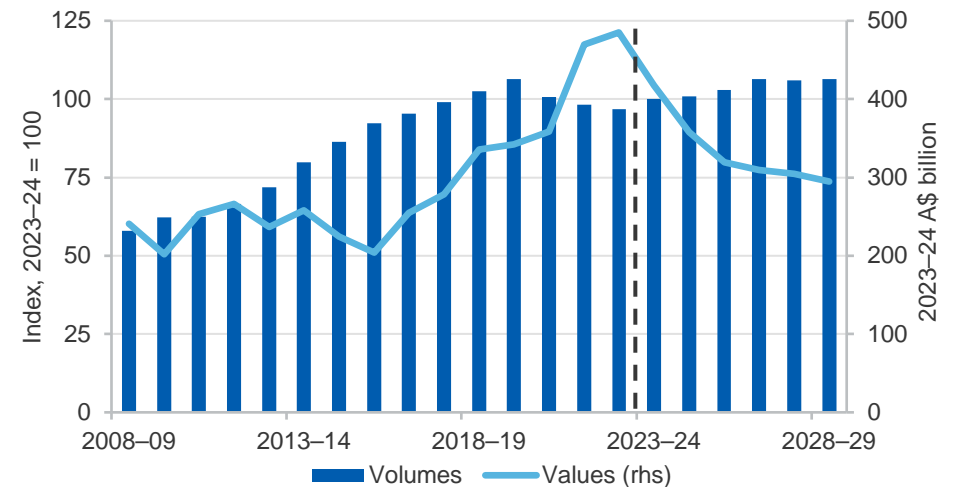
1.3 Export values

Australia's export values are forecast to be \$417 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 8% from the March quarter 2023: a rise in volumes only partly offset the impact of a double digit fall in prices.

There has been a significant upward revision to the aggregate forecasts since December. Resource and energy exports are forecast to be \$417 billion in 2023–24 and \$369 billion in 2024–25. Exports are forecast to fall to around \$300 billion in real terms in 2028–29 (Figure 1.1).

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



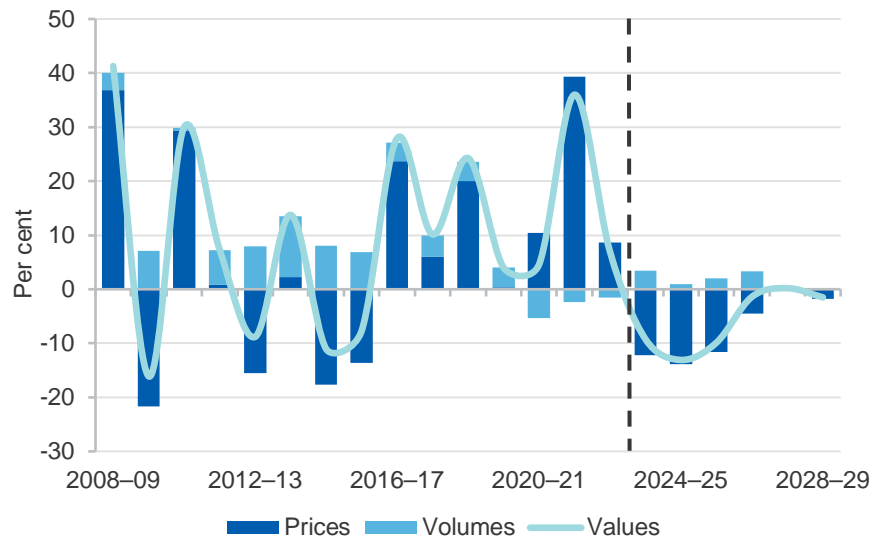
Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Weak demand and improved global commodity supply are expected to drive a fall in prices, more than offsetting the impact of a forecast small rise in export volumes (Figure 1.2). Export values are forecast to fall by 12% to \$369 billion in 2024–25, driven by lower prices.

Within the totals, energy export earnings are set to show double digit falls. LNG earnings are forecast to fall by \$6 billion to \$65 billion in 2024–25, and then settle at \$50-55 billion in the period from 2025–26 to 2028–29. Lower prices will drive the falls. Thermal coal exports are forecast to fall even more sharply: from \$66 billion in 2022–23 to \$36 billion in 2023–24 and \$30 billion in 2024–25. Exports should settle at \$24-27 billion thereafter. Uranium should earn Australia \$1 billion in 2023–24, and more than \$2 billion after 2024–25.

Among resource commodities, **iron ore** remains the largest earner, forecast to earn about \$136 billion in 2023–24, but fall to \$111 billion in 2024–25. The sharp retracement in **lithium** prices is expected to see lithium exports fall from \$20 billion in 2022–23 to \$11 billion in 2023–24. Export values should then stabilise at around the \$10-11 billion mark.

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



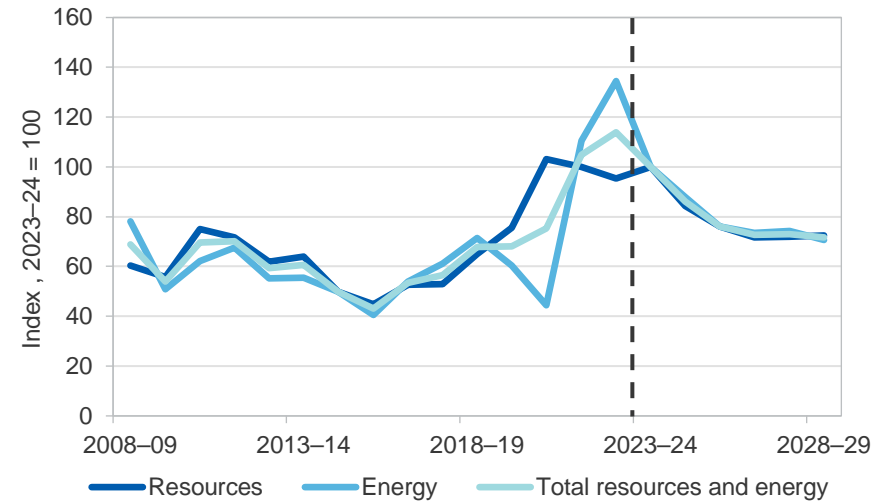
Source: ABS (2023) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

1.4 Prices

Since the December 2023 *Resources and Energy Quarterly*, resource and energy prices have generally declined in US\$ terms (Figure 1.3). Slow 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 supply remains relatively tight for some commodities (such as coal, iron ore and copper).

In Australian dollar terms, the Resources and Energy Commodity Price Index fell by 2% (preliminary estimate) in the March quarter 2024, to be down 11% on a year ago. In US dollar terms, the index fell by 1% in the quarter, to be down 14% on a year ago. Resource export prices (in A\$ terms) were unchanged from the March quarter 2023, while energy prices fell by 21%.

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

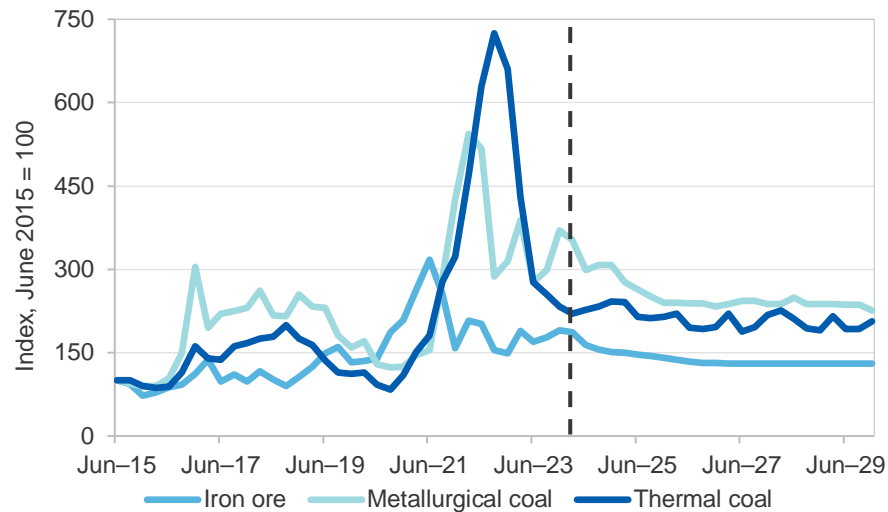


Notes: The export price index is based on Australian dollar export unit values (EUVs, export values divided by volumes); the export price index is a Fisher price Index, which weights each commodity’s EUV by its share of total export values.
Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Iron ore prices have declined in net terms in recent months, hurt by worries of falling Chinese demand and high Chinese stockpiles (Figure 1.4). The price of **metallurgical coal** has held relatively high, with production problems adding to firm demand. Some Russian supply remains stranded from world markets and some Queensland mines have continued to be affected by bad weather.

Energy prices continue to ease, as demand and supply factors push in the same direction. The enormous supply chain disruptions that pushed prices high in 2022 and 2023 have continued to ease, with Western European nations obtaining supply elsewhere from Russia. Slow world economic growth has constrained energy usage. **Thermal coal** prices are still above pre-pandemic levels, with some Russian production shut in.

Figure 1.4: Bulk commodity prices



Notes: Prices are in US dollars, and are the international benchmark prices
 Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

LNG prices are declining as the Northern Hemisphere winter passes and European storage levels remain relatively high. Prices should come under downward pressure from rising US and Qatari supply in 2025. Gas/LNG markets remain more vulnerable to supply shocks following the stranding of some Russian supply.

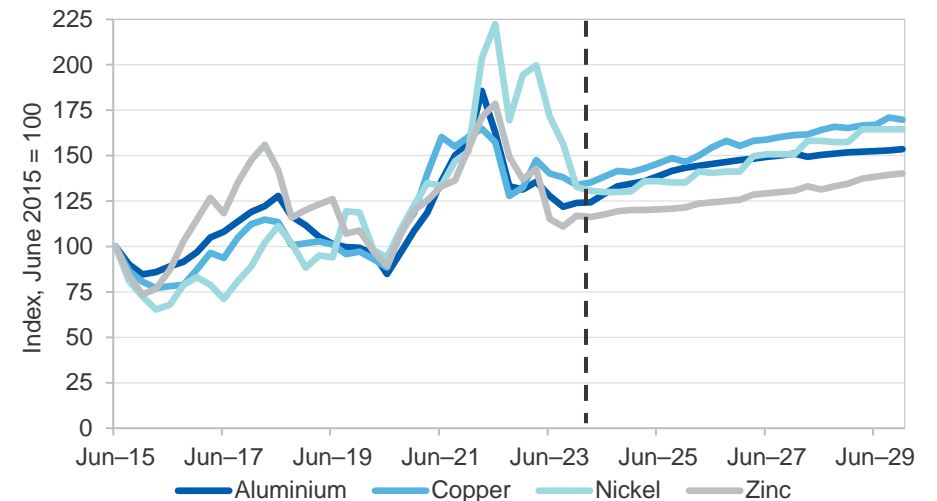
Oil prices have risen modestly since the last REQ, with OPEC+ extending output cuts to offset the impact of weak demand. However, the rising take-up of EV's will detract from demand over the outlook period.

The **gold** price has hit a record above US\$2,100 since the last REQ, on the back of a number of supportive factors: the prospect of lower interest rates in most economies in 2024–25, geopolitical tensions, and worries over the Chinese property market.

Base metal prices have been mixed, impacted by weak construction and manufacturing in major economies (Figure 1.5). The price of **nickel** has steadied after falling throughout 2023: inventories are rising due to high

Indonesian output and moderating (cyclical) global demand. Closures and cutbacks are occurring in many nickel producing nations, and further expansions in Indonesia will likely be put on hold if prices fall back to January/February 2024 lows. Exchange inventories of Russian **aluminium** are rising, shunned by Western consumers. Stocks of most base metals are low for this stage of the economic cycle, which skews price risks to the upside. Rising infrastructure-related demand (particularly for the global energy transition) should support prices over the outlook period, combined with broader demand following easing monetary policy.

Figure 1.5: Base metal prices



Notes: Prices are in US dollars, and are the international benchmark prices
 Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

Since the last REQ, **lithium** prices (spodumene and lithium hydroxide) have dropped to their lowest level since 2019. Market surpluses have seen inventories rise, and producers in a number of countries (including Australia) have announced cuts/closures in response to the relatively weak outlook for prices. However, Australian lithium exports will continue to contribute substantially to resource and energy export earnings.

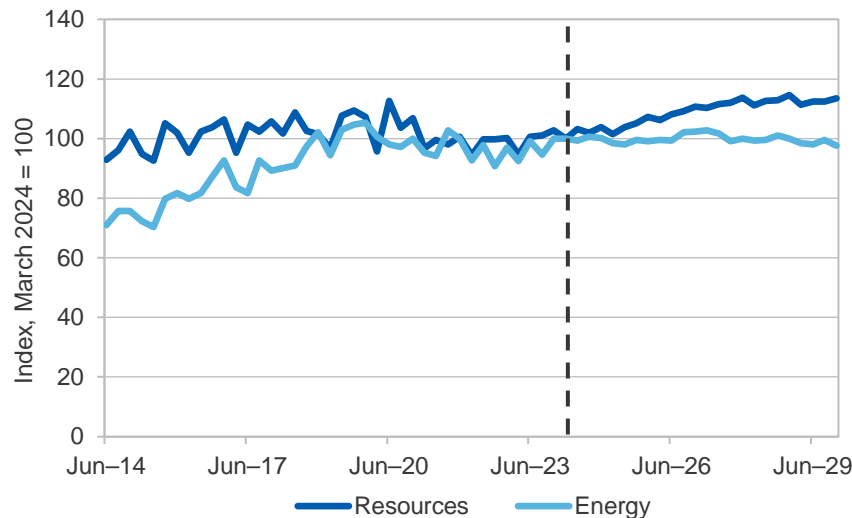
1.5 Export volumes

March quarter export volumes rose

The Resources and Energy Export Volumes Index (preliminary estimate) fell 1.1% in the March quarter 2024 from the December quarter 2023 but was up 6.7% on the March quarter 2023. Resource commodity volumes rose by 5.1% in the year to the March quarter 2024 and energy export volumes recorded 8.5% gains (Figure 1.6). High prices, 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 and 2026. The global energy transition will support resource export volumes over the outlook period. Relatively high prices (due to low investment in new supply) and the global energy transition are set to see energy production and exports stagnate over the outlook period.

Figure 1.6: Resource and energy export volumes



Source: Department of Industry, Science and Resources (2024)

Energy exports will level out in 2024, as the sharp price falls of the past year temper production and encourage delayed maintenance to occur.

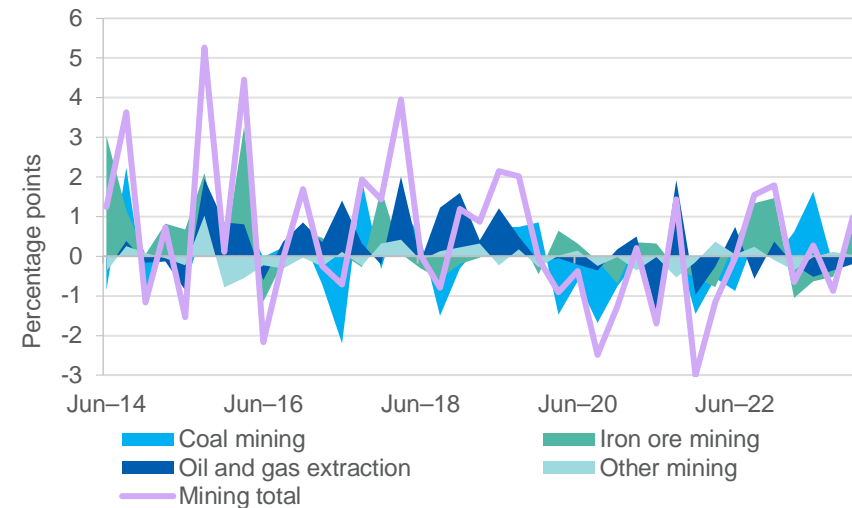
The current El Niño climate episode is expected to end by June 2024. There is a strong chance of a La Niña episode developing in 2024–25, raising the odds of the type of wet weather disruptions that hampered the production and transportation of Australian mines in the 2021–2023 period. Further out, depleting oil fields will hurt oil exports, and coal exports will be impacted by the global energy transition and constraints on finance for new mines.

1.6 Contribution to growth and investment

Mining output rose while the overall economy grew more modestly

Australia's real GDP rose by 0.2% in the December quarter 2023, to be up 1.5% from a year before. Mining value-added rose by 1.0% in the December quarter but was 0.5% lower than in December 2022 (Figure 1.7). The quarterly rise was driven by stronger Iron Ore mining (up by 1.9%) and Coal mining (up by 1.6%) which continues to recover from the impact on production of the La Niña weather episode. Exploration rose by 1.1% to be up 9.8% over the year. Oil and gas extraction contracted, as maintenance and operational issues impacted.

Figure 1.7: Contribution to quarterly growth, by sector

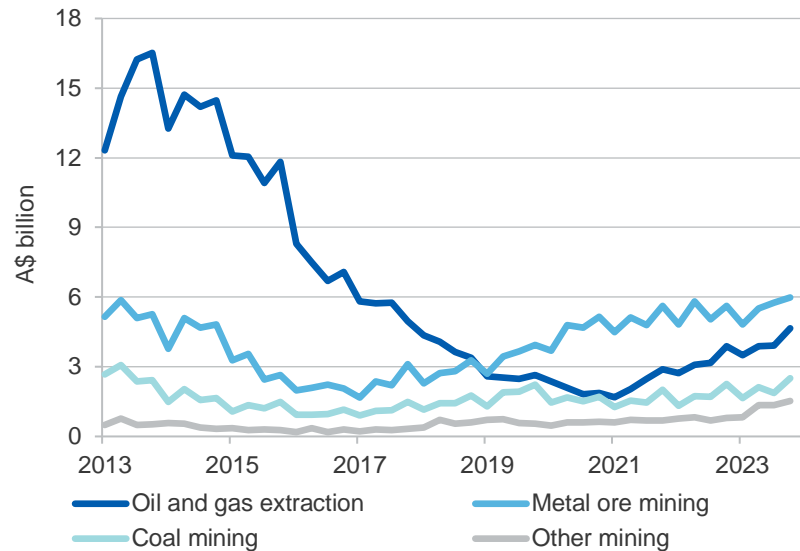


Source: ABS (2023) Australian National Accounts, 5206.0

Mining investment is growing strongly

The latest ABS Private New Capital Expenditure and Expected Expenditure survey shows that Australia's resources industry invested \$14.7 billion in the December quarter 2023, up 17% from the December quarter 2022. In quarterly terms, investment grew for all categories, with particular strength in coal, oil & gas mining (Figure 1.8).

Figure 1.8: Mining capex by commodity, not seasonally adjusted



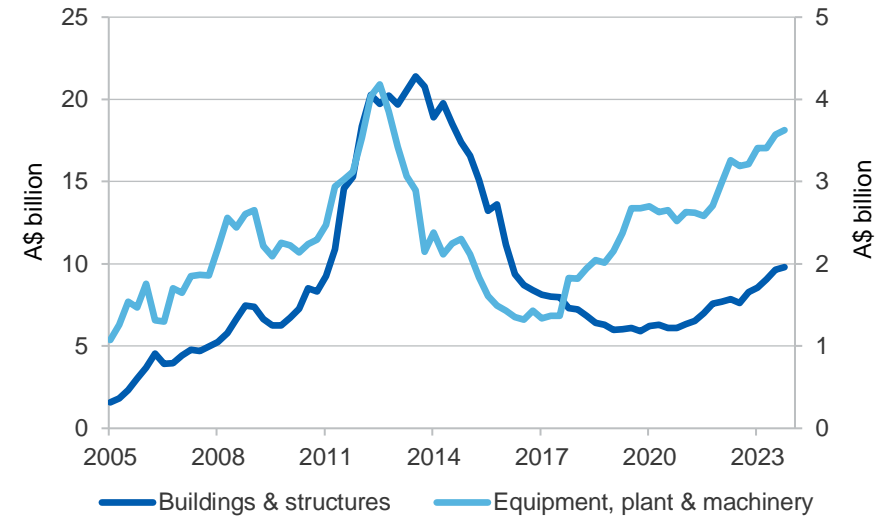
Notes: Other mining includes non-metallic mineral mining and quarrying and exploration and other mining support services; chart data is in nominal, original terms

Source: ABS (2024) Private New Capital Expenditure and Expected Expenditure, 5625.0

Expenditure for buildings and structures rose by 1.6% in the December quarter, while investment in equipment, plant and machinery rose by 4.7%, 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.

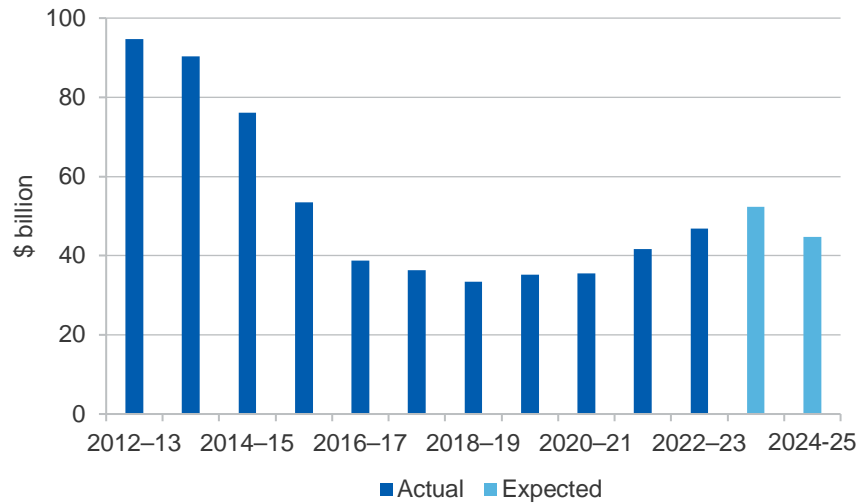
Source: ABS (2024) Private New Capital Expenditure and Expected Expenditure, 5625.0

Forward expectations suggest that total mining industry investment in 2023–24 is set to rise in the near-term (Figure 1.10). The fifth estimate for 2023–24 suggests the mining industry will invest \$52 billion during the financial year. This is around 2% higher than the fourth estimate in the survey. The first estimate for 2024–25 (\$45 billion) is around 7% higher than the equivalent estimate for 2023–24. Estimates for forward spending tend to be revised up over time.

Further out in the outlook period, capital expenditure in the lithium and nickel industries is expected to edge back following recent declines in prices.

Energy commodities including coal, gas and (especially) uranium are experiencing relatively strong prices at present, and have good prospects for enhanced exploration activity over the next few years.

Figure 1.10: Mining industry capital expenditure, fiscal year



Notes: Chart data is in nominal terms

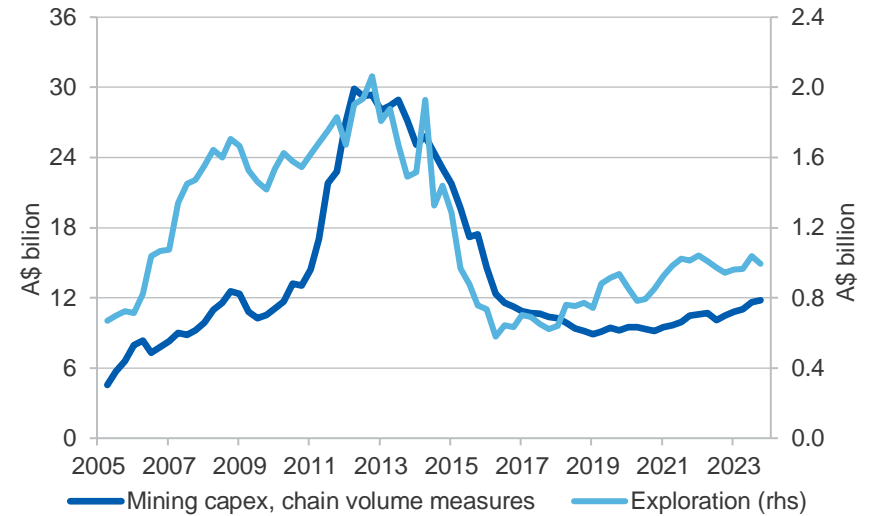
Source: ABS (2024) Private New Capital Expenditure and Expected Expenditure, 5625.0

Exploration expenditure (adjusted for inflation) fell by 5% to \$993 million in year to the December quarter 2023. However, 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 coal (up by 34% in the December quarter), oil and gas (up by 19%), and 'other mining' (up by 19%). Fossil fuel exploration is likely to have received a boost from the energy price spike of 2022. This price spike occurred as Western nations moved away from Russian exports, raising the likelihood of some Russian production being stranded for many years.

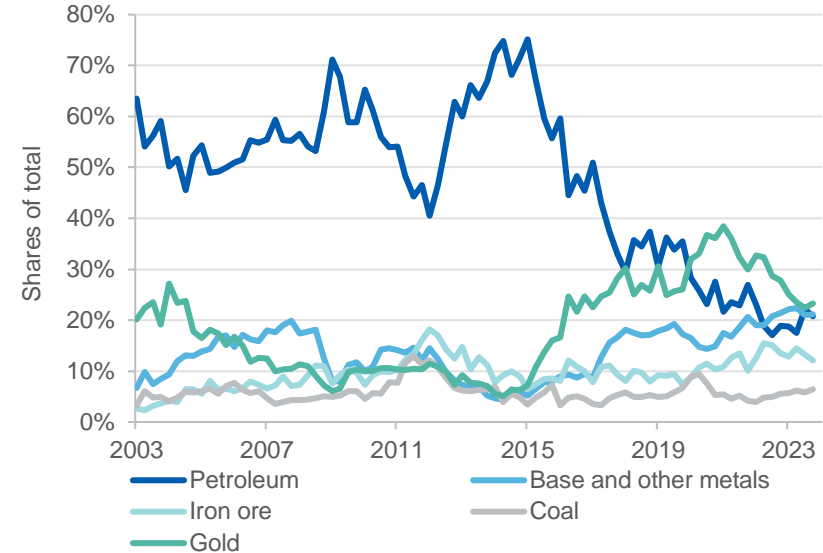
Exploration spending is a leading indicator of broader capital investment, and recent growth suggests interest is rising in precious and industrial metals (such as copper and iron ore), and critical minerals. Given the typical lags involved, we could expect capital spending by resource and energy companies to continue to lift over the next few years.

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



Source: ABS (2024) Private Capital Expenditure Survey, Chain Volume measure, 5625.0

Figure 1.12: Shares of exploration expenditure by commodity type



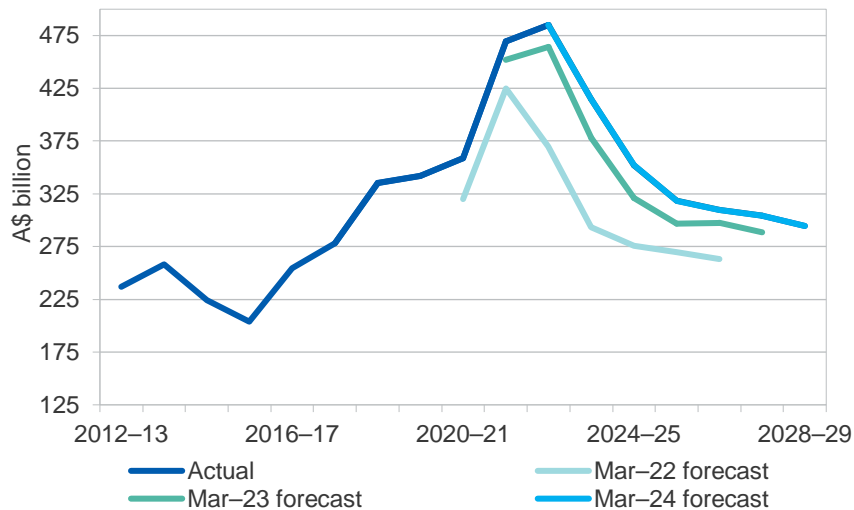
Source: ABS (2024) Private Mineral and Petroleum Exploration, 8412.0

1.7 Revisions to the outlook

The forecast for Australia's resources and energy exports in 2023–24 is \$10 billion higher than the forecast contained in the December 2023 *Resources and Energy Quarterly*. The forecast for 2024–25 (nominal prices) is \$19 billion higher than the same report (Figure 1.13). Compared to the March 2023 REQ, export earnings further out in the outlook period are holding up better than expected.

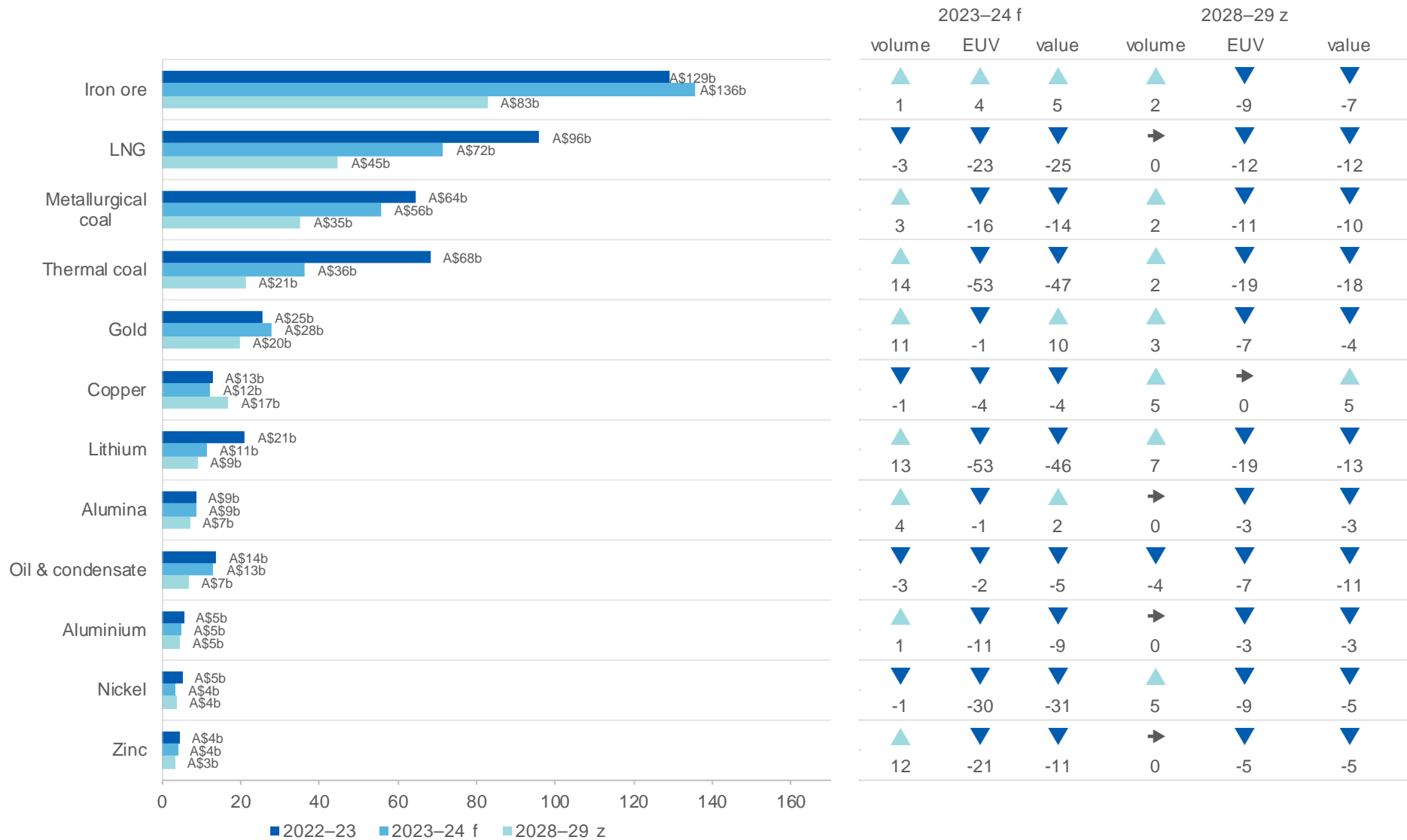
The 2023–24 and 2024–25 revisions have been largely driven by an upward revision to the iron ore price and the impact of a weaker than expected exchange rate against the US dollar (AUD/USD). Further out, an improved outlook for iron ore has more than offset downward revisions to export earnings for lithium and oil.

Figure 1.13: Resource and energy exports, by forecast publication



Source: Department of Industry, Science and Resources (2024)

Figure 1.14: Australia's major resources and energy commodity exports, 2023–24 dollars % change from 2022–23 CAGR % change from 2022–23



Notes: f forecast; z projection. EUV is export unit value.
 Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

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

Exports (A\$m)	Percentage change							CAGR ^g %
	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^f	2026–27 ^f	2027–28 ^f	2028–29 ^f	
Resources and energy	466,338	417,092	368,892	338,664	336,657	339,042	336,128	-5.3
– real ^b	485,078	417,092	357,541	319,423	309,786	304,371	294,395	-8.0
Energy	238,711	183,402	163,127	141,082	140,437	137,686	130,916	-9.5
– real ^b	248,304	183,402	158,108	133,067	129,227	123,606	114,662	-12.1
Resources	227,627	233,690	205,765	197,581	196,220	201,356	205,212	-1.7
– real ^b	236,774	233,690	199,434	186,356	180,558	180,765	179,734	-4.5

Notes: **b** In 2023–24 Australian dollars; **f** forecast; **g** growth rate on 2022-23 levels.

Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

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

	Unit	Prices			Unit	Export volumes			Real export values, A\$b, 2023–24 prices		
		2022–23	2023–24 ^f	2028–29 ^f		2022–23	2023–24 ^f	2028–29 ^f	2022–23	2023–24 ^f	2028–29 ^f
Iron ore	US\$/t	95	103	75	Mt	895	900	983	129	136	83
LNG	A\$/GJ	21	17	12	Mt	82	79	79	96	72	45
Thermal coal	US\$/t	302	135	115	Mt	182	208	207	68	36	21
Metallurgical coal	US\$/t	277	289	207	Mt	156	161	175	64	56	35
Gold	US\$/oz	1,831	1,995	1,909	Mt	228	253	275	25	28	20
Lithium	US\$/t	5,174	1,800	1,231	Kt	440	499	676	21	11	9.1
Crude oil	US\$/bbl	87	84	73	Kb/d	852	845	1,135	14	13	6.9
Copper	US\$/t	8,289	8,258	10,061	Kt	282	274	215	13	12	17
Alumina	US\$/t	343	341	369	Mt	16,566	17,165	16,708	8.6	8.8	7.2
Aluminium	US\$/t	2,333	2,204	2,685	Kt	1,440	1,462	1,483	5.5	5.0	4.6
Nickel	US\$/t	23,911	17,889	20,950	Kt	161	159	214	5.2	3.6	3.8
Zinc	US\$/t	2,981	2,529	2,979	Kt	1,247	1,400	1,213	4.5	4.0	3.3
Uranium	US\$/lb	51	85	119	t	4,809	5,478	7,217	0.8	1.2	2.0

Notes: **a** Export data covers both crude oil and condensate; **b** Lithium carbonate equivalent; **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 2023

Country	China	US	EU	India	ASEAN	Japan	S Korea	Taiwan	Australia
Per cent share of global GDP (PPP)	19	15	15	8	5	4	2	1	1
Yearly change	▲ 5.2%	▲ 2.5%	▲ 0.6%	▲ 6.7%	▲ 4.9%	▲ 1.9%	▲ 1.4%	▲ 0.8%	▲ 1.8%
Share of Australia's two-way trade	30%	6%	9%	4%	10%	12%	7%	4%	–

Global overview

- In 2023, global economic activity **increased by 3.1%**. Growth is expected to maintain **3.1%** in 2024 and **3.2%** in 2025.
- Steady **disinflation** and **growth in major economies** expected to **ease monetary conditions and support growth** in late 2024 and 2025.
- **China's economic growth** is projected to slow from **4.6%** in 2024 to **3.4%** in 2028.



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 and weather-related shocks**



SOURCE: IMF; ABS; OCE

2.1 Summary

- Global industrial production and manufacturing activity recovered in late 2023 and early 2024, due to improvements in global goods demand.
- The outlook for global growth in 2024 improved slightly, with the balance of risks remaining slightly tilted to the downside. As inflation returns to target levels, central banks will likely adopt less restrictive stances, allowing growth to pick up in 2025.
- Despite better-than-expected growth in the December quarter 2023, key downside risks challenge China's growth outlook, including ongoing issues in the real estate sector.

2.2 World economic outlook

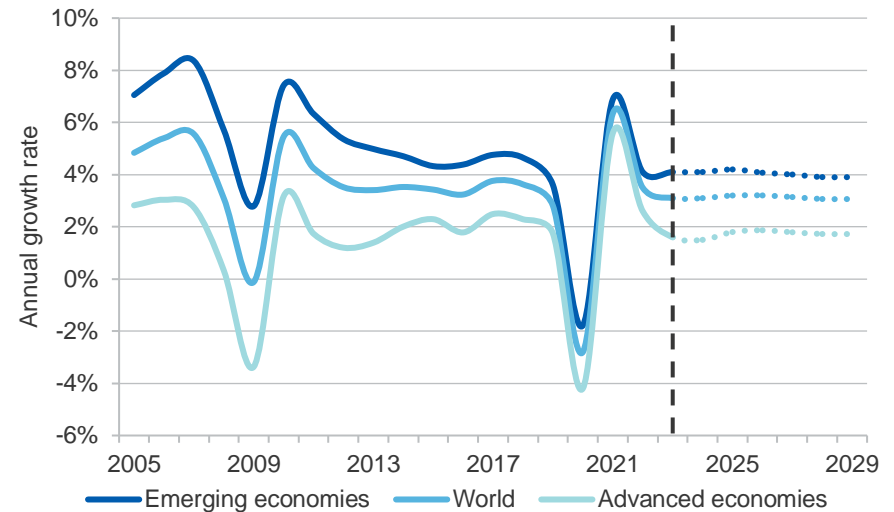
Declining inflation and resilient growth expected to support a soft landing

The International Monetary Fund (IMF) forecasts the world economy to grow by 3.1% in 2024, rising modestly to 3.2% in 2025. This represented an upgrade of 0.2 percentage points for 2024 compared to the IMF's October 2023 outlook, reflecting stronger than expected consumption in the United States, China and emerging economies in 2023. With higher confidence of a soft landing, the IMF stated the balance of risks is less negative than in October, however it is still tilted to the downside.

Growth in advanced economies is expected to slow to 1.5% in 2024, picking up in the latter half of the year and rising to 1.8% in 2025. While US consumption has continued to be stronger than expected, European economies slowed substantially in 2023 under pressure from high energy prices and tighter monetary policy. As inflation eases further towards central bank targets, easing monetary policy will support a lift in consumption and industrial activity — particularly in Europe.

Emerging economies (notably China and India) experienced stronger growth than expected in 2023 and are expected to continue this momentum throughout the outlook, with growth rising from 4.1% in 2023 to 4.2% in 2025.

Figure 2.1: GDP growth forecasts



Source: IMF (October 2023, January 2024)

Inflation eased more than anticipated in most major economies in 2023. Effects of tightened monetary policy including weaker consumption growth, retail sales, and investment intentions were seen across major economies, particularly in Europe and Japan, weighing on growth for manufacturing exporters — including China, Japan and South Korea. Signs in late 2023 and early 2024 suggest goods consumption in major economies appears to have turned a corner, with surveys pointing to improvements in global manufacturing sector output and new orders.

Over the 5-year outlook, the IMF expects global economic growth to ease to 3.1%, below the historical average of 3.8% over 2000–2019. Growth in advanced and emerging economies is expected to diverge over the outlook period, with major emerging markets China and India accounting for a major share of global economic growth by 2029. Growth in advanced economies is projected to ease over the outlook towards long-run potential growth of 1.7% by 2028, with slower growth reflecting demographic profiles and economic maturity.

The IMF expects growth in China's economy to ease from 4.6% in 2024 to 3.4% by 2028. China's growth is projected to slow as potential growth from its traditional growth engines of construction (property and infrastructure) and manufacturing exports yield diminishing returns over time, and the economy transitions towards services (see September 2023 *Resources and Energy Quarterly*).

The IMF emphasised both upside and downside risks to global growth stemming from uncertainty over the outlook for China, as its property sector downturn continues. Additional property sector reforms and large-scale investment may boost subdued confidence and household consumption over the outlook. However, structural challenges and local government financing constraints pose risks for China's growth outlook.

Downside risks to global growth remain as global core goods prices are easing but core services remain elevated relative to pre-pandemic levels. Ongoing labour market tightness may slow further disinflation, keeping monetary policy tight for longer. Fiscal policy stances are also expected to tighten across the advanced and emerging economies to rebuild budgetary room given rising sovereign debt burdens. If inflation in major economies eases to central bank targets sooner than expected, this could result in an earlier return towards neutral monetary policy, presenting an upside risk for global growth.

The sharp rise of artificial intelligence (AI) presents an opportunity for supply-side reforms as productivity and incomes are expected to improve with the growth of AI over the medium term. Advanced economies where services and cognitive-intensive roles are key drivers of the economy are likely to benefit from the technology faster than emerging economies.

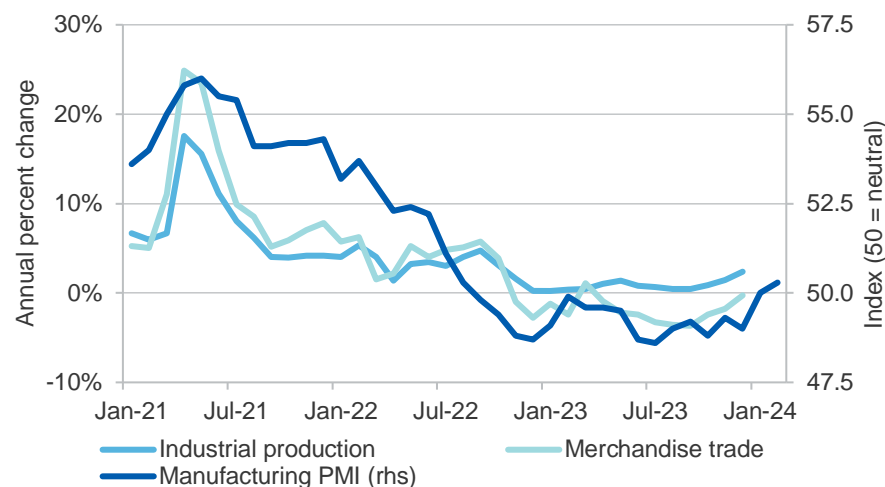
Global industrial production and trade diverges while demand remains low

Global industrial production (IP) increased by 1.6% year-on-year in the December quarter 2023 (Figure 2.2). Positive annual growth reflects lower energy prices in many major economies as well as rebounding industrial activity in China, following a weaker 2022. Global IP growth was weak throughout much of 2023 due to downturns in the industrial sectors of major producers such as Europe and Japan.

Global merchandise trade volumes declined by 1.9% year-on-year in 2023 (Figure 2.2). Softer goods demand weighed on a wide array of goods, except passenger vehicles which surged in 2023. The WTO expects a recovery of trade volume to 3.2% in 2024, however rising trade distortions and geopolitical fragmentation are expected to weigh on global trade going forward. The IMF noted 3,200 new restrictions on trade were imposed in 2022 and about 3,000 in 2023, up from about 1,100 in 2019.

Forward indicators of manufacturing activity indicate a recovery from a prolonged contraction is in prospect. The JP Morgan Global Manufacturing Purchasing Managers Index (PMI) measured 50.3 in February 2024, indicating the first expansion in 18 months. The rise was driven by expansions in major producers such as China, the United States, India and South Korea. Improvements in global manufacturing activity have come through increasing output, with new orders also rising above 50 for the first time in 20 months. The downturn in new export orders continued but the rate of decline eased, raising optimism in the manufacturing sector.

Figure 2.2: World industrial production, trade and manufacturing



Notes: PMI data is up to February 2024; IP and trade data only available to December 2023. Source: Bloomberg (2024); CPB Netherlands Bureau for Economic Policy Analysis (2024).

Inflationary pressures easing but remain vulnerable to further shocks

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 recently by persistence in services inflation.

US headline inflation measured 3.2% in February 2024, moderating less than expected despite lower energy and food prices (Figure 2.3). US services inflation rose marginally to just below 5.0% year-on-year, raising concerns over the pace of further disinflation.

Eurozone headline inflation maintained its moderating trajectory in February 2024 to 2.6%, albeit recording a slightly higher result than its low point of 2.4% in November 2023. Headline inflation has declined significantly throughout 2023 due largely to falling energy prices, however core inflation (excluding food and energy prices) appears to be easing at a slower pace, falling to 3.1% in February 2024.

In January 2024, the IMF forecast global headline inflation would fall from 6.8% in 2023 to 5.8% in 2024 and 4.4% in 2025. Compared to the October 2023 outlook, the forecast for 2025 was revised down marginally, while the forecast for 2024 was unchanged. Inflation is expected to fall more quickly in advanced economies due to tighter monetary policy and less exposure of these economies to commodity price and exchange rate shocks.

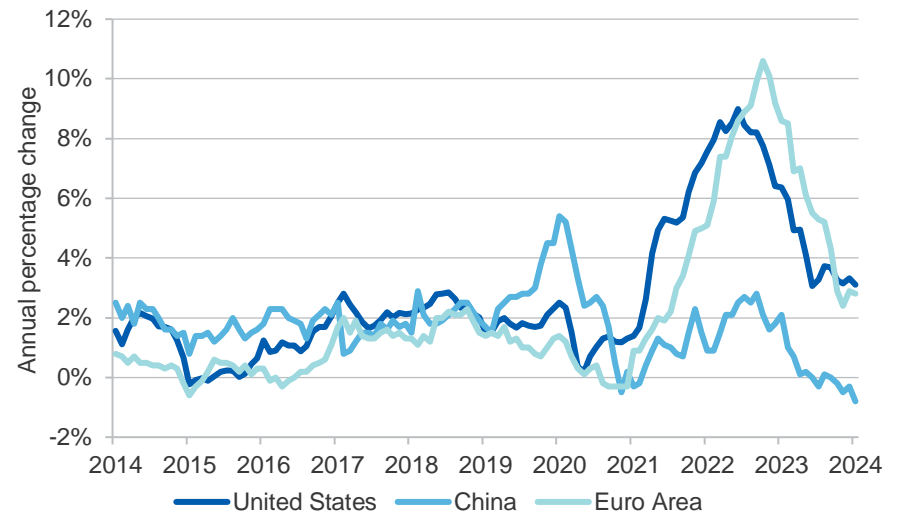
The Hamas-Israel conflict and the escalation of geopolitical tensions in the Middle East presents upside risks to inflation through energy commodity prices and shipping prices. The Middle East produces about 35% of the world's oil exports and 14% of gas exports, and hosts key transit routes for energy commodity shipping such as the Persian Gulf and the Red Sea.

Attacks on commercial shipping vessels in the Red Sea (which controls 11% of global trade) have also caused diversion of shipping around the Cape of Good Hope, driving up global shipping prices. Shipping transiting the Red Sea has dropped by more than half since early December, and further escalation of the conflict may lead to a rebound in global goods price inflation. This shipping disruption has occurred at a time when another key transit corridor (the Panama Canal) is running at low capacity

due to drought: daily transits through Panama Canal were down to 20 slots in January 2024 from its normal capacity of 38–40.

The potential for inflationary shocks through global commodity or shipping prices is elevated over the outlook period, due to heightened geopolitical risks, fragmentation of world trade and greater potential for weather-related shocks such as drought or flooding.

Figure 2.3: CPI inflation in the United States, China and Europe



Source: Bloomberg (2024)

2.3 Major trading partners' economic outlook

The outlook for Australia's major trading partners remains weak, with their GDP growth in 2024 forecast by the RBA to be around 3.1%, then 3.0% in 2026, well below its pre-pandemic decade average. Slower growth in Australia's major trading partners is expected to slow demand for Australia's exports. That said, the IMF expects robust economic growth in China and the US, as well as ongoing expansion in India. Growth from these key markets should support growth in their trade partners' economies, underpinning Australian resource and energy export earnings over the outlook period.

Box 2.1: Commodity demand prospects will be underpinned by urbanisation and investment in Australia’s major trading partners

Long-term demand for resource and energy commodities has historically been driven by fundamental drivers such as population (total resource demand), income growth (consumption intensity), urbanisation (commodity intensity) and technological change (changes in commodity mix).

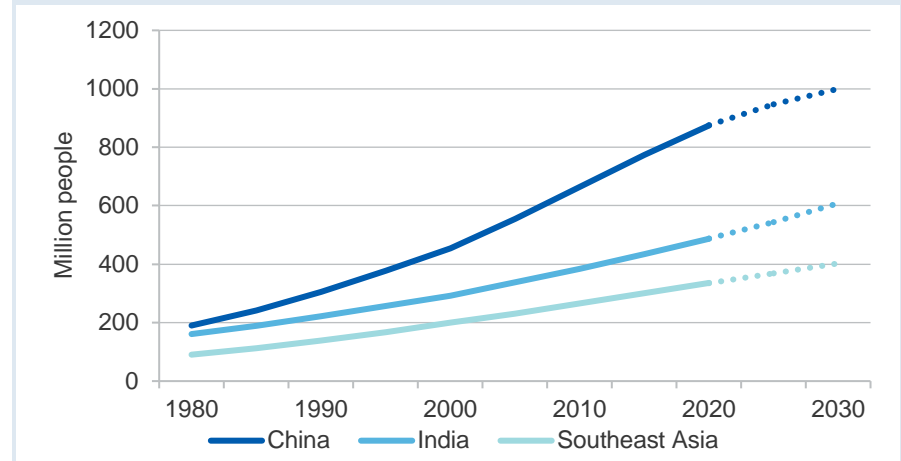
Three key export markets for Australia (China, India and Southeast Asia) are projected to add 313 million people to their urban populations from 2020 to 2030 (Figure 2.4). This will be a major driver of increased energy consumption within these regions, as well as metal consumption for infrastructure and property construction. While China’s property sector has slowed and may drive less commodity demand growth than otherwise, its urban population is still expected to continue growing — albeit at a slower rate than previously.

A significant structural shift in commodity demand is also expected to result from the technological change arising from the energy transition. This will drive a shift in the commodity mix required for energy generation from traditional energy commodities (such as coal) to those used in clean energy technologies (such as lithium and copper).

As economies continue to grow, urbanise and develop new industries (such as in the clean energy value chain), this will drive new growth in demand for Australia’s resource and energy commodities, as well as shifts in the weighting of Australia’s major trading partners (such as China and India) as sources of demand for specific commodities (Figure 2.5)

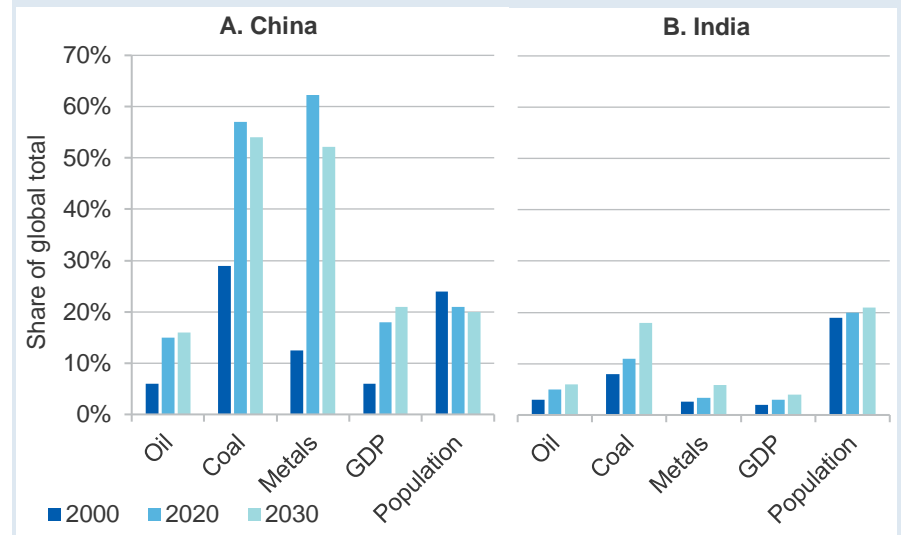
In the medium-term this will be driven largely by global investment efforts to construct clean energy infrastructure and value chains as governments and business work towards 2030 emissions targets. Demand for Australian resource commodities is expected to be assisted by policies such as the US Inflation Reduction Act which will provide incentives for manufacturers to use Australian critical minerals.

Figure 2.4: Urban population projections for key export markets



Source: UN (2018, 2022)

Figure 2.5: Changing concentration of commodity demand



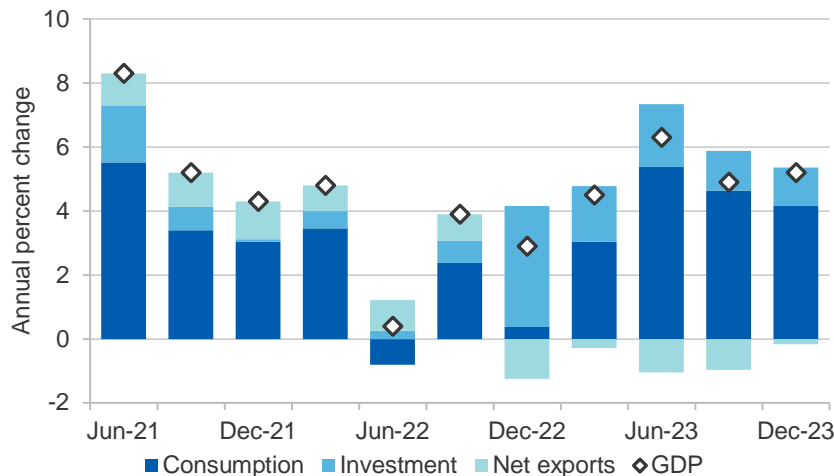
Notes: ‘Metals’ here refers to steel, copper, aluminium, nickel and zinc.
Source: IMF (2024); UN (2022); Wood Mackenzie (2024)

China's recent growth exceeded expectations, but risks remain

China's economy grew by 1.0% in the December quarter 2023, with GDP 5.2% higher year-on-year (Figure 2.6). Strong household consumption growth was the key driver of China's economic growth in 2023, as services demand recovered following the lifting of pandemic restrictions in early 2023. Policy measures to boost investment in infrastructure and manufacturing supported the rebound. However, the IMF expects China's growth to slow over the coming years, as consumption growth fades and the property sector remains weak.

While the rebound in consumption demand appeared to fade through the middle of 2023 — leading to bearish forecasts for China's economy — recent indicators point to strengthening consumption early in 2024, particularly in services. The official index of services production increased by 5.8% year-on-year in January-February 2024, led by growth in accommodation and food services (12%), and information and technology services (10%). Retail sales of consumer goods rose by 5.5%, driven by growth in online sales of physical goods by 14%.

Figure 2.6: China – contributions to quarterly real GDP



Notes: Consumption is made up of both household and government sectors.
Source: Bloomberg (2024); National Bureau of Statistics of China (2024)

In February 2024, China's inflation rose to 0.7% year-on-year following 4 consecutive months of deflation. The rebound in price growth was driven by food price deflation easing to an 8-month low as the prices of pork and fresh vegetables lifted. China's core inflation — excluding food and energy prices — rose to 1.2% in February 2024, remaining below policy targets.

Year-to-date fixed asset investment (FAI) increased by 4.2% year-on-year in January-February 2024, supported by 6.3% growth in infrastructure and 9.4% growth in manufacturing investment. Particularly strong growth was reported for investment in high-tech manufacturing, rising by 10% year-on-year. Private FAI was up by 0.4% during January-February 2024, weighed down heavily by declining investment from private property developers. This has translated to a higher share of FAI from state-owned enterprises.

China's industrial production rose by 7.0% year-on-year in January-February 2024, the fastest rate in 2 years. Growth was driven by continued strength in utilities output (7.9%) and manufacturing (7.7%). Notable year-on-year increases were reported for automobile production (9.8%) and electric vehicle charging stations (41.8%). This followed strong growth in automobile industry output throughout 2023, especially EV's and hybrids.

The Caixin Manufacturing Purchasing Managers' Index (PMI) rose to 50.9 in February 2024, a fourth straight month of growth. Output improved with modest growth in new orders. New export orders grew for the second consecutive time in 7 months, and overall sales rose the most in 5 months. Business sentiment hit a 9-month high, linked to projections of higher world demand.

The persistent downturn of China's property sector — which accounts for around 30–35% of China's steel demand and 20% of total GDP — has continued to act as a drag on China's economic activity, with conditions remaining weak despite various monetary and fiscal policy support measures announced in 2023. Investment in real estate development declined by 9.0% year-on-year in January-February 2024 and new property starts (by floor space) were on average 20% lower year-on-year in 2023. New home sales in 30 major cities fell by 33% year-on-year in January 2024.

With more than half of large private developers in China either defaulting or under severe financial stress, Chinese authorities are actively adopting new policy measures to stabilise the property sector, supporting its overall economic growth target of 5% in 2024.

The Chinese Communist Party conference in December 2023 called for a “new model” to increase the state’s share of its property market, from 5% currently to 30%. One of the programs underpinning its plan is “Project Whitelist”, a policy launched by the housing ministry in January and approved by banks in February. The project involves CNY123.6 billion (US\$17.2 billion) and local governments to compile a list of property projects eligible for financial support and collaborate with banks to fulfil the financing needs of these projects. Another program involves the state to purchase existing distressed projects and newly build more subsidised housing for low-and-middle-income families, aimed to add 6 million affordable housing units over the next five years.

In February 2024, the People’s Bank of China (PBoC) cut its key mortgage rates – five-year loan prime rate — by 25 basis points, and injected CNY1 trillion into the banking system by cutting the reserve requirement ratio for banks. Key Tier 1 cities — Beijing and Shanghai — introduced lower mortgage down payment requirements for first and second homes in December 2023, and cut interest rates on outstanding first-home mortgages to support household consumption.

Escalating structural issues continue to weigh on the property sector rebound, as local government debt levels rise while the population declines and properties remain oversupplied. The IMF expects fundamental demand for new housing (measured by urban household formation) to drop by 50% over the next decade. China’s population declined for the second consecutive year in 2023 (-0.15%), a sharper decline than 2022. China’s working age population peaked in 2011, while the number of people above the national retirement age of 60 is projected to increase from 280 million to 450 million by 2035. Ageing demographics is expected to worsen local government budget shortfalls and pressure China’s current pension system.

A potential new source of growth in China’s economy is its active push to be dominant in high-end goods manufacturing. China became the world’s largest car exporter in 2023, driven by its stronghold in the electric vehicle (EV) market. Last year, Chinese EV exports grew by 70%, reaching a global market share of 35%. Its large domestic market, strong EV and green energy supply chain ranging from key battery minerals to processing technologies, and favourable government policies have contributed to a distinct cost advantage for Chinese EVs and batteries. Continued government support is expected as Chinese authorities named EV exports a “key pillar” of its trade in February 2024.

The IMF expects China to grow by 4.6% in 2024, an upward revision of 0.4% reflecting ongoing investment in infrastructure and manufacturing and stronger than expected consumption. The IMF projects growth to drop to 4.1% in 2025 and 2026 and to 3.4% by 2028 in line with a long-term trend towards lower growth. Uncertainties remain, with its ongoing real estate downturn, local government debts, and headwinds to its export-led growth — due to bifurcating supply chains and rising trade restrictions.

[Japan slowing due to weak real incomes and external demand](#)

Japan’s GDP rose by 1.0% year-on-year in the December quarter 2023, with annual growth weighed down by two consecutive quarters of decline over H2 2023. Private consumption — accounting for 53% of GDP — was the key drag on GDP growth, having contracted for 3 consecutive quarters to be 0.5% lower year-on-year. Cost of living pressures have weakened consumers’ real incomes, with post-COVID pent-up demand for services appearing to fade in the December quarter 2023.

In response to cost-of-living pressures, the government released a ¥17 trillion economic relief package in November 2023 aimed at supporting consumption (e.g. cost of living relief measures) and business investment (e.g. targeted tax cuts for strategic sectors).

The depreciation of the Yen through much of 2023 contributed to strong growth in Japan’s exports, however this was not enough to lift Japan’s industrial sector out of contraction. Slowing growth in goods demand both

domestically and in Japan's major trading partners, was a key issue for its commodity-intensive industrial sector throughout 2023.

Japan's industrial outlook remains weak, however there are signs of improvement with several important indicators returning to growth as 2023 ended. Vehicle exports improved over the year (up by 11% year-on-year in November 2023), as did growth in machinery orders (6.1% in December 2023) and industrial output (0.6% in December 2023) (Figure 2.7).

While the Jibun Bank Japanese Manufacturing PMI remained in contractionary territory in February 2024 — due to weakening demand and cost pressures — firms remained optimistic about the 12-month outlook, citing expected improvements in market demand.

Japan's core inflation declined to 2.0% in January 2024, meeting the Bank of Japan (BoJ) inflation target. Supporting expectations for cost pressures to ease further, Japan's producer price inflation was reported at 0.2% in January 2024, down from 9.5% in January 2023.

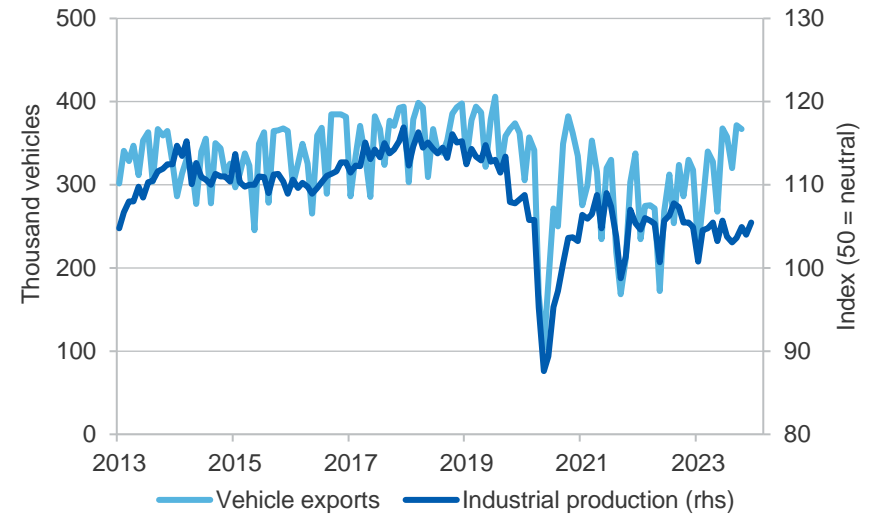
The IMF expects Japan's economic growth to slow to 0.9% in 2024, a slight downgrade from October 2023, then slow further to 0.8% in 2025. Growth is expected to slow as factors that supported strong growth in H1 2023 fade, such as COVID-related pent-up demand and the surge in inbound tourism. While Japan's exports grew strongly in 2023 due in part to Yen depreciation, further depreciation to the same extent is unlikely based on the outlook for interest rates in other major currency hubs.

As the effects of past stimulus efforts fade and macroeconomic policy settings return to neutral, Japan's economic growth is projected to slow to 0.5% in 2026, then to its long-run potential of 0.4% from 2027 onwards.

South Korea's industrial outlook has turned positive

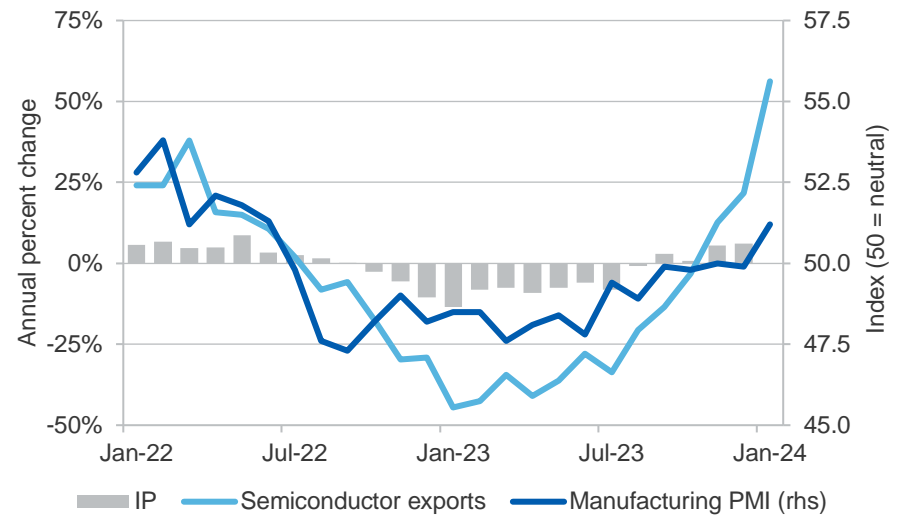
South Korea's GDP grew by 2.2% year-on-year in the December quarter 2023, recovering from 0.9% in the June quarter 2023. Annual growth was primarily driven by 9.9% year-on-year growth in exports which, combined with imports tracking flat, led to a 61% expansion in the country's trade balance. Export growth was led by sales of manufactured products, including vehicles, ships and semiconductors.

Figure 2.7: Japan industrial production and vehicle exports



Source: Bloomberg (2024)

Figure 2.8: South Korean industrial activity and exports



Source: Bloomberg (2024)

South Korea's industrial sector and goods exports appear to be on the upswing, having been weighed down in 2022–23 by the downturn in the global technology cycle and falling global goods demand.

South Korea's industrial production increased in December 2023 to be 6.2% higher year-on-year (Figure 2.8). Having been in contractionary territory since mid-2022, South Korea's manufacturing PMI returned to expansion in late 2023 and rose further to 50.7 in February 2024. Improvement in February was led by increasing output and the second consecutive expansion in new orders since June 2022. Exports of semiconductors increased by 56% year-on-year in January 2024, rebounding from a prolonged downturn which commenced in August 2022.

The IMF forecasts South Korea's economic growth to be 2.3% in 2024 and 2025, supported by robust growth in goods exports and investment. Growth is then forecast to ease to 2.2% in 2026 and to 2.1% by 2028.

Resilient US labour market and consumption supporting growth

The US economy grew by 3.1% year-on-year in the December quarter 2023, driven by robust personal and public consumption growth. This was driven by continued growth in both goods and services consumption. While 2022 and H1 2023 were characterised by weak goods consumption growth — as consumers preferred services following the end of COVID restrictions — goods consumption picked up towards the end of the year, growing by 5.1% in real terms in December 2023 (Figure 2.9).

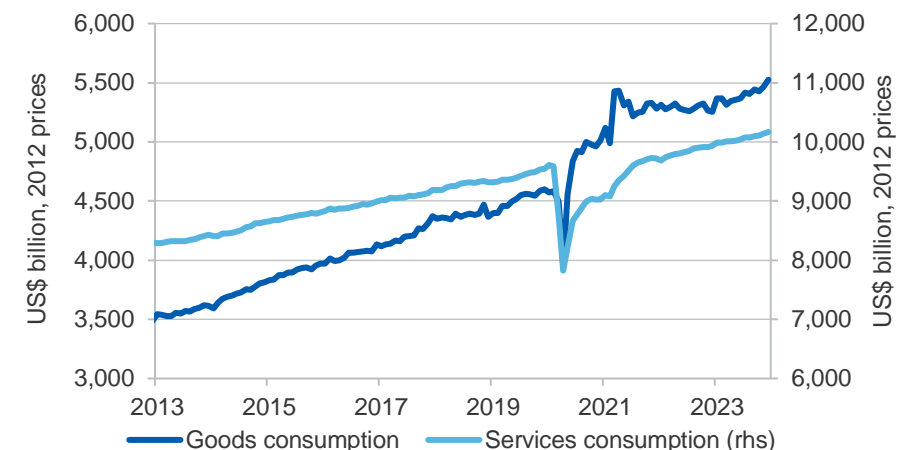
US labour market resilience and remaining savings buffers have continued to support strong consumption. The US labour market has softened slightly, but less than was expected. The unemployment rate held steady at 3.7% in January 2024, only marginally higher than the average of 3.5% in H1 2023. While official employment growth slowed further over the end of 2023 and into early 2024, an alternative measure (nonfarm payroll employment) instead indicated an acceleration in employment growth, adding 353,000 jobs in January 2024 — above the average rise of 220,000 over H2 2023. Wage growth has also rebounded, up from 5.2% in September 2023 to 6.8% in December 2023.

Supported by investment policies such as the Infrastructure Investment and Jobs Act, Inflation Reduction Act and the CHIPS & Science Act, US private non-residential investment and construction spending continued to grow strongly over H2 2023. Investment growth has been led by spending in power and manufacturing, with private investment in manufacturing structures rising in real terms by 69% year-on-year in December 2023.

US industrial production tracked flat year-on-year in January 2024, as declines in manufacturing (down by 0.9%) and mining output (down by 1.2%) associated with cold weather, were balanced by higher utilities output (up by 9.0%) for heating purposes.

The US industrial outlook appears to be recovering in early 2024. The US Manufacturing PMI stayed in contractionary territory at 47.8 in February with both manufacturing output and new orders returning to contraction amid seasonal headwinds. Notable improvement was reported in new export orders returning to expansion after 8 months of contraction. Output is likely to improve further in coming months, given cold weather impacts in February are expected to subside.

Figure 2.9: Real US consumption of goods and services



Notes: Consumption data is monthly, reported in annualised terms.
Source: Bloomberg (2024)

In January 2024, the IMF upgraded its forecast for US economic growth in 2024 by 0.6% to 2.1% due to ongoing strength in US consumption and ongoing labour market tightness. The IMF also revised down its forecasts for US inflation, which is now expected to average 2.2% in 2024 and 1.9% in 2025 — downward revisions of 0.5% in both years. Combined with declining US inflation (both headline and core) and ongoing increases in US labour productivity growth (2.7% in the December quarter 2023), markets and the US Federal Reserve are convinced the US tightening cycle has concluded. In their December economic projections, the Federal Open Market Committee’s median expectations suggested at least 75 basis points of interest rate cuts in 2024. The recent strong monthly increase in US core inflation (0.4% in February 2024) has cast doubts over the pace of further declines in services inflation, however the US Fed is broadly expected to commence its cutting cycle in 2024.

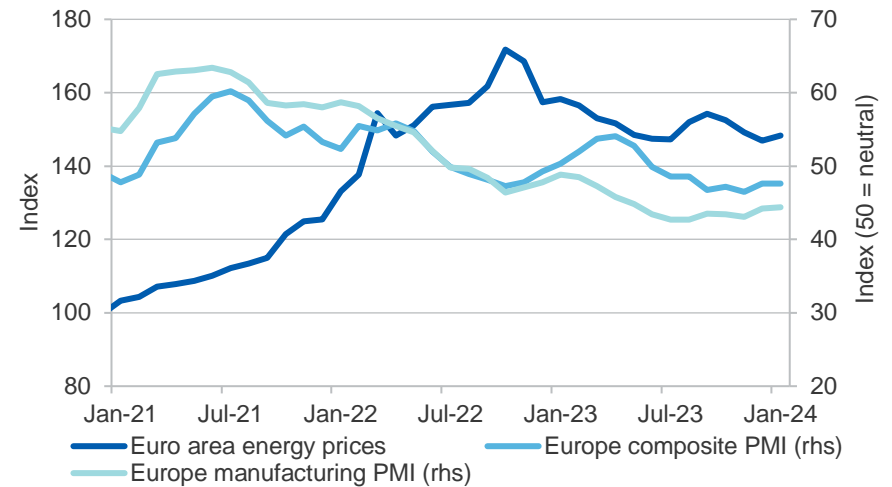
Growth is forecast to ease to 1.7% in 2025 as monetary policy lags, fiscal tightening and softening of labour markets slow aggregate demand. US GDP growth is then projected to stabilise at around 2.1% from 2026 onwards, as monetary policy is returned to a neutral stance and long-term investment policies support continued capital accumulation.

Eurozone economies face slower growth, manufacturing downturn

Eurozone GDP growth was flat over the December quarter 2023, bringing annual GDP growth to 0.1% year-on-year. Among the larger economies Spain grew by 0.6% over the quarter, while Italy’s quarterly growth picked up to 0.2%. France’s economy did not grow over the quarter, while Germany’s economy contracted by 0.3% to be down 0.2% year-on-year.

Europe’s manufacturing sector has been in a prolonged downturn since July 2022, driven by the rapid surge in energy prices (Figure 2.10). Europe’s industrial outlook remains weak, however there are signs that the worst of the downturn may be over. In February 2024, the Eurozone manufacturing PMI recorded a contractionary reading of 46.5, however business sentiment in Europe’s manufacturing sector improved as declines in output slowed to a 9-month low and new orders to 11-month low respectively.

Figure 2.10: European energy price index and PMIs



Source: Bloomberg (2024); Eurostat (2024)

In its January update, the IMF forecast Euro Area growth at 0.9% in 2024, revised down by 0.3% from October 2023. Ongoing manufacturing weakness led to more downgrades to German growth (now 0.5% in 2024, up from -0.2% in 2023), while weaker-than-expected services activity drove downgrades for France (1.0% in 2024) and Spain (1.5% in 2024).

The near-term economic outlook for Europe remains weighed down by ongoing weakness in the industrial sector, with the services sector also falling into contraction in H2 2023. The Eurozone Composite PMI was reported at 47.9 in January 2024, an 8th consecutive monthly contraction.

The cumulative lags of tight monetary policy in the region are expected to continue slowing economic activity until monetary policy begins easing, with real incomes expected to drive a recovery in consumption over H2 2024 as the energy price shock subsides and inflation eases. The IMF then expects Euro Area growth to pick up further to 1.7% in 2025, driven by continued recovery in consumption and industrial activity. Over the remainder of the outlook period, economic growth is expected to slow from 1.7% in 2026 toward a long-run potential growth of 1.3% by 2029.

India's GDP growth to be strong over the medium term

India's GDP growth was 8.4% year-on-year in the December quarter 2023, exceeding market expectations of 6.6% growth. GDP growth was driven by strong private consumption expenditure — especially for services — as well as continued strength in fixed capital formation. India's manufacturing PMI remained expansionary in February 2024, reaching a 5-month high of 56.9. Accelerated expansion was driven by robust demand, both domestic and international, causing companies to scale up production. Strength in demand and new business enquiries led business optimism about the coming year to its highest since late 2022. The IMF forecasts India's economic growth to slow to 6.5% in 2024 and 2025, revised up by 0.2% in both years due to stronger-than-expected domestic demand seen in 2023.

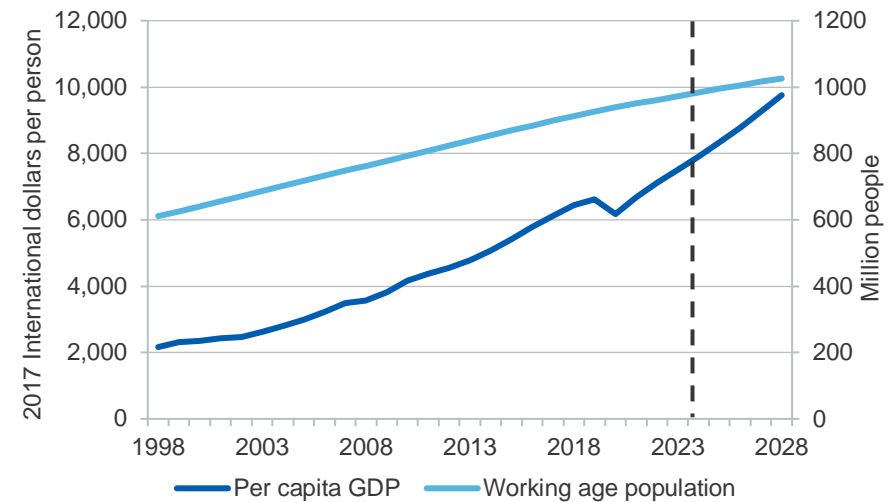
Compared with many major economies, India has a relatively young population and its working age population is expected to continue growing strongly over the outlook period — this will drive higher output (from a growing labour force) and domestic consumption (Figure 2.11). From 2026 to 2029, India's GDP growth is expected to stabilise at a long-run potential rate of about 6.3%. Long-run growth is expected to be driven by large-scale infrastructure investment, population and productivity growth.

Exchange rate assumption revised lower

Since the start of 2024, the Australian dollar has weakened both relative to the US dollar and in trade-weighted terms (Figure 2.9). The AUD/USD move arose due to market expectations for US interest rates to remain at current levels for longer than was expected in late 2023.

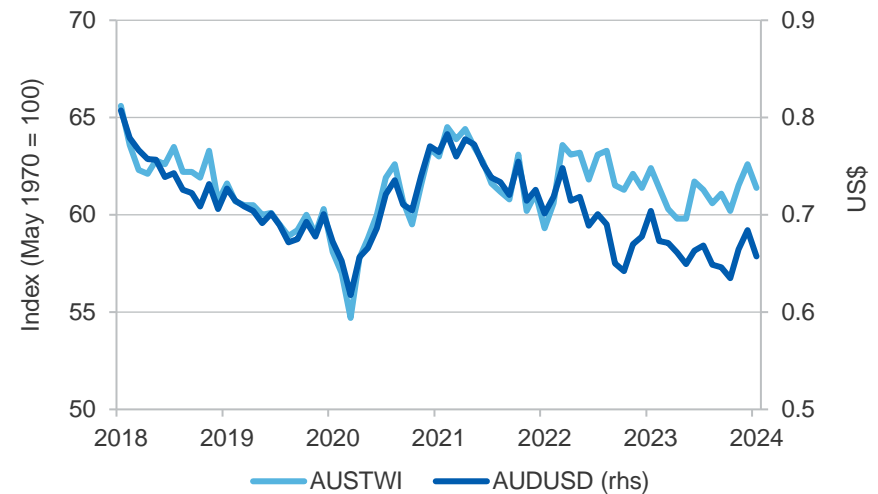
Assumption adjustments were made in line with changes in market consensus on the exchange rate outlook. The market consensus (surveyed by Bloomberg) is for the Australian dollar to appreciate against the US dollar over the outlook period, as interest rates decrease quicker in the US than in Australia. In February 2024, the median consensus for the AUD/USD exchange rate was an average of US\$0.68 in 2024, US\$0.72 in 2025 and US\$0.74 in 2026. The AUD/USD exchange rate is assumed to rise to US\$0.75 by mid-2026.

Figure 2.11: Per capita GDP and working age population in India



Notes: Working age population is calculated as people aged 15-64
Source: IMF (2024); UN (2022)

Figure 2.12: Australian trade-weighted index and AUD/USD



Source: RBA (2024)

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

	2023	2024 ^a	2025 ^a	2026 ^a	2027 ^a	2028 ^a	2029 ^a
World ^b	3.1	3.1	3.2	3.2	3.1	3.1	3.1
China ^c	5.2	4.6	4.1	4.1	3.7	3.4	3.4
Japan	1.9	0.9	0.8	0.5	0.4	0.4	0.4
South Korea	1.4	2.3	2.3	2.2	2.2	2.1	2.1
India ^d	6.7	6.5	6.5	6.3	6.3	6.3	6.3
ASEAN-5 ^e	4.9	5.3	5.2	5.1	5.0	5.0	5.0
Eurozone	0.6	1.2	1.9	2.0	1.8	1.7	1.7
United States	2.5	2.1	1.7	2.1	2.1	2.1	2.1

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 (2024); Bloomberg (2024)

Table 2.2: Exchange rate and inflation assumptions

	2023	2024 ^a	2025 ^a	2026 ^a	2027 ^a	2028 ^a	2029 ^a
AUD/USD exchange rate	0.66	0.68	0.72	0.75	0.75	0.75	0.75
Inflation rate ^b							
United States	4.1	2.2	1.9	2.2	2.1	2.1	2.1
	2022–23	2023–24 ^a	2024–25 ^a	2025–26 ^a	2026–27 ^a	2027–28 ^a	2028–29 ^a
Australia	7.0	4.0	3.2	2.8	2.5	2.5	2.5

Notes: **a** Assumption; **b** Average CPI growth over the specified year (fiscal or calendar).

Sources: ABS (2024) Consumer Price Index, 6401.0; Bloomberg (2024); Department of Industry, Science and Resources (2024); RBA (2024); IMF (2024)

Steel



Australia's steel sector



5m+ tonnes
produced
each year



100,000+
employed in the
steel industry

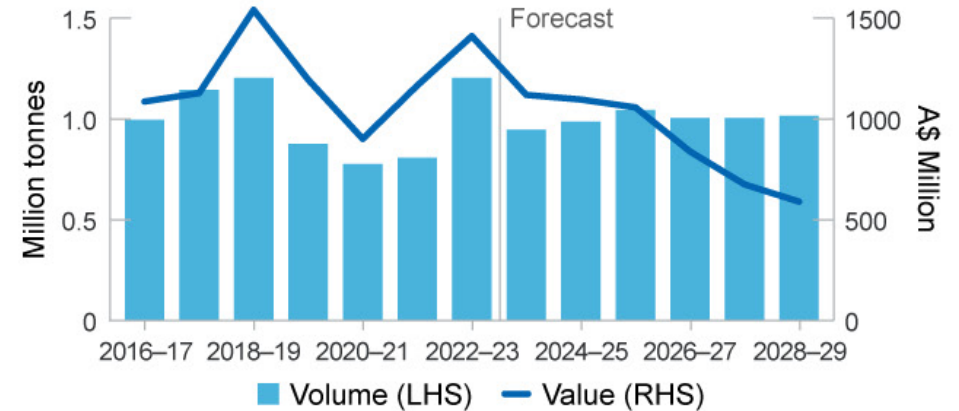


Significant
export markets

- China
- Japan
- South Korea
- Taiwan
- India



Australian steel exports



Outlook



Global steel prices
have softened due
to weaker demand



China's property
sector weakness
continues



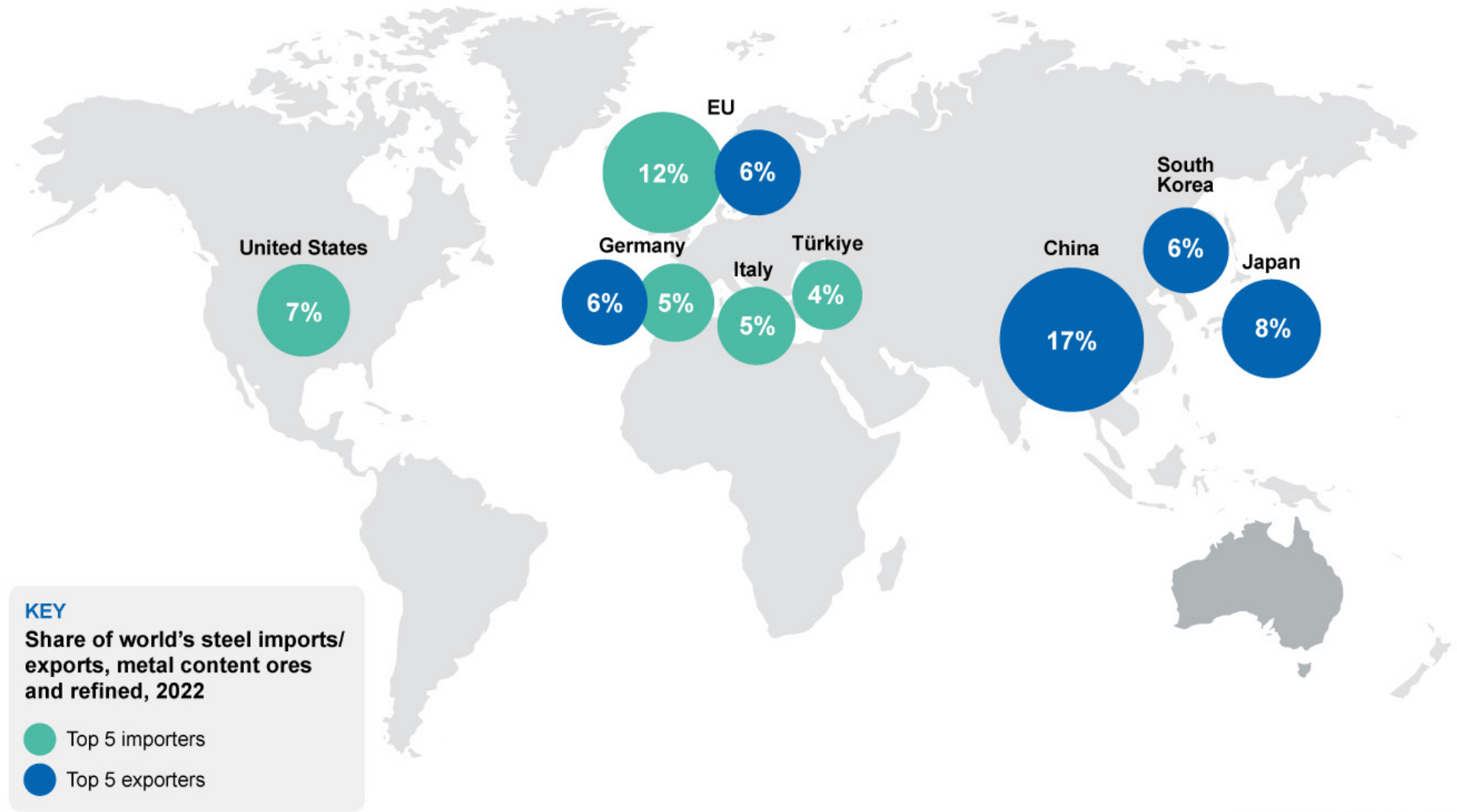
Australian export
values expected to fall
by 15% in 2023-24



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

- World steel production was flat in 2023 following large falls in 2022. An expected stabilisation and then gradual pickup in global industrial output, combined with further stimulus-related infrastructure projects, should see annual growth of nearly 2% in steel production in 2024 and 2025.
- World steel production is projected to reach 2.1 billion tonnes by the end of the outlook period (to 2029). 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.
- Global steel consumption is forecast to grow 1.4% year-on-year in 2024. The weakness in China’s property sector over the past couple of years is expected to persist this year. Less restrictive monetary policies in advanced economies should see demand recover in 2025 and 2026. The global energy transition will support the continued consumption of steel.

3.2 World production and consumption

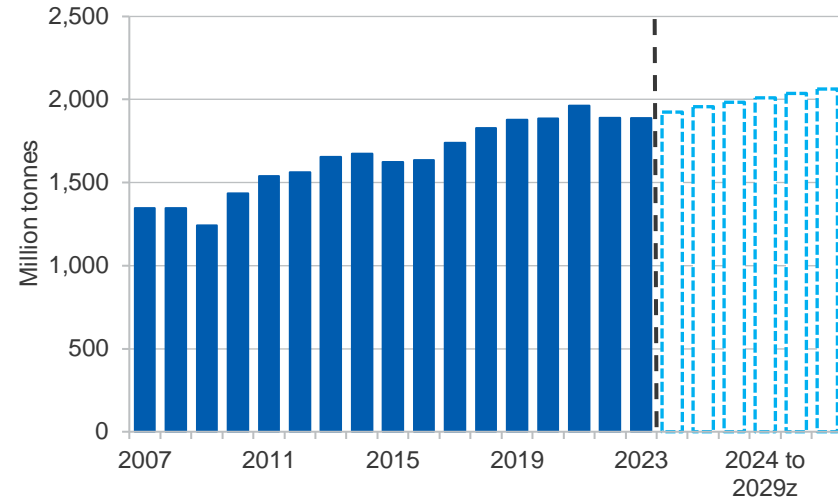
Global steel production stabilised in 2023 following large falls in 2022

World steel production was flat in 2023, with output of 1.9 billion tonnes — the same as in 2022 (Figure 3.1). The 2023 result did not see the anticipated demand recovery after geopolitical tensions, energy price shocks and COVID lockdowns weakened the global economy throughout much of 2022.

Overall, world steel demand continues to be affected by the high inflation and interest rate environment in most advanced economies which has contributed to weaker industrial output over the past year (Figure 3.2). An expected stabilisation and gradual pickup in growth in ex-China global manufacturing over 2024, combined with further stimulus-related infrastructure projects, is expected to support stronger steel demand.

Protracted weakness in Chinese property demand throughout 2023 was offset by increased steel demand from exporters of manufactured products as well as some infrastructure investment. Weak profitability amongst most Chinese steel mills continues to weigh on the sector.

Figure 3.1: Global annual steel production



Note: z projections
Source: World Steel Association (2024); DISR (2024)

Figure 3.2: World manufacturing PMI and industrial 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 (2024); S&P Global (2024); Bloomberg (2024)

Although steel output has weakened in recent months, world steel production is expected to record year-on-year growth of 1.9% in 2024.

Over the outlook period, world steel production is projected to grow by 1.5% a year to reach 2.1 billion tonnes by 2029. Growth in world steel production over the outlook period 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.

As the world's largest exporter of key commodities required for steel production, Australia is well placed to benefit from the increased demand projected in global markets over the outlook to 2029 (see *Iron Ore* and *Metallurgical Coal* chapters).

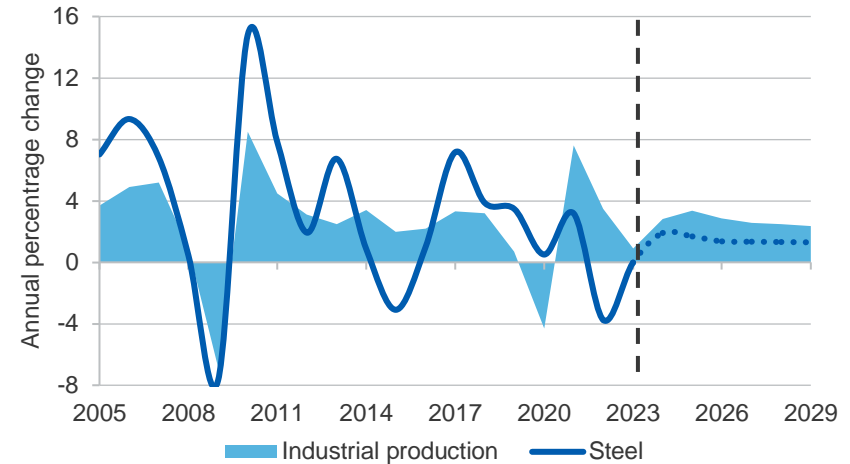
Global industrial production expected to rebound in 2024 and 2025

Global industrial production growth was 0.9% year-on-year in 2023. Growth is expected to pick up noticeably over the next two years — to around 3% a year — as the steel-intensive manufacturing, infrastructure and civil construction sectors recover (Figure 3.3).

The downturn in global construction activity seen since late 2022 is expected to flatten out and gradually recover beginning in the second half of 2024. With private sector residential and commercial activity dampened by tighter credit conditions, global construction continues to be driven primarily by infrastructure. The Middle East, Asia Pacific and Americas registered the strongest conditions in 2023, while construction activity continued to deteriorate in Europe. However, the IMF and most market analysts expect substantial falls in interest rates in major economies over the next two years, which should support a broader recovery in construction activity.

Global manufacturing activity is showing tentative signs of recovery, with the JP Morgan Global Manufacturing PMI moving into neutral territory with a reading of 50 points in December 2023. This followed more than five quarters of contraction. The improved result stemmed from an increase in global manufacturing output and a slowing in the rate of decline in new orders. Data broken down by country showed that output rose in China, India and Brazil, and fell more slowly in the US, Japan and the Eurozone.

Figure 3.3: World industrial and steel production



Source: World Steel Association (2024); Wood Mackenzie (2024); DISR (2024)

Infrastructure construction to drive global steel demand to 2029

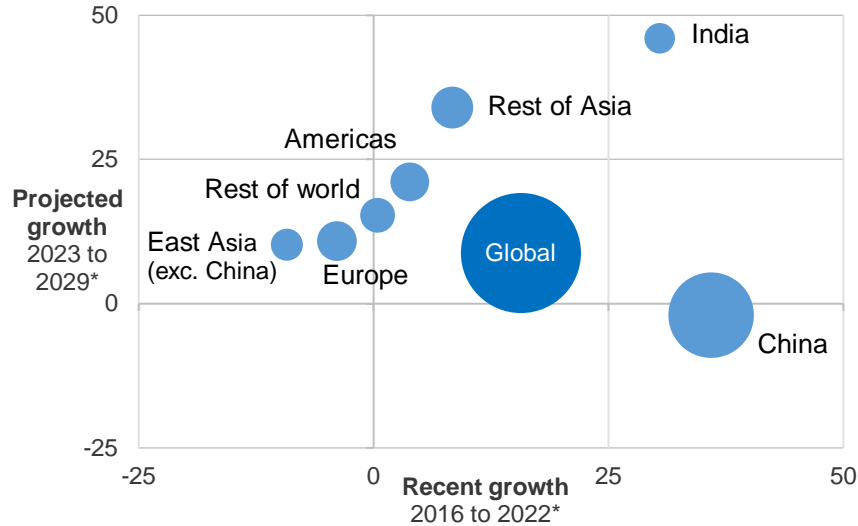
Global steel consumption is projected to grow by 1.3% a year over the outlook period to 2029. Growth is expected to be highest in regions such as South and South-East Asia (particularly India), the Middle East, and North America (particularly the US and Mexico) (Figure 3.4).

Construction — representing about 50% of world steel demand — is expected to see solid growth over the outlook period. This will be spurred by considerable levels of infrastructure investment pledged across many major nations in recent years. This includes the US\$1.2 trillion Bipartisan Infrastructure Framework in the US, as well as India's US\$1.3 trillion National Infrastructure Pipeline.

Global steel production is forecast to grow by around 1.5% annually to 2029. This includes up to 120 million tonnes (Mt) from new capacity — either underway or planned over the next couple of years — with large-capacity projects slated for Asia, North America, Europe and the Middle East. By process, Blast Furnace-Basic Oxygen Furnace steelmaking (favouring iron ore and metallurgical coal as inputs) is expected to make up just under half of new global supply, and more than 75% of new

capacity in Asia. Decarbonisation initiatives will increasingly impact global steel industry over the outlook (discussed below).

Figure 3.4: World steel demand growth by country/region



Notes: * Growth is total growth in percentage terms over the period; Rest of Asia ex. China, Japan, South Korea, Taiwan, and India.

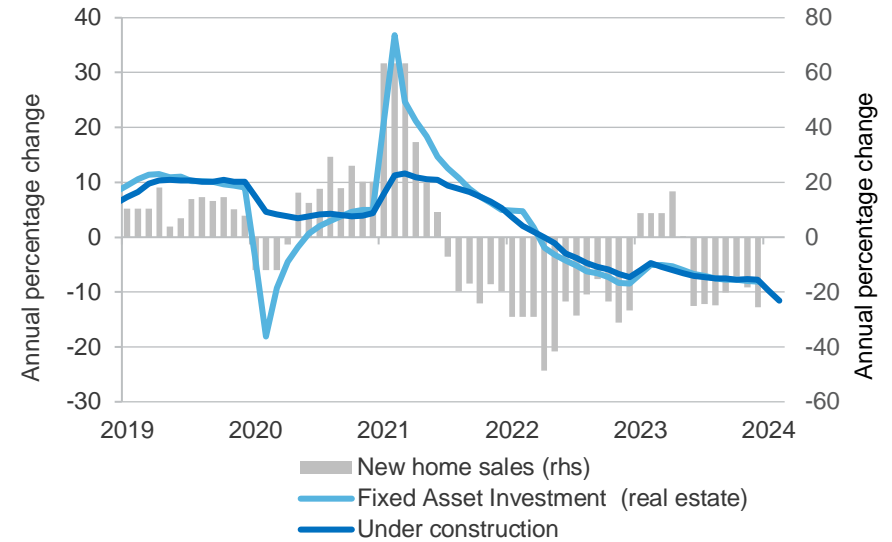
Source: World Steel Association (2024); DISR (2024)

China’s property completions improve, but new starts remain weak

China’s property sector downturn has yet to stabilise. New home sales were down 26% year-on-year in December 2023, and floor space under construction was down 12% in January-February (Figure 3.5). Fixed asset investment in real estate was down 8.1% year-on-year in December 2023.

Despite monetary policy easing over the past year, there is yet to be a meaningful pick up of credit growth in the broader economy. Bloomberg’s China Credit Impulse (measuring new loans compared with broader GDP) indicate that loans have stagnated over the past year as investor caution continues (Figure 3.6).

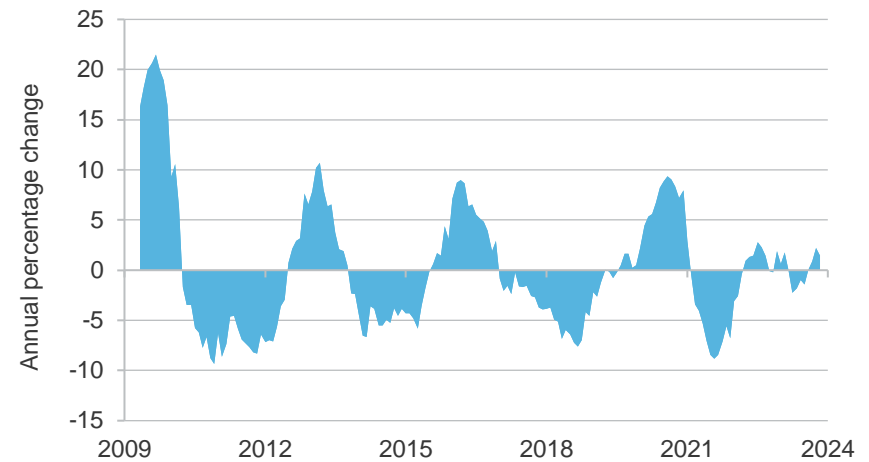
Figure 3.5: China’s residential property sector pipeline



Notes: China’s property data combines January and February monthly data.

Source: NBS (2024); Bloomberg (2024)

Figure 3.6: China credit impulse

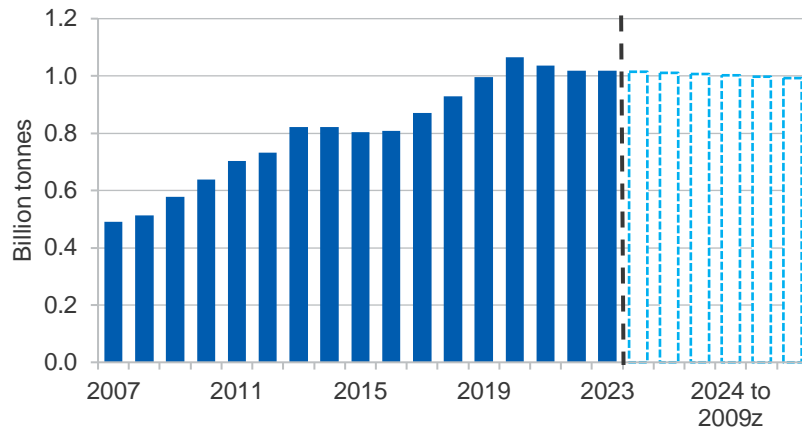


Source: NBS (2024); Bloomberg (2024)

Confidence among homebuyers will take time to stabilise and remains a key downside risk, undermining government efforts to stimulate property demand. Whether the property downturn has reached the bottom remains to be seen.

Structural factors including a slowdown in urbanisation rates and the peak in China's population are adding to the challenges the sector faces (see *Macroeconomic outlook*). However, one positive sign is the turnaround in property completions, with floor space of completed residential buildings up by 16% in December (year-on-year), compared with a fall of 14% a year earlier.

Figure 3.7: China annual steel production



z = projections

Source: World Steel Association (2024); Department of Industry, Science and Resources (2024)

In December 2023, China's monthly steel output plunged by 13.5% year-on-year to bring 2023 total production to slightly below the figure for 2022 (Figure 3.7). Chinese steel mill margins remain weak. The challenging conditions faced by Chinese steel mills over the past two years have continued into 2024 due to weak steel prices and high prices for key inputs including energy and metallurgical coal.

Substantial increases in fixed asset investment in infrastructure and manufacturing have been critical in supporting steel demand in China in 2023 (see *Macroeconomic outlook*). Infrastructure spending is expected to provide additional support to China's economy over the outlook period. The government approved issuance of an extra 1 trillion yuan worth of sovereign bonds targeting post-disaster recovery, and reconstruction should support steel demand. Legislators also renewed authorisations to frontload some local government bond issuance in 2024.

Strong growth in exports has also played a key role in supporting China's steel sector, by partly offsetting the effects of property sector weakness. Chinese steel exports were up 35% in 2023 — a seven-year high — driven by surging export volumes in the second half of the year. However, China's rising exports have increased trade tensions with a number of trading partners, with 5 countries commencing trade remedy investigations against Chinese steel products in 2023 and the potential for further actions this year — including from the US and the EU.

Overall, China's steel production in 2024 is expected to experience a mild fall, down by 0.5%. This trend is expected to continue over the rest of the outlook period, with projected falls of 0.4% a year to 2029.

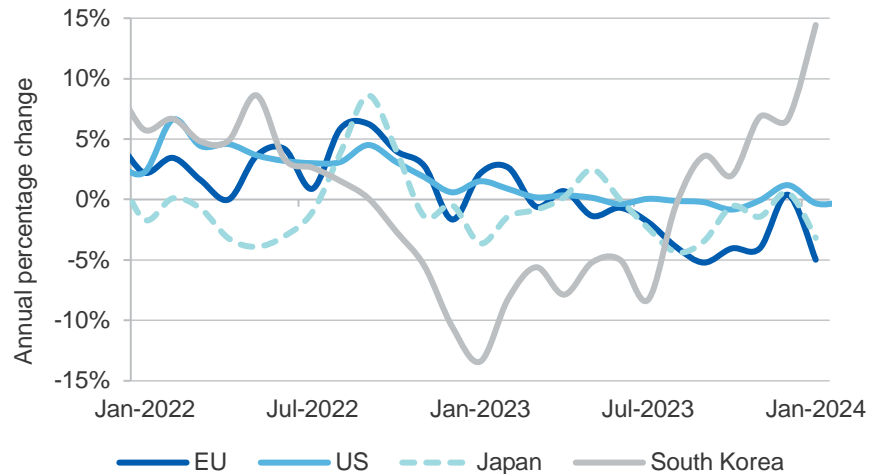
Rebound in ex-China steelmaking expected after weak 2023

Ex-China global steel production is estimated to have fallen by around 0.1% in 2023. Overall steel demand was affected by the high inflation and interest rate environment in the US and EU in particular. Higher energy and input costs, as well as moderating global demand, have caused manufacturing and industrial production to weaken in many major economies during 2023. However, industrial production has shown tentative signs of stabilising in the EU and Japan in recent months, and South Korea's industrial production has moved into positive growth after substantial falls last year (Figure 3.8).

After falling steadily throughout most of 2023 as demand for steel fell, global steel prices — for both reinforcing bar ('rebar') and flat steel products such as hot-rolled coil (HRC) — are now steadying, particularly in China and southern Europe. Improving prices will help lift operating

conditions for steel mills struggling with high input costs. By contrast, US prices for HRC eased in early 2024 following the sharp rises in the final quarter of 2023. The substantial price differential between US rebar prices and other markets has continued into early 2024 (Figure 3.10).

Figure 3.8: Industrial production — EU, US, Japan and S Korea



Source: Bloomberg (2024)

European steel outlook remains highly uncertain

European steel production and consumption fell sharply in 2023, as businesses reduced stocks and steel-intensive sectors struggled with falling demand and high energy costs. The European Central Bank's aggressive monetary policy tightening cycle continues to dampen the Eurozone construction sector, with the delayed effect of tightening monetary policy expected to slow the onset of the rebound in steel demand over the first half of 2024.

The HCOB Eurozone Construction PMI fell for the 21st consecutive month in January 2024, to reach 41.3, the largest fall in activity since the pandemic-affected months of April and May 2020. Downturns were evident in all three construction subsectors (housing, commercial and infrastructure). Housing recorded the biggest fall, but infrastructure and

commercial construction also declined. Inflows of new business at Eurozone construction firms fell rapidly in January, and the ongoing downward trend points to further weakness in business conditions extending well into 2024.

Slowdowns in construction activity were steepest in Germany, with German construction firms recording the largest fall in activity since April 2020. Germany's economy has been hit particularly hard, facing both a manufacturing recession and a property crisis.

Steel demand from the European automotive sector is unlikely to return to 2015-19 levels in 2024. The automotive industry continues to face challenging conditions in 2024, including the weak overall economic climate, supply chain shortages and disruptions from the shift from ICE to electric vehicles, including preparing for the petrol car ban by 2035.

EU steel output fell by an estimated 7.4% year-on-year in 2023 (and remained 16% below pre-COVID 2019 levels). Over the outlook period to 2029, EU steel production is forecast to grow modestly (at just over 1% a year), though will remain below its 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.

Decarbonisation initiatives to increasingly impact global steel industry

The decarbonisation of steel production and supply chains will affect growth and trade patterns over the outlook period to 2029. Most existing steel makers and iron ore miners have committed to net zero emissions by 2050. However, overcoming the substantial technological, energy and feedstock challenges required to achieve this transformation will take both time and substantial capital investment. There are already many pilot plants under construction around the world, especially hydrogen-based DRI operations, most of which are expected to begin over the next two years.

As producers and miners prepare for the impact of the introduction of the EU's Carbon Border Adjustment Mechanism (CBAM) and other carbon pricing initiatives, there has been a rise in collaboration and strategic

alliances around the world. Examples include the partnership between Liberty Steel and AD Ports Group to import magnetite ore from Australia and Vale and H2 Green Steel's iron ore pellet supply agreement. BlueScope Steel and BHP and Rio Tinto have agreeing to jointly investigate the development of the country's first ironmaking electric smelting furnace pilot plant. The project aims to demonstrate that production of molten iron from Pilbara ores is feasible using renewable power when combined with Direct Reduced Iron process technology. The Australian Government also recently awarded a grant to Liberty to replace the existing blast furnace at Whyalla with a low carbon EAF.

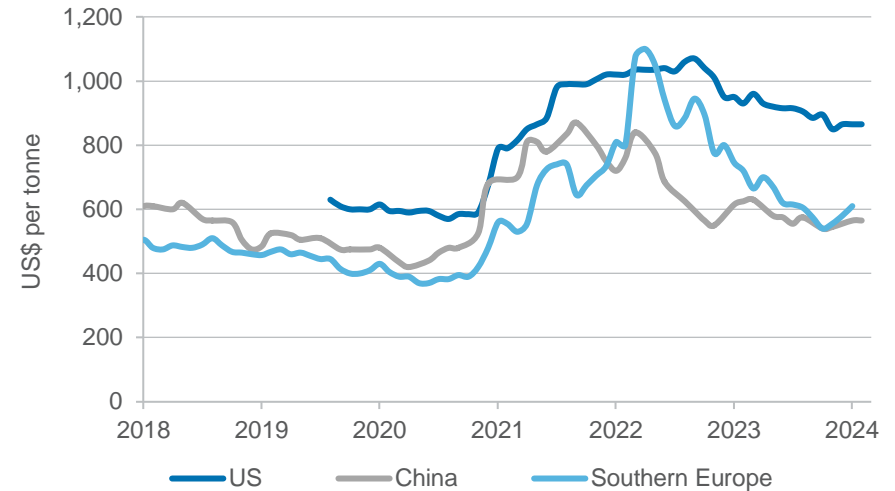
A report from EU steel producers on embedded emissions of steel imports to the EU is due in 2024. Although cost penalties in the initial years of the CBAM are relatively modest, as they increase the impact on trade patterns will increase. In 2023, the EU and the UK imported around 30 Mt of steel from non-EU nations — the largest being China (15%), India (13%), Turkey (12%) and Korea (12%). Most of the imported steel is produced in blast furnaces and will therefore be subject to carbon taxes. Over the next few years, before decarbonisation initiatives have affected substantial shares of production, high-cost producers are likely to seek out alternative export markets or look to use some of the excess steel domestically. Low-cost steel producers, by contrast, will be better placed to absorb the costs to maintain access to EU markets. Further information on the EU CBAM is provided in the *Aluminium, Alumina and Bauxite* chapter.

EU sanctions on Russian exports are scheduled to take effect in 2024. Following the initial ban on finished steel from Russia, a ban on billet imports will take effect in April. The EU imported 4-5 Mt a year of Russian steel prior to the Russian invasion of Ukraine but has since turned to China and India for that supply; these nations provided about 10 Mt in 2023.

India/Southeast Asian steel output to grow impressively in outlook period

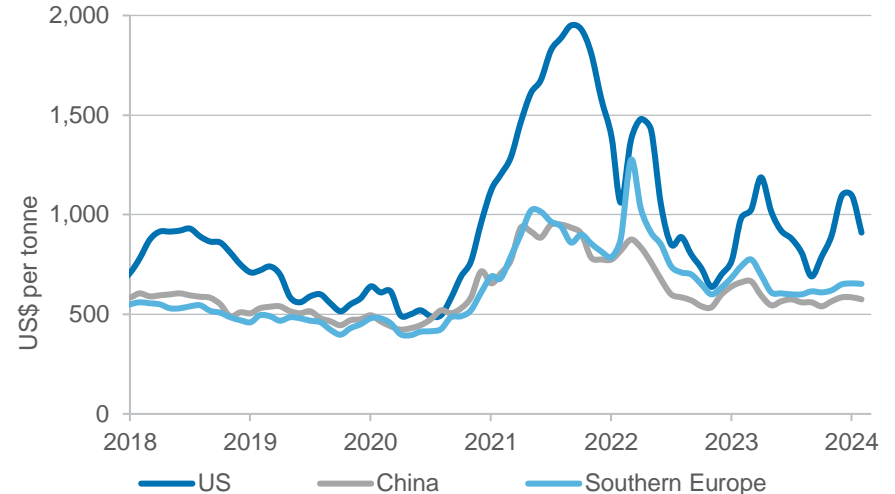
Indian steel output expanded rapidly in 2023, to reach 140 Mt, a rise of 12% year-on-year (Figure 3.11). This was driven by rising demand from strong levels of construction activity in all three sectors (residential, infrastructure and commercial).

Figure 3.9: Rebar steel prices



Source: Bloomberg (2024)

Figure 3.10: HRC steel prices



Source: Bloomberg (2024)

India's economic outlook remains healthy, with the demand for steel expected to maintain its high growth momentum — driven by the manufacturing and construction sectors. India's manufacturing PMI strengthened in February, with steady growth reported in output, new orders and foreign sales. Indian Government data from late 2023 indicate a pipeline of over 1700 projects in road transport, railways, energy and water, with an anticipated completion cost of around US\$360 billion.

India is projected to record some of the strongest growth in steel output globally over the outlook period (Table 3.1). Substantial steel production capacity is expected to be added over the next few years, with the Government aiming to double steel capacity to 300 Mt by 2030.

A considerable increase in total steel output is also expected in South-East Asia, with new production capacity expected from sizeable projects in Vietnam, Philippines and Malaysia. The World Steel Association predicts that steel production capacity in South East Asia will increase by 91 Mt by 2030. Major incoming projects to the region include the Panhua Group's new 10 Mt per annum (Mtpa) facility in the Philippines' Misamis Province, Sarawak Iron and Steel's 10Mtpa facility in Malaysia, and Hebel Bishi Steel Group's 3Mtpa facility in Indonesia.

Steel output in Japan weakens while Korea's output recovers

Japanese steel output contracted by 1.9% year-on-year in 2023. Rising costs and labour shortages dampened growth in construction activity.

However, in 2024, manufacturing steel demand is expected to show moderate growth, helped by the recovery of auto production. Over the outlook to 2029, Japan's steel production is expected to be flat (Table 3.1).

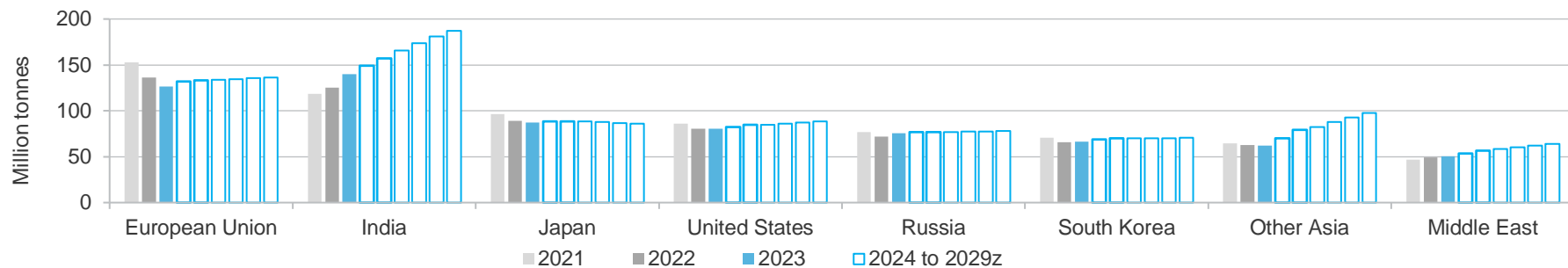
As noted above, South Korea's export-oriented economy has recovered strongly in recent months from the large falls in industrial production experienced in the first half of 2023. South Korean steel output is forecast to grow at around 1.0% a year over the outlook period (Table 3.1).

US manufacturing production recovers

US steel production increased by only 0.2% year-on-year in 2023. This result reflected weak industrial production and construction, particularly residential property, weighed down by tight monetary conditions.

The outlook for US steel demand in 2024 remains positive but contains downside risks. The potential for rate cuts in the second half of the year provides cause for optimism for construction as credit conditions ease. The outlook for manufacturing has also improved, with the US Manufacturing PMI recording the strongest reading since September 2022 driven by a sharp pickup in domestic orders. Over the rest of the outlook period to 2029, the Inflation Reduction Act and Infrastructure Investment and Jobs Act are expected to add to steel demand and support infrastructure growth. Overall, US steel production is projected to record 1.6% annual growth over the outlook period to 2029 (Table 3.1).

Figure 3.11: Other major producers — annual steel production



Note: z projections
Source: World Steel Association (2024); DISR (2024)

Table 3.1: World steel consumption and production

Crude steel consumption	Million tonnes							CAGR ^r
	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	
China	963	958	953	948	945	942	939	-0.4
European Union	147	152	155	157	160	163	166	2.1
India	130	138	149	159	169	179	189	6.5
United States	102	103	107	110	113	115	118	2.4
Other Asia ^a	111	116	119	122	125	129	133	3.0
Japan	59	59	59	60	61	62	63	1.1
Middle East	59	60	62	64	66	68	69	2.8
South Korea	54	55	55	56	57	58	58	1.2
Russia	45	45	45	46	48	49	50	1.6
World steel consumption	1,893	1,919	1,947	1,974	2,000	2,025	2,050	1.3
Crude steel production	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
China	1,019	1,015	1,011	1,007	1,002	997	992	-0.4
European Union	126	132	133	134	135	135	136	1.3
India	140	149	157	166	174	181	187	5.0
Japan	87	89	88	88	88	87	86	-0.2
United States	81	83	85	85	86	87	88	1.6
Russia	76	77	77	77	77	77	78	0.5
South Korea	67	69	70	70	70	70	71	1.0
Other Asia ^a	62	70	79	82	88	93	98	7.9
World steel production	1,888	1,924	1,957	1,983	2,010	2,037	2,063	1.5

Notes: ^a Asia ex. China, India, Japan, South Korea and Taiwan; ^f Forecast; ^r Compound annual growth rate; ^z Projection

Source: World Steel Association (2024); Department of Industry, Science and Resources (2024)

Iron Ore



Australia's iron ore sector



World's no.1
for iron ore
resources

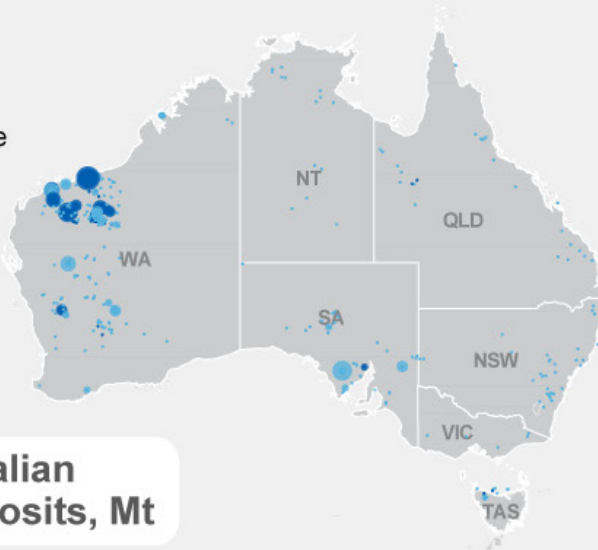


Largest
iron ore producer
in the world



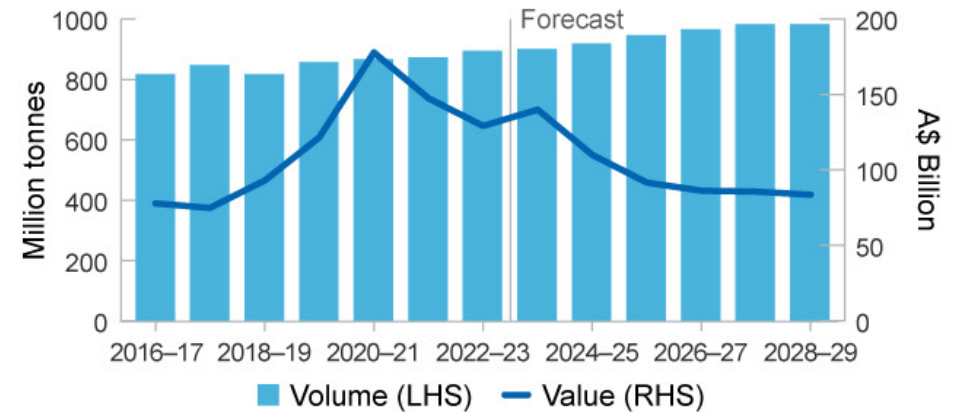
895m tonnes
of iron ore
exported in
2022–2023

- Deposit
- Operating mine
- <229
- 230–813
- 814–1,777
- 1,778–3,042
- 3,043–5,446
- >5,447



**Major Australian
iron ore deposits, Mt**

Australian iron ore exports



Outlook



Iron ore **prices have**
been **volatile** in 2024



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



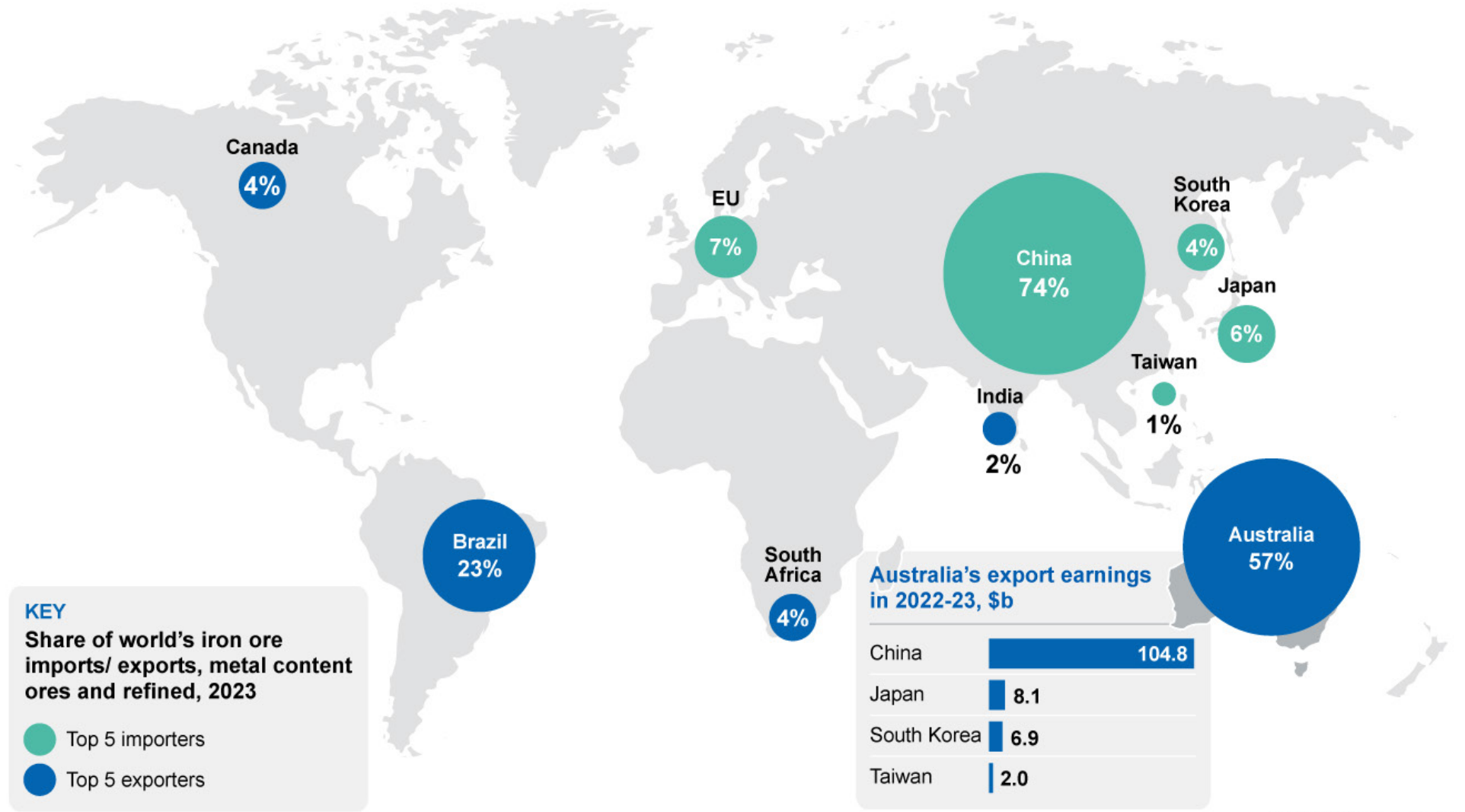
Australian **export**
volumes rising, with
further greenfield
supply expected



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 early 2024, after steady rises in the second half of 2023 driven by positive sentiment associated with the policy stimulus provided to the Chinese economy. Prices then fell to seven-month lows in March reflecting rising concerns about a rapid build-up of Chinese iron ore inventories amid sluggish growth in steel output in early 2024.
- Australian export volumes increased by 1.1% (year-on-year) to 893 million tonnes in 2023. As additional greenfield supply comes online from established and emerging producers, export volumes are forecast to increase by 1.6% annually over the outlook period to 2029.
- Lower prices projected over the outlook period will lower Australia's iron ore export earnings (in real terms) from \$136 billion in 2023–24 to \$107 billion in 2024–25, and to \$83 billion by 2028–29.

4.2 Prices

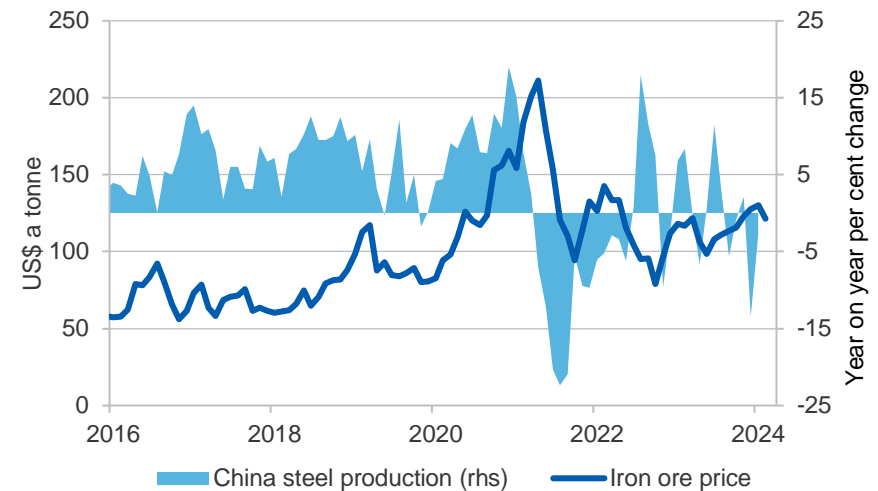
Iron ore price have been volatile in the March quarter

Iron ore prices have experienced bouts of strength in recent months, on the back of positive market sentiment following a series of Chinese government measures to support China's economy. After falling to a low of around US\$98 a tonne in mid-2023, the benchmark iron ore spot price (basis 62% Fe fines CFR Qingdao) recovered to average over US\$125 a tonne in January-February 2024 (Figure 4.1).

A rally in iron ore prices through the December quarter 2023 and early 2024 came despite weakness in Chinese steel production (down 13.5% and 6.9% year-on-year in December and January respectively).

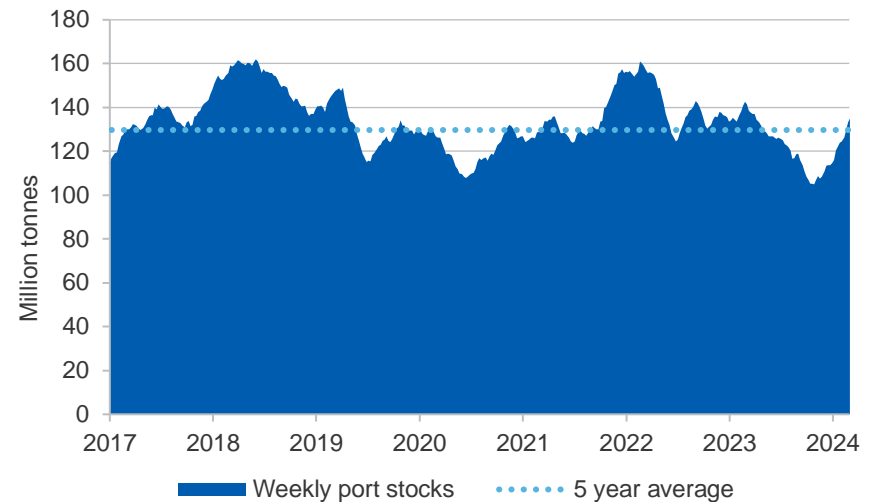
In mid-November, China's portside iron ore inventories fell to around 20% below historic averages (Figure 4.2). However, since then, inventories have rebuilt to levels around the historic average as mills have restocked. In part this may reflect cyclical factors, as mills stock up and boost output ahead of the peak construction season following the Chinese New Year.

Figure 4.1: Iron ore price, monthly



Notes: China import Iron ore fines 62% Fe spot (CFR Tianjin port)
Source: Bloomberg (2024) China import prices

Figure 4.2: China's weekly iron ore port stocks



Source: Bloomberg (2024)

However, since then iron ore prices have fallen sharply, to seven-month lows in early-March. This reflected rising concerns about a softer-than-expected growth outlook for China, particularly its property sector. The rapid build-up of iron ore inventories amid sluggish growth in steel output in early 2024 is also putting downward pressure on prices.

Despite recording flat steel production in 2023, China's iron ore imports grew by 6.6% to a record 1,180 million tonnes in 2023 (Figure 4.3). This included higher imports from countries such as Brazil, South Africa and Canada. Australian exports of iron ore to China rose by 1.5% in 2023.

China's monthly steel demand began losing momentum over H2 2023, resulting in rising steel inventories across China. The weakness in steel demand builds on the large falls in Chinese steel use observed in 2022.

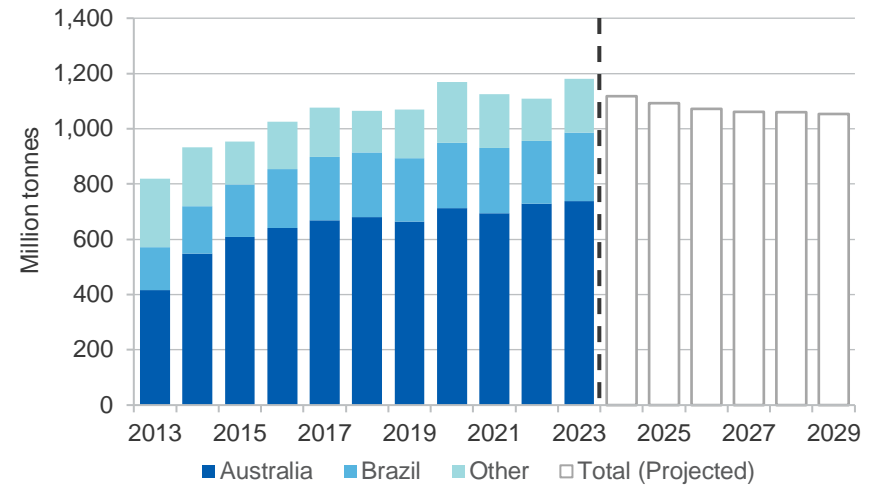
Chinese steel mill margins are low/negative due to weak steel prices and high input (iron ore, metallurgical coal and power) prices. As a result, spreads for premium 65% pellet and premiums for high-grade iron ore fines remain low, as mills seek to reduce operating costs (Figure 4.4).

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 over the next few years (see *Steel* chapter).

Ex-China steelmaking stabilised in 2023 following the sharp falls in 2022. The outlook for 2024 is healthy, with growth forecast to exceed 4.5% as European steel mills make up some of the production lost when high energy prices in 2022 led to widespread plant idling and production stoppages in Europe. 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.

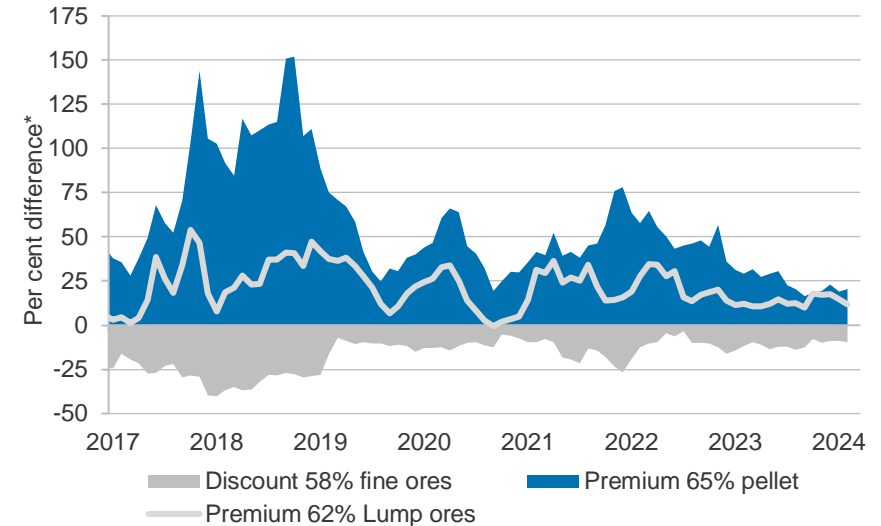
Risks to the global iron ore demand outlook remain broadly balanced. Inflation is moderating towards target levels in most advanced nations, with market expectations of interest rate cuts from the end of 2024.

Figure 4.3: China's iron ore imports



Source: Bloomberg (2024)

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 (2024)

The IMF's January 2024 0.4% upgrade to the China GDP growth forecast for 2024 indicates the potential for stronger underlying demand for steel. However, further deterioration in China's property sector remains a substantial downside risk, particularly if property prices continue to fall and confidence among Chinese homebuyers remains low.

Rising supply and easing demand to lower prices over the outlook period

China is projected to experience modest falls in steel output over the outlook period to 2029. This is expected to soften the rate of growth in global iron ore demand in the coming years, putting downward pressure on iron ore prices.

China's stated aim to shift its economy away from investment-led to consumption-led growth is expected to be a key driver of this downward trend in prices. China's declining population and the tapering in urban population growth in recent years is resulting in a structural downshift in demand for new residential and infrastructure-related construction.

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 3% per annum over the outlook period to 2029. 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\$68 a tonne in real terms by 2029 (Figure 4.5). These declines are not expected to result in significant Australian capacity being closed or cut back.

4.3 World trade

China iron ore imports reached record levels in 2023

Combined shipments from Australia, Brazil, South Africa and Canada — representing more than 80% of global seaborne supply — were estimated at around 1,370 million tonnes in 2023, a rise of 2.6% from 2022.

Over the outlook period, global trade is expected to grow by 2.1% annually, with new supply coming online in Australia, Brazil and Africa. Australia is projected to continue to ramp up greenfield projects from established producers Rio Tinto, BHP and Fortescue, as well as emerging producers such as Mineral Resources Limited and Atlas Iron. Australia's iron ore exports are projected to reach 983 million tonnes by 2029 (see Australia section for more detail).

Total iron ore shipments from Brazil increased by 21 million tonnes in 2023. Vale, which accounts for over 80% of Brazil's iron ore production, expects to produce 310-320 million tonnes in 2024. This aligns with the 315 million tonnes produced last year. However, the company plans to increase capacity by a further 50 million tonnes a year by 2026.

Brazil is expected to grow iron ore exports by around 6% annually over the outlook period. This will include Vale's S11D expansion, as well as new and expanded output by a number of other producers, such as CSN's Casa de Pedra mine, and IndoSino's Amapa high grade concentrate.

Outside of Australia 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 in Guinea which is targeting first production in 2025–26.

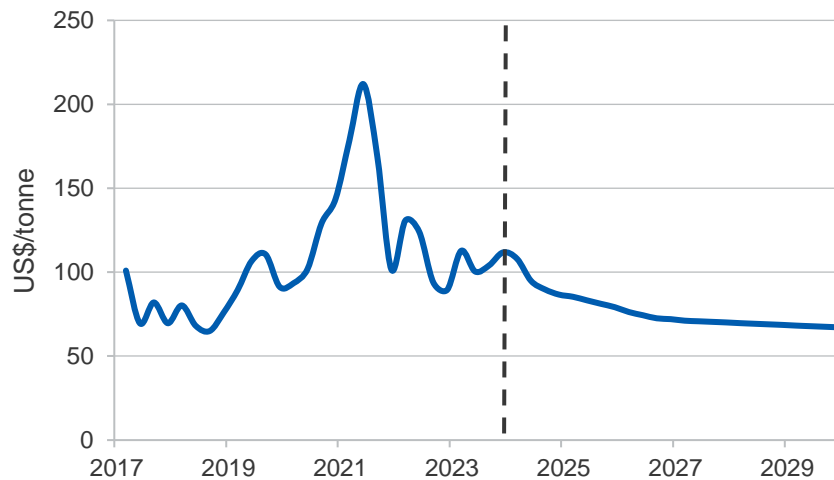
CMRG to play increasing role in contract negotiations

In late 2023, China's state-owned company China Minerals Resources Group (CMRG) commenced talks with the world's four largest iron ore mining companies — Rio Tinto, BHP, Vale and Fortescue. Reports indicate CMRG is seeking preferential terms on transport, grades and delivery arrangements, as well as price.

CMRG was established by the Chinese Government in July 2022 with the aim of enhancing China’s ability to ensure the supply of important mineral resources — including the establishment of a single, central purchasing platform for iron ore. CMRG has a broad remit, with responsibilities ranging from exploration and mining of mineral resources, management of supply chain services and investment activities.

Over the outlook period, CMRG is expected to play an increasing role in contract negotiations and price setting in the global iron ore market. In 2023, CMRG started negotiations on iron ore supply on behalf of a number of China’s major steelmakers.

Figure 4.5: Iron ore price outlook, quarterly (real)



Notes: China import iron ore fines 62% Fe spot (FOB)
 Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

Rio Tinto board gives go-ahead for Simandou mine

Progress on Guinea’s Simandou 150-200 million tonne mine continued in the March quarter 2024, with the announcement that Rio Tinto’s board approved the project. Rio Tinto expects infrastructure work to begin this

year. Rio Tinto plans to invest US\$6.2 billion in the mine, rail, and port project, in collaboration with a number of other companies. Final investment approval from Rio Tinto’s Chinese partners, which includes Baowu and Chinalco, is pending.

To support the project, Baowu raised US\$1.4 billion from a bond issue in China in January 2024. In 2023, 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 a new deepwater port on Guinea’s Atlantic coast.

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. The Guinean Government aims to complete infrastructure and commence commercial production in late 2025 or early 2026.

India’s iron ore imports to increase to meet rising domestic steel demand

In 2023, India’s iron ore and pellet exports more than doubled to reach an estimated 37 million tonnes. This growth reflected the removal of large export duties imposed in 2022. However, as India’s steelmaking capacity continues to grow in the year ahead — to meet the rising demand from manufacturing, infrastructure and residential and commercial construction — the quantity of iron ore available for export will be reduced.

There remains considerable uncertainty about the likely trajectory of India’s iron ore exports and imports over the next few years. India’s iron ore imports are forecast to rise rapidly over the outlook to 2029, albeit from a low base. Much will depend on how quickly iron ore production capacity — and associated rail and other infrastructure — can be brought online.

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 forecast easing in prices over the outlook period suggests India’s iron ore exports are likely to grow relatively slowly over the outlook to 2029.

4.4 Australia

Export volume growth to slow over the five-year outlook period

Australia's iron ore export earnings were \$136 billion in 2023 (2023-24 prices), a 9.5% increase from 2022. The increase reflected higher iron ore prices over the period, with the unit export price in 2023 around 8% higher compared with the previous year. In volume terms, Australia exported 893 million tonnes of iron ore in 2023, up by 1.1% (Figure 4.6). This follows the ongoing ramp up of BHP's South Flank, Rio Tinto's Gudai-Darri and Fortescue's Eliwana operations. Over the five year outlook, Australia's iron ore production volumes are projected to increase by 1.9% a year in volume terms, to reach an estimated 1,069 Mt by 2028-29 (Table 4.2).

BHP's iron ore output was around 281 million tonnes in 2023 (on a 100% ownership basis), down 1.3% year-on-year. Lower production was due to the continued tie-in activity for the Rail Technology Programme and the impacts of the ongoing ramp up of the Central Pilbara hub. The company left its production guidance for 2023–24 unchanged at 250-260 million tonnes (equating to 282–294 million tonnes on a 100% ownership basis). This includes the further ramp up of South Flank, which BHP expects to reach nameplate capacity by the end of the June quarter 2024, as well as its port debottlenecking project due for completion in 2024. The company is also exploring options for growing output to 330 million tonnes per annum in the second half of this decade.

Rio Tinto shipped around 332 million tonnes of iron ore in 2023, the second highest level on record. The result reflected productivity improvements across the Pilbara system and the rapid ramp up of the Gudai-Darri mine to its nameplate capacity of 43 million tonnes a year.

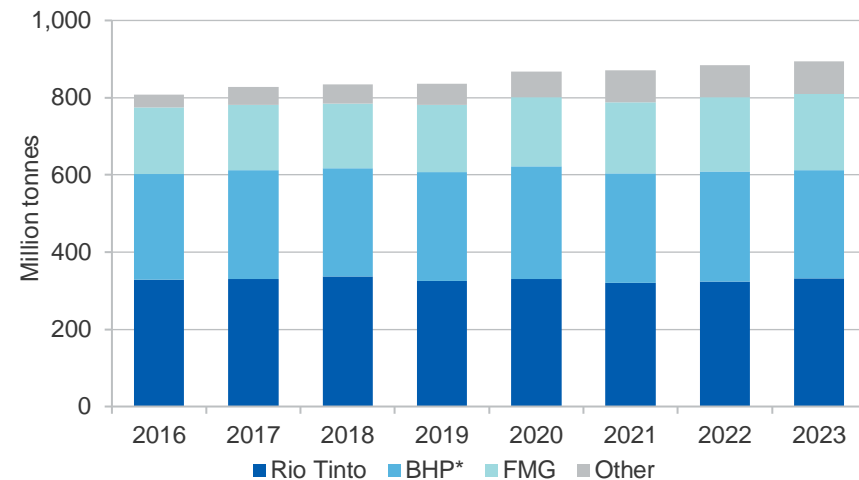
Rio Tinto's 2024 production guidance remains at 323-338 million tonnes. Rio Tinto is seeking to lift capacity of the Gudai-Darri mine to 50 million tonnes a year through incremental productivity gains. The capacity gain is subject to environmental, heritage and other relevant approvals.

Rio Tinto is also projecting continued expansion of its iron ore production over the outlook period to 2029. In June 2023, the company announced it

had awarded \$1 billion in construction contracts for its \$3 billion Western Range joint venture with Baowu Steel Group. This project will sustain production from its existing Paraburdoo hub, and is expected to produce 25 million tonnes per year.

The company also approved a \$110 million pre-feasibility study in December to progress development of the Rhodes Ridge prospect (in a joint venture with Wright Prospecting). The study is expected to be completed by the end of 2025 and will consider an initial plant capacity of up to 40 million tonnes per annum, with potential first output toward the end of this decade.

Figure 4.6: Australian iron ore exports by company



Notes: * Based on company's reporting of production, not shipments
Source: ABS (2024) International Trade, Australia, 5368.0; Company reports

Fortescue's total iron ore shipments were around 196 million tonnes in the 2023 calendar year, 2% higher year-on-year. Fortescue's production guidance for the 2023–24 financial year remains at 192–197 million tonnes, which includes approximately 2-4 million tonnes of production from Iron Bridge. The Iron Bridge shipment guidance has been revised down

from 5 million tonnes due to lower-than-expected throughput of the Raw Water Pipeline, which is undergoing work to improve its performance.

In January 2024, Mineral Resources reported the Onslow Iron project remains on target for the first ore-on-ship delivery by June 2024. The project is forecast to ship around 35 million tonnes of iron ore per year, with an expected mine life of at least 30 years.

Weaker prices to see Australia's export earnings fall over the outlook

Australia's iron ore export earnings are estimated to reach \$136 billion in 2023–24, reflecting higher production volumes and stronger prices. Weaker prices and a higher AUD/USD exchange rate are forecast to lead to lower iron ore earnings over the outlook period. Total export earnings are forecast to decline to \$107 billion in 2024–25, falling to around \$83 billion by 2028–29 (both in real terms) (Figure 4.7).

Exploration moderated in December quarter 2023

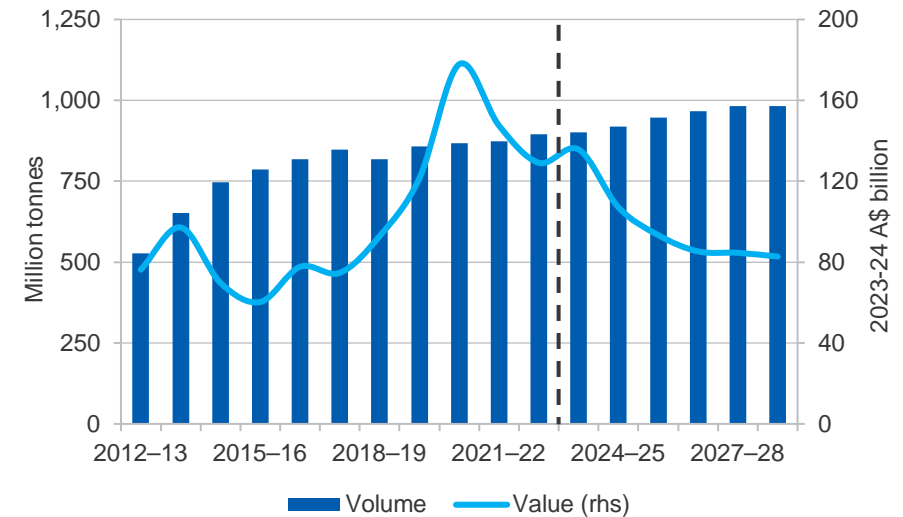
A total of \$171 million was spent on iron ore exploration in the December quarter 2023 (Figure 4.8). This was 13% lower compared to the previous quarter, and 2.2% lower than the same period in 2022. Exploration has fallen from near decade highs last year. However, the latest results continue the broad upward trend in iron ore exploration triggered by the historical high iron ore prices (of above US\$200 a tonne) in the first half of 2021.

Revisions to the outlook

Export earnings in 2023–24 have been revised up from the December 2023 REQ reflecting higher forecast prices and a lower-than-expected exchange rate. Earnings of \$136 billion rather than \$131 billion are now forecast for 2023-24. Export earnings in 2024–25 have also been revised up, from \$102 billion in the December 2023 *Resources and Energy Quarterly* to \$111 billion in this edition.

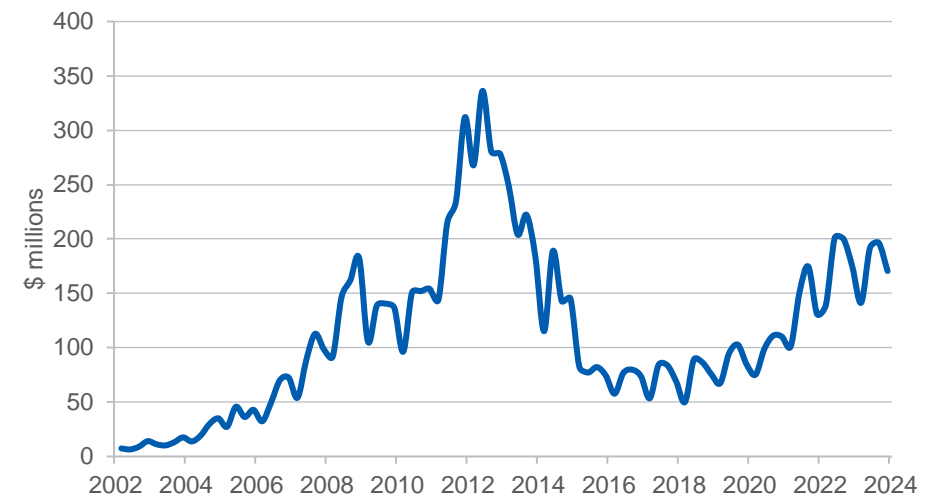
Compared with the March 2023 REQ, Australian iron ore earnings in 2027–28 (in nominal terms) have been revised up by around \$8 billion, reflecting forecasts of slightly higher prices and a minor rise in volumes.

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



Source: ABS (2024) International Trade, Australia, 5368.0; Department of Industry, Science and Resources (2024)

Figure 4.8: Australian iron ore exploration expenditure



Source: ABS (2024) Catalogue 8412.0

Table 4.1: World trade in iron ore

	Million tonnes							CAGR ^r
	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	
World trade	1,620	1,633	1,672	1,699	1,739	1,788	1,832	2.1
Iron ore imports								
China	1,180	1,118	1,092	1,072	1,061	1,060	1,053	-1.7
Japan	102	104	104	104	103	102	101	-0.2
European Union	108	112	113	114	113	114	114	1.0
South Korea	72	74	75	75	72	75	76	1.0
Rest of Asia ^a	53	61	77	84	94	104	117	14.2
India	4	18	31	44	52	72	89	70.7
Iron ore exports								
Australia	893	905	937	952	981	983	983	1.6
Brazil	367	390	413	440	467	494	521	6.0
South Africa	59	60	61	62	63	64	64	1.4
Canada	56	58	60	62	62	62	62	1.7
India	37	38	39	40	41	42	43	2.5

Notes: ^a Excludes China, Japan, South Korea, Taiwan and India; ^s Estimate; ^f Forecast; ^r Compound annual growth rate, ^z Projection

Source: World Steel Association (2024); International Trade Centre (2024); Department of Industry, Science and Resources (2024)

Table 4.2: Iron ore outlook

		Million tonnes							
World	Unit	2023 ^f	2024 ^f	2025 ^z	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
Prices ^a									
– nominal	US\$/t	105	95	84	77	75	75	75	-5.4
– real ^b	US\$/t	107	95	82	74	71	69	68	-7.3
Australia	Unit	2022–23 ^f	2023–24 ^f	2024–25 ^z	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^r
Production									
– Steel ^c	Mt	5.6	5.4	5.5	5.5	5.4	5.5	5.5	-0.4
– Iron ore ^g	Mt	957	962	999	1,029	1,051	1,068	1,069	1.9
Exports									
Steel ^c	Mt	1.21	1.00	1.00	1.07	1.03	1.03	1.05	-2.5
– nominal value	A\$m	1,356	1,192	1,182	1,207	995	815	730	-9.8
– real value ⁱ	A\$m	1,411	1,192	1,146	1,139	916	732	639	-12.4
Iron ore ^h	Mt	895	900	919	947	967	983	983	1.6
– nominal value	A\$m	124,131	135,692	110,504	98,976	92,695	94,246	94,493	-4.4
– real value ⁱ	A\$m	129,120	135,692	107,104	93,353	85,297	84,609	82,761	-7.1

Notes: a Spot price, 62% iron content, fob Australian basis; b In 2024 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 Compound annual growth rate; z Projection
Source: ABS (2024) International Trade in Goods and Services, Australia, 5368.0; Bloomberg (2024); World Steel Association (2024); company reports; Department of Industry, Science and Resources (2024)

Metallurgical Coal



Australia's metallurgical coal sector



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

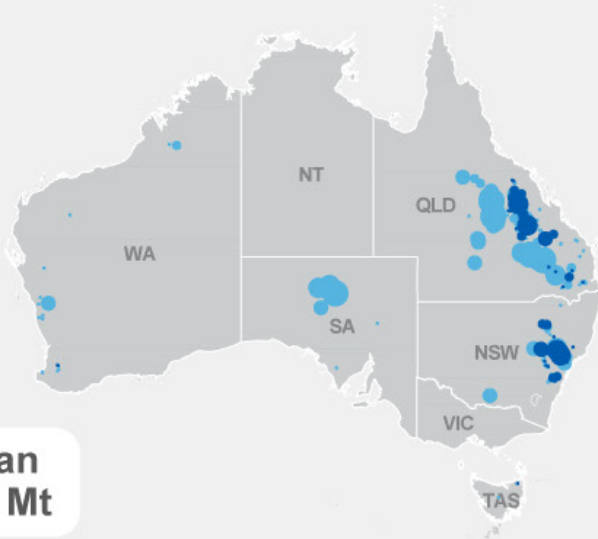


Strong growth in exports to **India** and **South Korea** in recent years



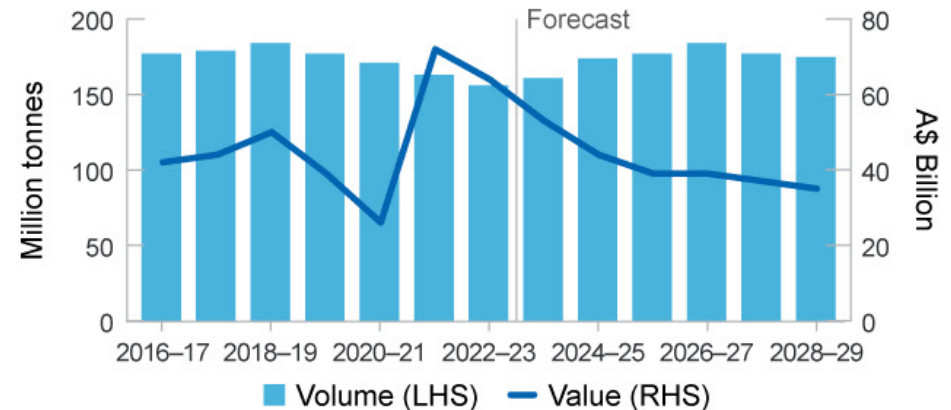
Almost all of Australia's production is exported

- Deposit
- Operating mine
 - <500
 - 500–1,000
 - 1,001–2,000
 - 2,001–4,000
 - >4,000



Major Australian coal deposits, Mt

Australian metallurgical coal exports



Outlook



Metallurgical coal prices remain strong in early 2024



As supply disruptions pass, prices and export values are set to ease



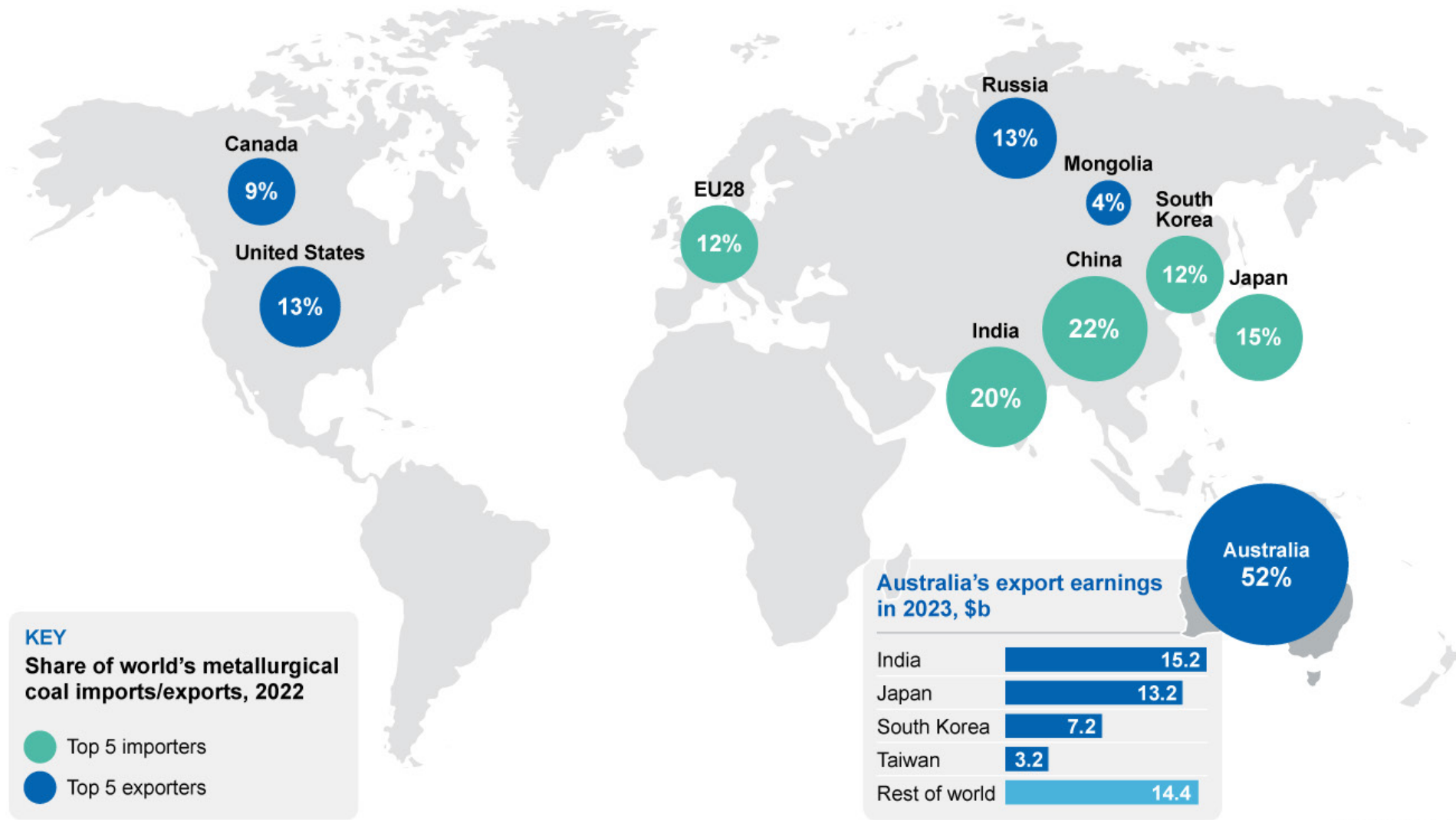
Volumes are expected to grow over the next five years as new mines ramp up



Exploration spending rose through the year

SOURCE: World Steel; GA; DISR; OCE

Metallurgical Coal TRADE MAP



SOURCE: WSA; ABS

5.1 Summary

- Australia’s metallurgical coal export earnings are expected to decline to \$56 billion in 2023–24, easing further and then stabilising between \$35 and \$40 billion (in real terms) over the second half of the outlook period.
- Metallurgical coal prices are falling slowly as supply disruptions gradually diminish. Prices are expected to ease from US\$277 a tonne in 2024 to US\$185 a tonne (in real terms) by 2029.
- Export volumes are expected to increase from 161 Mt in 2023–24 to 175 Mt by 2028–29, as mines in NSW and Queensland ramp up (see [Australia section](#)). Another La Niña introduces volatility to the outlook.

5.2 World trade

Global demand for metallurgical coal reached 317 million tonnes in 2023, growing by 8% from 2022. India and China drove the majority of this growth, with China drawing in rapidly growing coal flows from Mongolia via recently upgraded rail links. In 2023, India overtook China as the world’s number one importer of seaborne metallurgical coal, though China still retains top spot for overall (land and sea) metallurgical coal imports.

Demand from other markets was broadly stable through 2023, with South Korea, Taiwan, and Europe totals similar to their 2022 volumes. Demand from Japan was subdued, falling to 40 million tonnes in 2023 from 43 million tonnes in 2022.

World steel output is expected to grow at 1.5% per year over the outlook period, providing a strong baseline for metallurgical coal use in the medium term. World metallurgical coal demand is projected to rise from 317 million tonnes in 2023 to 331 million tonnes by 2029.

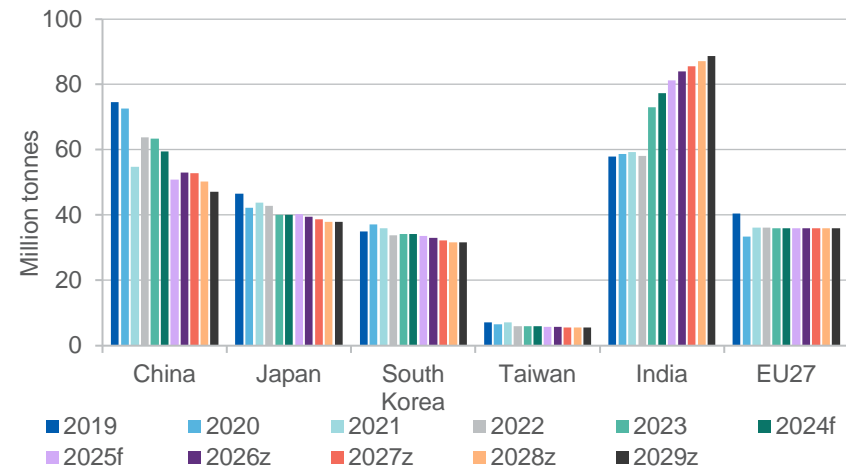
Numerous Asian countries continue to progress ambitious steel plans, and despite some delays associated with the pandemic and various geopolitical problems, it is likely that the pace of steel production in the region will pick up over time. Metallurgical coal imports are thus expected to grow in a range of Asian nations including India, with other areas including the European Union also holding up relatively strongly (Figure 5.1).

Chinese metallurgical coal imports are peaking

Total (seaborne and land) Chinese imports of metallurgical coal rose strongly in 2023 but may be peaking. Over the five years to 2022, China imported an average of 66 million tonnes of metallurgical coal per year. In 2023 imports rose to 103 million tonnes. Most of this extra volume came from Mongolia via the upgraded rail link between the two nations.

China has imposed import tariffs of 3% on metallurgical coal, in order to protect its domestic industry. Indonesia and Australia are exempt from these tariffs under Free Trade Agreements. Russia and Mongolia are not expected to be exempt, but import volumes from these countries are unlikely to be affected given the limited alternatives.

Figure 5.1: Metallurgical coal imports



Notes: f Forecast z Projection

Source: McCloskey (2024); Department of Industry, Science and Resources (2024)

China’s seaborne imports of metallurgical coal will continue to be influenced by its domestic steel production and by government industry policy. China imposed cuts on steel production in 2021 and 2022 to meet decarbonisation goals, but subsequently relaxed them in 2023. The targets could stay relaxed in 2024 to mitigate the impact of slower economic growth. Many of China’s steel mills are undergoing upgrades to use ultra-

low emissions technology: this should improve efficiency and reduce the impact of stricter emissions policies.

China's steel output is projected to decline modestly over the outlook period, which should flow through to metallurgical coal imports. Seaborne metallurgical coal imports are expected to fall from 64 million tonnes in 2023 to 47 million tonnes by 2029.

India's demand is expected to grow

India's imports of metallurgical coal grew by 25% to an estimated 73 million tonnes in 2023. India has been investing heavily in steel production capacity in recent years; the Government is looking to double steel production capacity to 300 million tonnes by 2030. Hence, steel production (and consumption) is expected to increase significantly over the outlook period (by 1.3% per year and 6.5% per year, respectively).

As its steel production has expanded, India has surpassed China as the world's largest importer of seaborne metallurgical coal in 2023. Growth is expected to continue through the outlook period, driven by India's manufacturing and construction sectors. While India is also increasing its production of metallurgical coal, this increase is not expected to keep pace with demand. Seaborne metallurgical coal imports are expected to increase from 73 million tonnes in 2023 to 89 million tonnes in 2029, with most of this additional supply drawn from Russia and Australia.

5.4 World exports

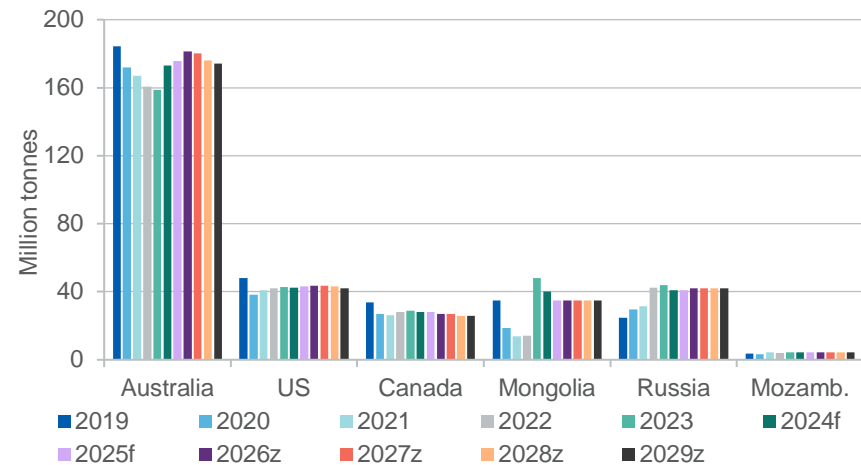
World exports are expected to decline over the outlook period, albeit from a high baseline in 2023. Global trade in 2023 reached 349 million tonnes, almost 12% above 2022. World exports are expected to fall to 333 million tonnes by 2029, with a mixed profile among individual nations (Figure 5.2).

US metallurgical coal exports expected to remain stable

Metallurgical coal exports from the US were strong in 2023 at 43 million tonnes. Seaborne metallurgical coal exports from the US are expected to be flat over the outlook period, with a small decline to 42 million tonnes by 2029. The US has a relatively small project pipeline for coal: there are

currently two new projects and one expansion project planned for metallurgical coal, with all expected to come online by 2025.

Figure 5.2: Metallurgical coal exports



Notes: f Forecast z Projection

Source: IEA (2024); Department of Industry, Science and Resources (2024)

The combined production capacity for these projects is just under 8 million tonnes per annum. The US government is investing in upgrading transport infrastructure which should help resolve previous supply chain disruptions. Labour force shortages continue to be a challenge for US producers, posing particular issues for new and expanding mines.

Safety concerns may hamper Mongolian coal exports in the short term

Mongolia's exports of metallurgical coal more than tripled in 2023, rising from just 14 million tonnes in 2022 to 48 million tonnes. Improved rail links to China were the main driver, helped by record prices from 2022.

With prices expected to soften over the outlook period, volumes are expected to drop back to 35 million tonnes by 2025 and remain around that level thereafter. Mongolia has three new metallurgical coal projects in its pipeline and one expansion project. Together, these could expand production capacity by 18 million tonnes per annum over the longer term.

Canadian mines expected to maintain output

Canada currently has eleven new metallurgical coal projects and one expansion project in its pipeline. These projects are expected to come online between now and 2027, and will act to replace mines reaching end of life. Canada has a high bar for project approvals with complex regulatory structures and significant influence at the local and community level.

Exports of Canadian metallurgical coal are expected to decline over the outlook, falling from 29 million tonnes in 2023 to 26 million tonnes by 2029.

Exports out of Mozambique are growing, supported by improved transport

Mozambique's exports are expected to be steady at 4 million tonnes per year through the outlook period. Mozambique remains a high-cost producer with low processing yields. A good portion of production capacity sits above the 90th percentile total cash cost. When prices fell in 2020 (due to the pandemic), some of Mozambique's high-cost miners exited the market. With prices expected to decline over the outlook period, risks for Mozambique exports remain weighted to the downside.

Russian mines reapproaching capacity but tariffs may hurt production

Russia's metallurgical coal exports were strong in 2023, increasing to 44 million tonnes compared to 37 million tonnes in 2022. The majority of this increased output was exported to India and China.

Russian exports to Europe dropped to almost zero in 2023, with exports to Japan experiencing the largest drop outside of Europe. Other countries, including Malaysia, South Korea, Turkey and Vietnam, increased their imports from Russia. Russia implemented exchange rate-linked export duties in October 2023 in a bid to increase government revenue. These duties were initially expected to remain in place through 2024 but were removed in January 2024 in a bid to keep exports competitive.

Over the outlook period, Russian seaborne metallurgical coal exports are expected to experience a small decline, dropping from 44 million tonnes in 2023 to 42 million tonnes by 2029. Exports will be impacted by lower prices and miners' difficulties finding funds to invest in new/existing mines.

5.3 Prices

Metallurgical coal prices set to decline further

The Australian prime hard coking coal price averaged US\$294 a tonne in 2023. While this was significantly lower than the 2022 average of US\$360 a tonne, prices continued to experience volatility as a result of supply side issues (Figure 5.3). Prices appeared to be stabilising around the middle of the year, but climbed back up in September when supply from Australia's BMA's Peak Downs mine in central Queensland was suspended after two truck sliding incidents.

Prices held at high levels towards the end of the year due to additional supply disruptions — including Cyclone Jasper and the associated long queues at Queensland ports. Vessel queues remained high in January 2024, but showed some signs of easing in February. Prices are expected to broadly trend downwards in 2024, averaging US\$277 a tonne for the year. Prices will likely experience volatility in the latter half of 2024 due to the likelihood of a new La Niña cycle and associated disruptions.

Figure 5.3: Metallurgical coal prices — Australian vs US, FOB



Notes: 'Low Vol' is low volatility coking coal

Source: McCloskey (2024); Department of Industry, Science and Resources (2024).

Prices for metallurgical coal fluctuated sharply again in 2023, mostly due to disruptions in Australian supply (linked to safety incidents, cyclones, and delays due to port queues). Over the outlook period, prices will be driven by the length and severity of weather disruptions from La Niña. The last La Niña cycle lasted three years, if a similar length occurs supply could experience disruptions out to 2026. There is also upside risks from potential escalation in the Russia-Ukraine conflict which could further reduce Russian exports. In real terms, prices are expected to fall to US\$185 a tonne by 2029.

5.4 Australia

Metallurgical coal production has only partially recovered

Australian metallurgical coal production and exports have been constrained in recent years by bad weather and logistical problems (Figure 5.4). But demand factors also played a role, including relatively soft steel production among some regional importers, and sustained low exports to China even following the removal of trade restrictions.

Recovering global supply will bring seaborne metallurgical coal prices down. Falling prices (and production issues) have affected Bowen Coal's Bluff project, which has now paused having previously been restarted. Other mines continue to produce at the lower end of their production guidance ranges. Further price falls could potentially affect the outlook for new projects, though key prospects such as Olive Downs and Maxwell are expected to continue ramping up in the near-term.

Capital spending also remains subject to concerns over environmental factors and social licence. These pressures have been mainly directed against thermal coal, but metallurgical coal is also being affected.

Labour force shortages in coal mining has eased slightly. According to ABS labour force data, total persons employed in coal mining in 2023 averaged 47,000. This is a minor improvement on the previous year of 44,300, however is still below the pre-pandemic average in 2019 of 53,000.

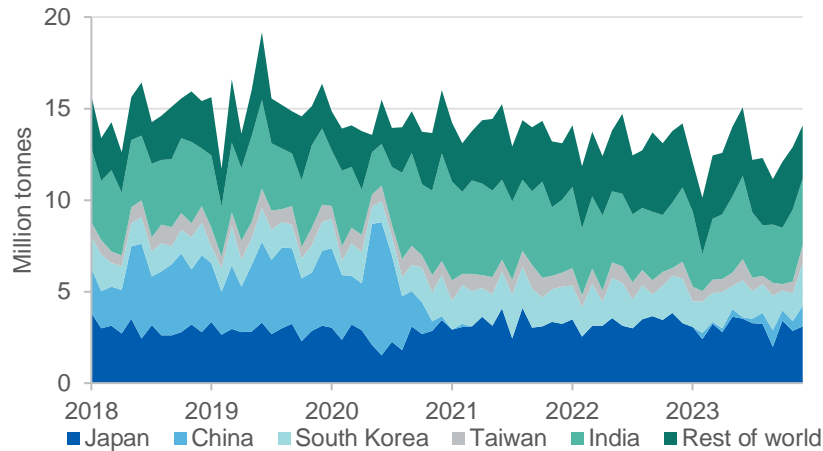
Supply constraints are expected to ease to some degree over the outlook period. Some supply constraints reflect disruptions caused by weather and logistics, and so are inherently short-term and capable of rapid resolution. However, others such as labour and capital shortages could be sustained, with potential to worsen over the next five years.

There are a range of Australian projects which could commence, ramp up or restart production. These prospects include Bowen's Bluff mine, Burton and Broadmeadow East projects, Pembroke's Olive Downs complex, Anglo American's German Creek (where output is already ramping up), Fitzroy's Ironbark No. 1, Vitrinite's Vulcan mine, Malabar's Maxwell mine, Q Coal's Cook project, Sojitz's Crinium mine, and Futura's Wilton and Fairhill deposits. Whitehaven's large Winchester South deposit remains a prospect, with potential for development late in the outlook period.

Although the fundamentals remain favourable, there are risks to navigate. Higher electric arc furnace (EAF) and green steel production may harm the demand for metallurgical coal from steel mills using blast furnaces. The pace of the roll-out of this technology at an economical scale in major steel producing nations remains unclear. Prices represent another risk — they are currently on an easing path which could leave them below the level required to incentivise increased output. Australia accounts for just over half of global export volumes and has cost and scale advantages over other producers. It thus retains an important role in balancing global markets.

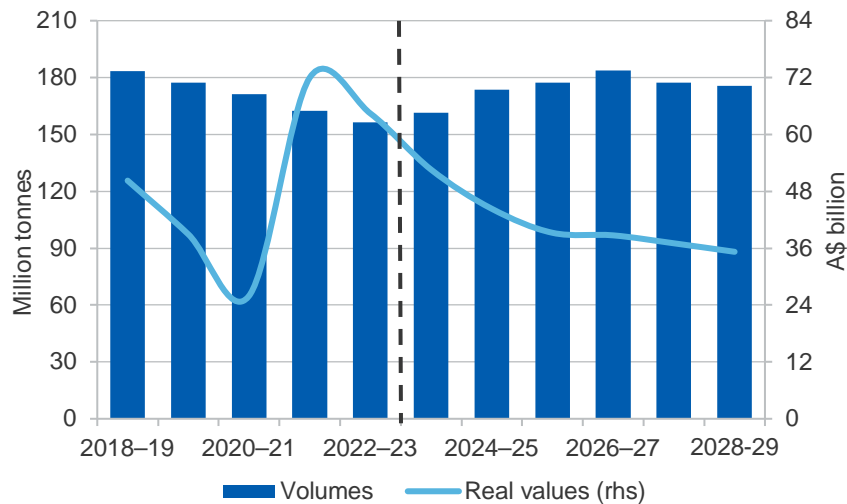
At this stage, assuming profit margins can be sustained, capital and labour shortages are not considered sufficient to prevent growth in output. Most of the potential capacity is expected to proceed, although with potential for further delays as markets find their equilibrium. Higher production in New South Wales and (especially) Queensland is expected to lift Australia's exports from a weather-affected 156 Mt in 2022–23 to 175 Mt by 2028–29. Metallurgical coal export earnings are expected to ease from \$64 billion in 2022–23 to \$35 billion by 2028–29 (real terms, Figure 5.6), with higher volumes only partly offsetting the impact of falling prices.

Figure 5.4: Australia's metallurgical coal export volumes, monthly



Source: ABS (2024) International Trade, Australia (trade tables subscription)

Figure 5.5: Australia's metallurgical coal exports

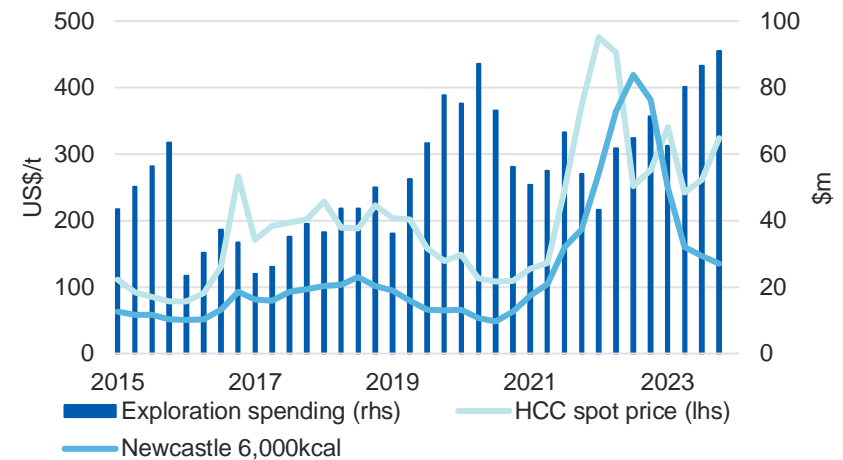


Source: ABS (2024) International Trade, Australia 5454.0; Department of Industry, Science and Resources (2024)

Coal exploration expenditure has steadily increased

Exploration expenditure for thermal and metallurgical (Figure 5.4) has been trending upwards since March 2022 when prices began to rise significantly. In 2023, coal exploration expenditure in Australia reached \$320 million, a 33% increase on the previous year, and the highest investment figure since 2014. Expectations are that this investment is likely focused on metallurgical coal which is expected to see sustained demand over the outlook.

Figure 5.6: Australian coal exploration expenditure and prices



Notes: exploration for all coal types
Source: ABS (2024); McCloskey (2024)

Revisions to the outlook for Australian metallurgical coal exports

The export earnings forecast for 2023–24 and 2024–25 have been revised up from the December 2023 *Resources and Energy Quarterly* due to an upward revision to prices. The forecast has been revised up by around \$4 billion in 2023–24 and \$9 billion in 2024–25. In terms of the medium-term forecast, export projections have been revised up by around \$5-7 billion for 2025–26, 2026–27 and 2027–28. This reflects a stronger price expectation compared to the March 2023 edition of the REQ.

Table 5.1: World trade in metallurgical coal

	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^f
World trade	Mt	349	334	335	340	339	335	333	-0.8
Metallurgical coal imports									
China	Mt	64	59	51	53	53	50	47	-4.8
India	Mt	73	77	81	84	86	87	89	3.3
Japan	Mt	40	40	40	39	39	38	38	-0.9
European Union	Mt	36	36	36	36	36	36	36	0.0
South Korea	Mt	34	34	34	33	32	32	32	-1.3
Metallurgical coal exports									
Australia	Mt	151	173	176	181	180	176	174	2.4
United States	Mt	43	42	43	44	44	43	42	-0.3
Canada	Mt	29	28	28	27	27	26	26	-1.8
Russia	Mt	44	41	41	42	42	42	42	-0.7
Mongolia	Mt	48	40	35	35	35	35	35	-5.1
Mozambique	Mt	4	4	4	4	4	4	4	0.0

Notes: **f** Forecast; **z** Projection.

Source: IEA (2024) Coal Information; IHS (2024); Department of Industry, Science and Resources (2024)

Table 5.2: Metallurgical coal outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^f
Contract prices ^e									
– nominal	US\$/t	289	282	231	208	210	210	206	-5.5
– real ^d	US\$/t	295	282	226	200	198	194	186	-7.4
Spot prices ^g									
– nominal	US\$/t	292	277	226	208	210	210	205	-5.7
– real ^d	US\$/t	298	277	221	199	198	194	185	-7.7
Australia	Unit	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^f
Production ^s	Mt	167	173	178	181	188	182	180	1.3
Export volume	Mt	156	161	174	177	184	177	175	2.0
– nominal value	A\$m	61,922	55,715	49,498	41,747	42,061	41,246	40,228	-6.9
– real value ⁱ	A\$m	64,411	55,715	47,975	39,376	38,704	37,028	35,233	-9.6

Notes: **d** In 2024 US dollars. **e** Contract price assessment for high-quality hard coking coal. **i** In 2023–24 Australian dollars. **f** Forecast. **g** Hard coking coal fob Australia East Coast ports. **z** Projection.

Source: ABS (2024) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Science and Resources (2024)

Thermal Coal



Australia's thermal coal sector



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

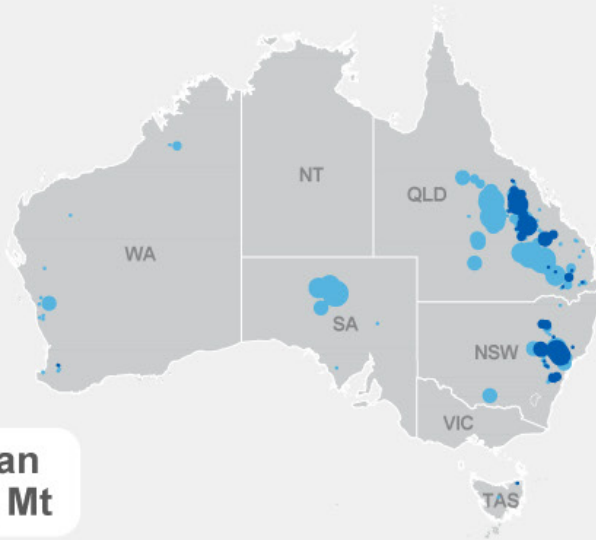


Strong growth in exports to **India** in recent years



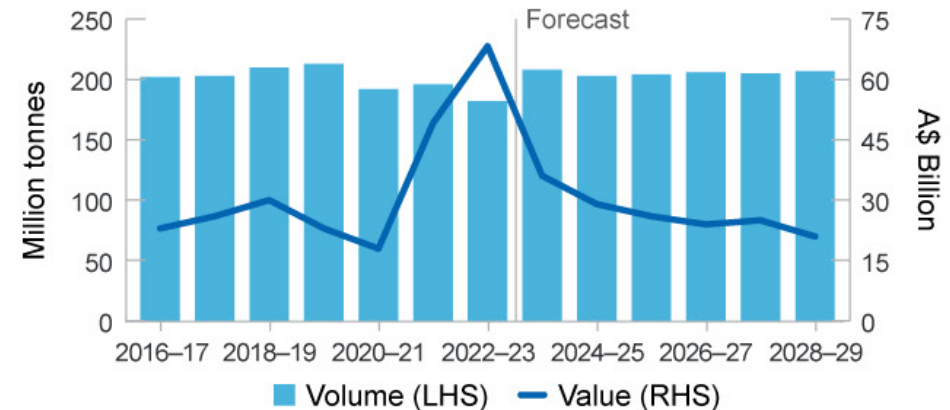
75-80% of Australia's thermal coal is **exported**

- Deposit
- Operating mine
 - <500
 - 500–1,000
 - 1,001–2,000
 - 2,001–4,000
 - >4,000



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**



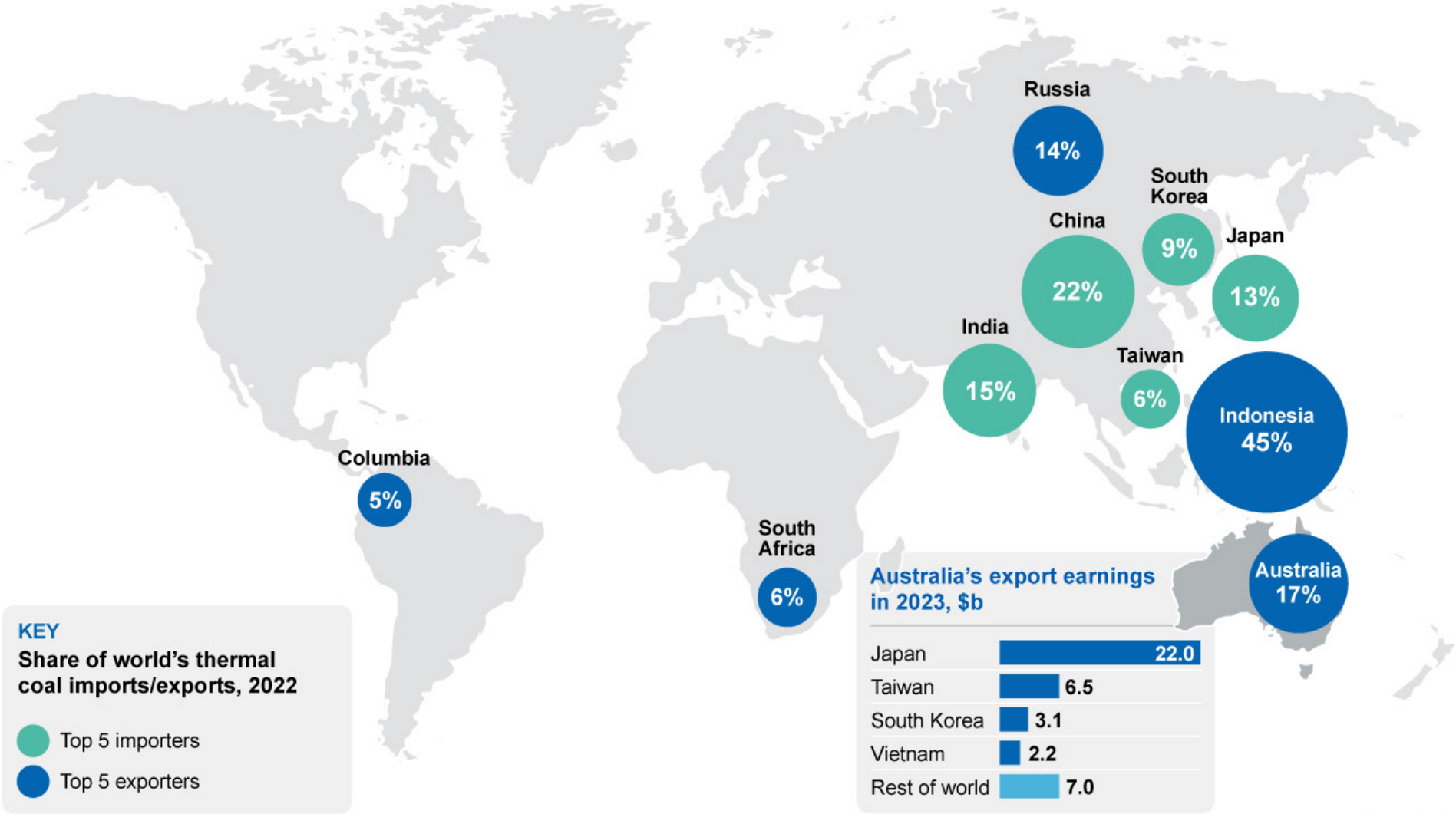
Volumes should **lift** as **weather disruptions ease** and **new mines ramp up**



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

- Australia’s thermal coal export earnings are expected to ease from \$36 billion in 2023–24 to around \$21 billion by 2028–29 (in real terms) as prices continue to fall.
- Thermal coal spot prices are expected to fall slowly over coming years, from US\$133 a tonne in 2024 to US\$105 a tonne (in real terms) by 2029. Contract prices are expected to fall from around US\$200 a tonne (in JFY 2023–24), converging on spot prices.
- Export volumes are expected to hold steady at around 205 million tonnes (Mt) per annum through the outlook period, with mine depletions and ramp-ups likely to be roughly balanced (see [Australia section](#)).

6.2 World trade

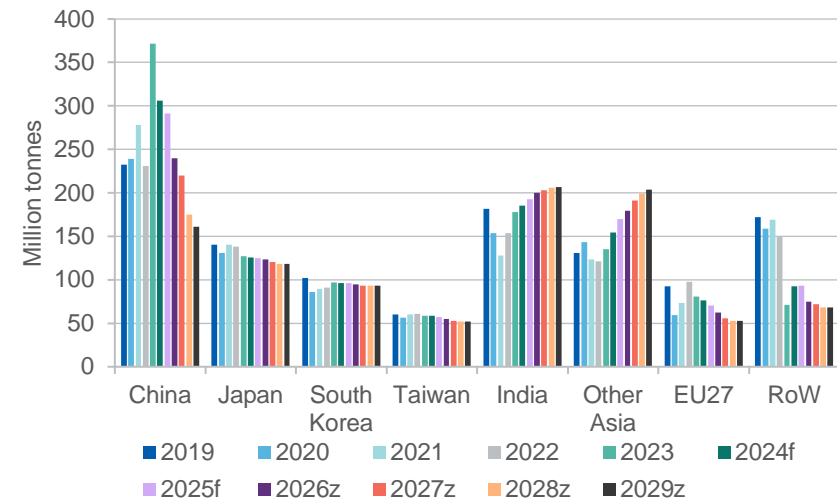
Thermal coal markets have been relatively stable over the March quarter 2024. The 6,000 kcal Newcastle price has averaged \$US127 a tonne across January and February, compared with \$US135 a tonne in the December quarter 2023. In the near term, seaborne thermal coal imports are expected to be subdued by high inventories across several markets and by decreased demand from China — impacted by Chinese New Year holidays. There is also the high likelihood of a La Niña weather event reappearing in 2024, bringing with it heavy rainfall likely to be generally unfavourable to coal production and transport in Australia and Indonesia.

Trade in thermal coal is expected to broadly decline over the next five years, though with significant variance between nations (Figure 6.1). The pace of this decline is still uncertain with industry experts predicting a wide range of scenarios driven by varying energy transition plans and the pace of renewables uptake. Slowing demand is expected to remove some price pressure over time.

World demand for thermal coal is still expected to be dominated by Asia. China and India are expected to remain the largest importers of seaborne thermal coal over the next five years. However, a noticeable rise in China’s domestic thermal coal production and the expansion of renewable power generation, is expected to result in a decrease in its seaborne imports.

Long-term changes in thermal coal usage are linked to the scale of existing and proposed coal plants. There are currently 6,550 coal plants in operation, with over 75% in Asia. A quarter of ex-Asia coal plants are expected to shut in the outlook period, against just 3% in Asia.

Figure 6.1: Thermal coal imports



Note: f Forecast z Projection. RoW is Rest of the World.

Source: McCloskey (2024); IEA (2024) Coal Market Report; Department of Industry, Science and Resources (2024)

The majority of coal plant projects in the pipeline are also concentrated in Asia, with China accounting for 63% of the total projects (by number), India for 10%, and Indonesia accounting for 6%. Much of the planned capacity in China is replacement capacity or capacity intended to support renewables. Demand for coal in India is expected to rise over the next five years, but higher domestic output is forecast to meet most of this demand. Other Asian markets expect to see higher or steady demand over the outlook period include Japan, South Korea, Vietnam, and the Philippines.

As the share of coal plants in Asia continues to grow, the policy and administrative decisions of governments in the region will become increasingly important to coal markets.

6.3 World imports

Global seaborne imports of thermal coal are expected to fall at an average annual rate of 2.6% per year over the outlook period. Volumes traded are expected to decrease from an estimated 1,120 million tonnes in 2023 to 957 million tonnes by 2029, with China and Europe being the largest contributors to the decline.

China's seaborne thermal coal imports are peaking

China's imports of seaborne thermal coal remained elevated in the December quarter of 2023, rounding out a record-breaking year. In 2023, China imported 372 Mt of seaborne thermal coal, a 62% increase on the previous year and significantly higher than the historic average. The primary reasons for this high demand include easing prices for low-grade thermal coal, energy security concerns (see next paragraph), and the removal of import tariffs. Temporary falls in domestic production — linked to safety issues in some Chinese mines — is also boosting imports.

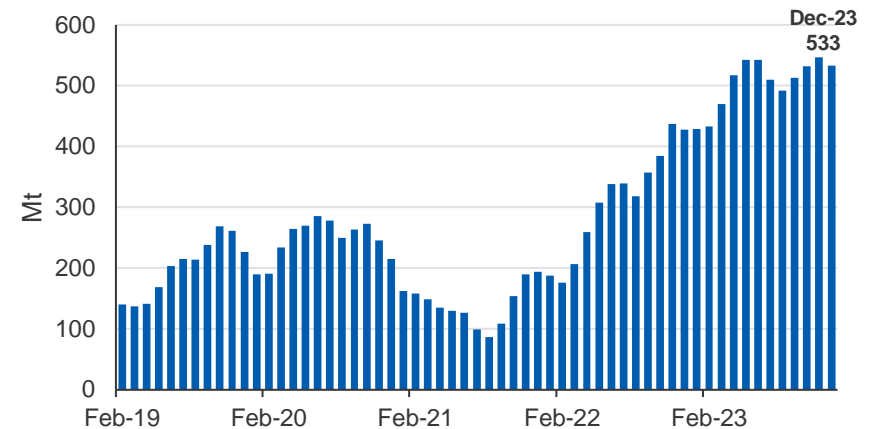
Energy security continues to drive high coal inventory in China, with inventory totalling 533 million tonnes in December 2023 (Figure 6.2). This is a historically high level and around 1/6 of China's total annual coal use. China removed coal tariffs in May 2022 to safeguard against the supply risks resulting from Russia's invasion of Ukraine. However, these tariffs were reinstated on 1 January 2024. The tariff does not apply to Australia and Indonesia, due to existing free trade agreements, but it will affect Russia, Mongolia, South Africa, Colombia, US, and Canada.

China's imports of thermal coal are expected to drop

China's energy security concerns — and the associated push to increase domestic coal production and diversify its domestic energy sources — is expected to lower seaborne imports over time. While views vary on how quickly this will occur, the rapid expansion of renewables suggests a faster decline in coal imports than previously expected.

Emissions reduction is playing a growing role in China's energy policy. In 2023 alone, China expanded its solar capacity by over 55% to 610GW.

Figure 6.2: Chinese coal inventory



Source: Bloomberg (2023)

China's president Xi Jinping has pledged to reach net zero by 2060 and to reduce coal consumption in the 2026 to 2030 period. Despite this pledge, however, China is still building significant amounts of coal fired power generation capacity. Around 63% of the world's coal plant pipeline projects are in China. Much of this is replacement capacity for aging and inefficient coal plants. Some is also expected to be used for flexible and dispatchable purposes when renewables are offline. This will make seaborne thermal coal demand from China more variable, and driven by unexpected demand requirements. This variability may lead to times when China's domestic production of thermal coal overtakes demand in certain months, moving China into a net export position when this occurs.

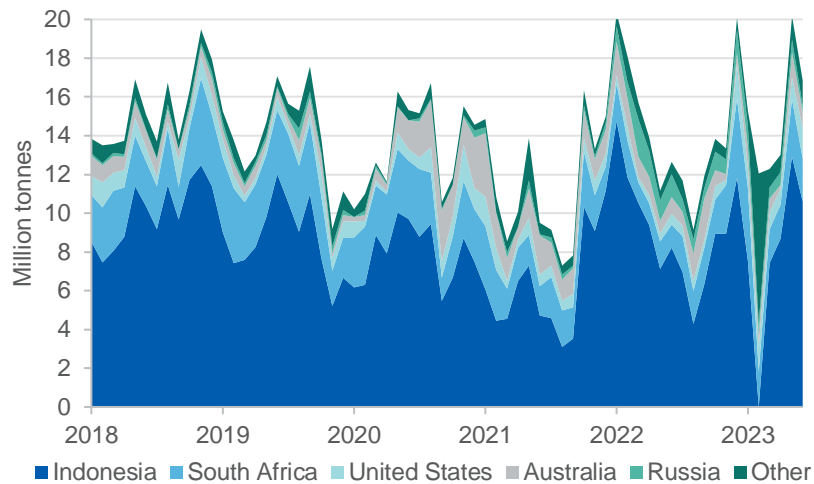
Over the outlook period, China's seaborne thermal coal imports is projected to drop from 372 million tonnes in 2023 to 161 million tonnes in 2029, representing an average annual fall of 13% per year.

India's imports will be supported by rising industrial and consumer use

India's seaborne thermal coal imports were high in the December quarter 2023, at about 52 million tonnes (Figure 6.3). Relatively low hydro and solar output combined with elevated winter demand drove imports up.

India remains one of the few markets expected to increase thermal coal demand over the next decade. The degree to which this increase will flow through to the seaborne market will depend on India's ability to increase domestic production and the capacity of associated rail networks to reliably ship at the necessary scale. India has ambitions to improve its Rail-Sea-Rail networks to more efficiently move coal from production centres to consumption regions.

Figure 6.3: India's thermal coal imports, monthly



Source: McCloskey (2024)

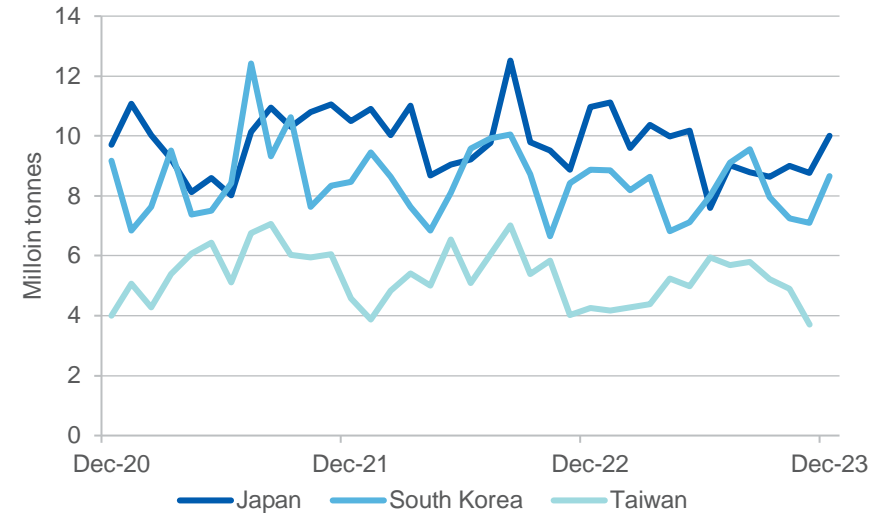
Over 80% of India's thermal coal demand is for power generation. India's current electricity generation mix constitutes coal (73%) followed by renewables (23%). According to the IEA, India adds a city the size of London to its urban population every year, resulting in millions of new connections to the electricity network.

The IEA's World Energy Outlook 2023 forecasts that, under the Stated Policies scenario, India's coal powered generation will increase by 16% by 2030 compared with 2022. Although India's production is expected to rise over time, it is not expected to keep pace with demand, and so a moderate lift in seaborne imports is still expected over the outlook period.

Japan, South Korea, and Taiwan imports are expected to decline

Elsewhere in Asia, imports have shown mixed trends (Figure 6.4). Japan's seaborne thermal coal imports fell by 10% in 2023 to 127 Mt. Part of this decrease is attributed to milder weather and increased use of nuclear power. Imports rose again in January to cover winter demand.

Figure 6.4: Japan, South Korea and Taiwan's thermal coal imports



Source: McCloskey (2024)

The Japanese government has committed to achieving net zero by 2050, and in December 2023 announced an end to new domestic construction of unabated coal-fired power plants. Most of Japan's coal fired power plants are expected to continue operations over the outlook period. However there are very few power plants in the pipeline — one in the pre-permit stage, and one under construction.

Japan's imports of seaborne thermal coal are expected to ease slowly over the outlook, reducing from 127 Mt in 2023 to 119 Mt by 2029. Following the outlook period, the pace of decline is expected to accelerate.

South Korean imports of thermal coal were down 6% in 2023 due to increased nuclear and solar generation. South Korea is aiming to reduce thermal coal's share in power generation — from 33% in 2022 to 15% by 2036 and to zero by 2050. Almost a quarter of the coal-fired power plants in South Korea have potential to retire within the outlook period, with few likely to be replaced.

South Korea's previous policy of phasing out nuclear energy changed following the election of President Yoon Suk-yeol in 2022. South Korea now has a target of increasing the share of nuclear power generation from the current 27% to 30% by 2030.

Growing nuclear energy deployment is expected to see South Korean imports of seaborne thermal coal decline modestly over the outlook, from 97 Mt in 2023 to 93 Mt in 2029.

Taiwan aims to reduce the share of coal used in electricity generation from 43% in 2022 to 30% in 2030. Renewables currently play a relatively small role in Taiwan's electricity generation (9% in 2022), but the country is looking to increase this to 20% by 2030, with offshore wind being a key focus. Unlike Japan and South Korea, Taiwan plans to phase out nuclear as an energy source by 2030, but may keep plants on standby to provide emergency capacity.

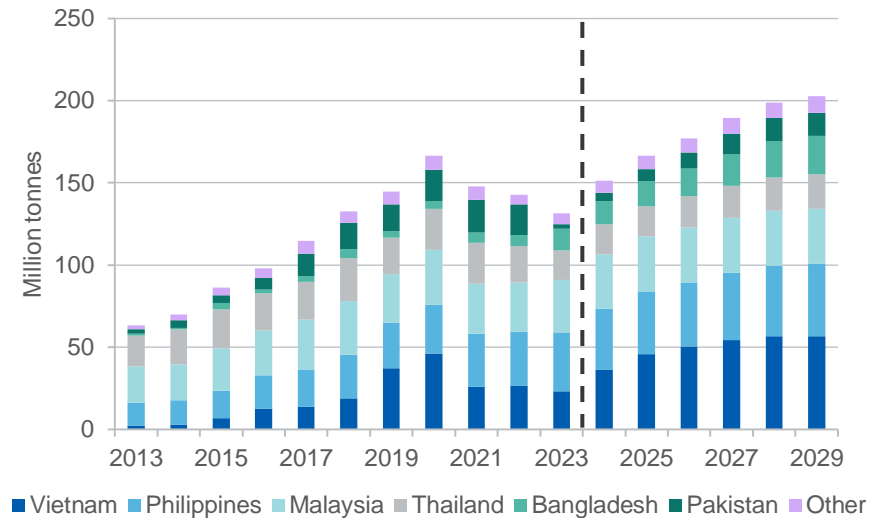
Taiwan has pledged to get to net zero by 2050. About a fifth of its coal plants have the potential to retire over the outlook period, with no new plants currently in the pipeline. Taiwan's seaborne imports of thermal coal are expected to decline from 59 Mt in 2023 to 52 Mt in 2029.

South Asia and South-East Asia are the two regions expected to increase seaborne thermal coal imports substantially over the outlook period (Figure 6.5). Stable seaborne import demand is expected from nations such as Malaysia and Thailand, whereas nations such as the Philippines, Vietnam, Bangladesh, and Pakistan are expected to increase imports.

The most significant gain is expected in Vietnam. This is despite Vietnam progressively reducing plans for new coal power plants in favour of gas and renewables. Vietnam had reached an agreement with G7 nations to

receive \$15.5 billion in commercial loans at market rates over 3 years to reduce coal capacity and reach peak emissions by 2030 — 5 years earlier than planned. However, there are still 15 coal power plants in the pipeline. Not all are expected to ultimately proceed, but Vietnam's seaborne thermal coal imports are still projected to rise from 23 Mt in 2023 to 57 Mt in 2029.

Figure 6.5: South and South-East Asia thermal coal imports



Source: IEA (2024) Coal Information; Department of Industry, Science and Resources (2023); McCloskey (2024)

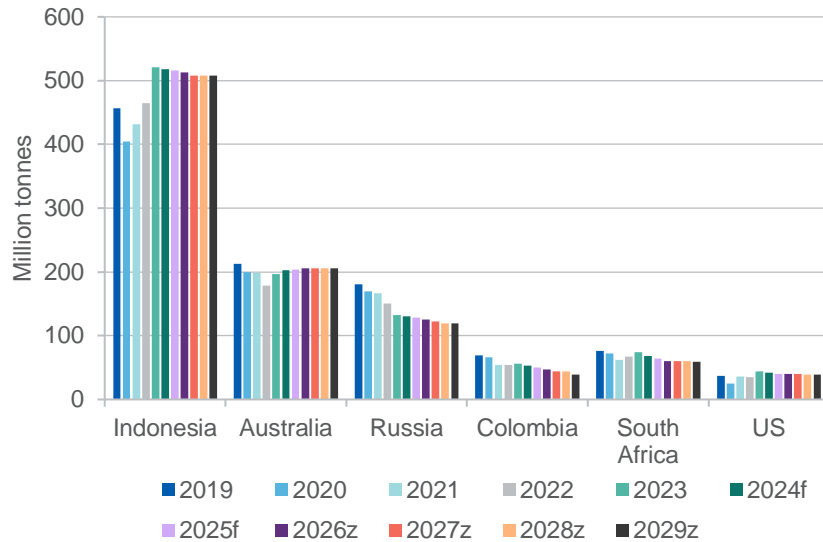
Other countries with plans to expand coal power plants include the Philippines, Bangladesh, and Pakistan. These countries are also yet to clearly commit to net zero targets, although all have published plans to reduce emissions. The Philippines has pledged to have emissions peak by 2030, Bangladesh intends to achieve a 22% reduction in emissions by 2030 (and has reduced the number of coal plants in construction), and Pakistan aims to reduce emissions by 50% by 2030.

Overall, the South/South-East Asia regions are expected to increase seaborne thermal coal imports from 131 Mt in 2023 to 203 Mt in 2029.

6.4 World exports

Seaborne thermal coal demand grew by almost 7% to an expected peak in 2023, while exports grew by 5%. As this peak passes, weak global demand is expected to see exports fall from 1,099 Mt in 2023 to 1,034 Mt in 2029, with less dominant exporters bearing the brunt (Figure 6.6).

Figure 6.6: Thermal coal exports



Notes: f Forecast z Projection.
 Source: McCloskey (2023); IEA (2024) Coal Information; ABS (2024); Department of Industry, Science and Resources (2024)

Weather disruptions present an ongoing risk to seaborne thermal coal supply. More frequent instances of extreme weather — including heat waves that lead to demand spikes — and storms, floods and droughts affect the stability of coal supply.

Indonesia's exports are peaking

Indonesia maintained its position as the world's top exporter of thermal coal in 2023, with exports totalling 521 Mt — a 12% increase compared to the previous year. Indonesia's exports of seaborne thermal coal are

expected to experience a slight decline over the outlook, dropping to 507 Mt by 2029.

The decline in exports can be attributed to several factors. Indonesia has large reserves of thermal coal, but much of it is at lower calorific values. Additionally, Indonesia's primary export market is China. With declining demand from China and the world more broadly, demand is likely to shift to coal with higher calorific value. Some of Indonesia's supply is expected to be diverted to the domestic market, with increases in domestic demand expected to outpace production.

Russian coal exports are falling following Russia's invasion of Ukraine

Following sanctions from the European Union, China became Russia's largest export market. In 2023, Russia exported 75 Mt of coal to China, a 60% increase on the previous year. However, this trend could be affected by China's decision to reinstate coal import tariffs on non-FTA countries. The tariffs took effect on 1 January 2024 and are expected to impact Russian exports, though the scale of impact is not clear yet. Thermal coal trade between Russia and China dipped in January 2024, but Chinese coal imports often decline at this time due to Chinese New Year.

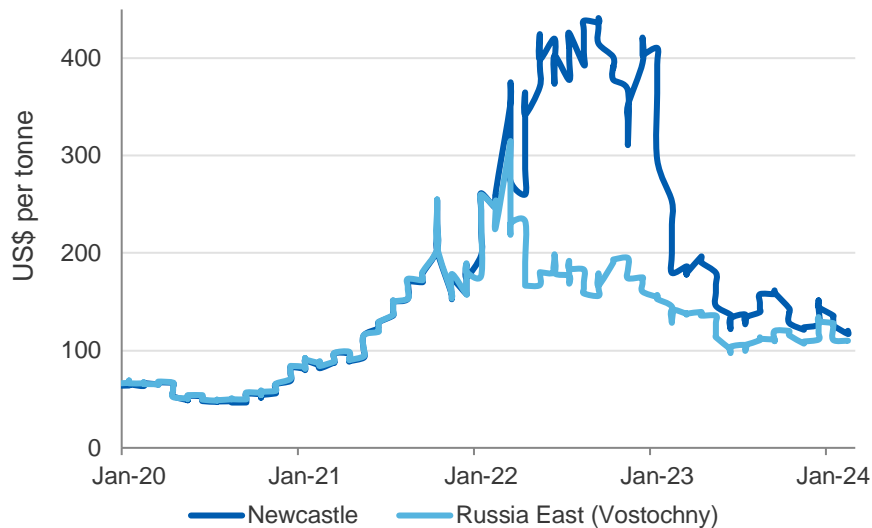
The outlook for Russian exports depends heavily on the demand profile and trade relationships of four countries — China (47% share of Russian exports in 2023), Türkiye (17%), South Korea (15%), and India (6%). With demand from China expected to soften over the outlook period, and the South Korean Government advising buyers to reduce Russian imports, Russian thermal coal may need to find new buyers.

Following the invasion of Ukraine, Russian coal producers had to discount their coal sharply in order to induce China and India to switch from Indonesian and Australian cargoes. North Asian nations such as Japan and South Korea took fewer Russian cargoes and more Australian thermal coal. In December 2022, the average Newcastle 6,000 kcal price was US\$407 per tonne, compared to US\$169 per tonne for the Russia East (Vostochny) 6,000 kcal — a discount of 58%. Markets have since settled back: in 2024, the Newcastle 6,000 kcal price so far has averaged US\$127

per tonne compared to the Russia East (Vostochny) 6000 kcal price of US\$118 per tonne, a discount of only 7% (Figure 6.7).

Russian seaborne thermal coal supply is expected to decline over the outlook period, falling from 133 Mt in 2023 to 119 Mt in 2029.

Figure 6.7: Russia vs Australia price comparison



Source: McCloskey (2024)

US exports remain hampered by weather conditions and high costs

Seaborne thermal coal exports from the US are expected to decline over the outlook period, but from a high base year in 2023. Exports jumped by 23% in 2023 to 44 Mt — the highest export volume in the last 5 years. US exports helped fill the gap left by lower Russian supply.

Lower domestic demand and international demand — along with tougher regulations on coal production — are expected to lead to a steady drop in US production. Export volumes are expected to drop back down to 39 Mt by 2029.

Columbian exports are expected to fall as emissions policies take effect

Seaborne thermal coal exports from Colombia are expected to decline over the outlook period. President Gustavo Petro, elected in 2022, initially imposed a ban on new coal mines and expansion projects. These were overruled by the Constitutional Court, but the environment ministry has issued another decree to stop granting open-pit mining licenses. Combined with the Colombian government’s decarbonisation goals, the country’s depleting reserves are expected to reduce exports from 56 Mt in 2023 to 39 Mt by 2029.

South African exports are facing cost pressures

Exports from South Africa are expected to decline over the outlook period. Following the European Union’s ban on Russian coal, South Africa was the primary source to fill this gap. Exports of South African thermal coal increased fourfold when comparing 2022 to 2021. South African thermal coal exports to the European Union and United Kingdom fell by almost a third in 2023, on the back of high stockpiles and weakened demand.

South African exports are expected to decline as global demand drops further and reserves deplete. Exports are forecast to fall from 74 Mt in 2023 to 59 Mt in 2029.

6.5 Prices

Prices have stabilised following a sustained decline

Price volatility for most thermal coal types has eased as prices corrected from the extraordinary peaks of 2022 (Figures 6.8 and 6.9). The average price for 6,000kc NAR thermal coal dropped to US\$135 a tonne in the December quarter 2023 and eased further in early 2024, averaging US\$127 a tonne. In the absence of further disruptions from global conflicts and extreme weather, prices are expected to decline gradually, as falling demand slightly outpaces falling supply. However, with the high likelihood of a La Niña cycle developing in the latter half of 2024, prices are vulnerable to volatility, though high global inventories (especially in China) should provide some buffer. In 2029, 6,000kc NAR thermal coal is expected to average US\$105 a tonne in real terms.

Prices remain subject to mostly upside risks over the foreseeable future. Any escalation of Russia’s invasion of Ukraine could remove Russian supply from the market. Escalations in the Hamas-Israel conflict will likely not have an immediate effect on prices, as only about 3% of global supply is shipped through the Red Sea region. However, an escalation would likely increase the price of oil and flow through into LNG contract pricing, which could in turn lead to a lagged rise in coal prices.

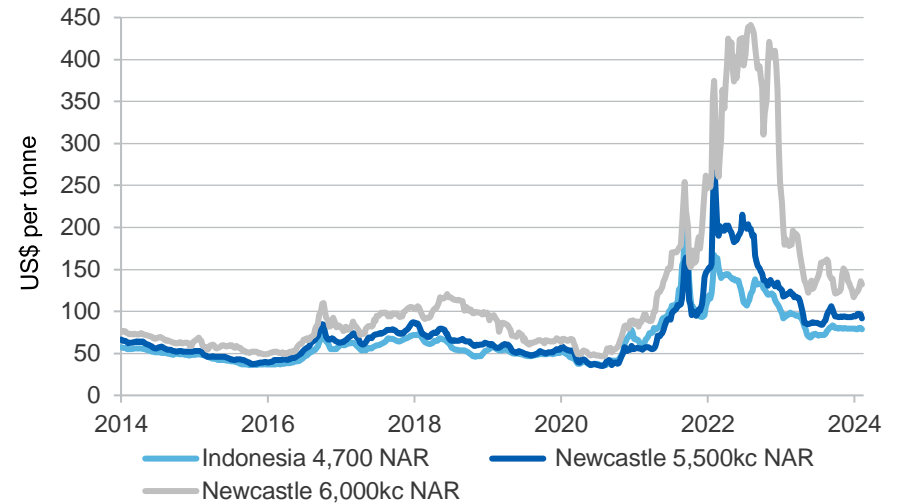
Prices are not expected to decline to below US\$100 a tonne over the outlook period. A range of structural price pressures, such as low capital availability, labour shortages, rising freight costs, and increased insurance premiums, are likely to persist. The 90th percentile cash cost has been increasing over the last few years, from US\$70 a tonne in 2019 to US\$92 a tonne by 2023.

These issues will likely see prices remaining elevated compared to their historical averages. However, there is some capacity to bring down costs through productivity improvements. Technological advancements such as automation of high-risk jobs, electrification of mine sites, and emissions reduction technology all have the capacity to reduce operating costs – although capital costs may increase over the short term. The advancement of artificial intelligence could also assist in areas such as exploration, transportation, and safety.

Prices may also experience increased volatility over the outlook period, beyond that expected from La Niña. Thermal coal has traditionally been the base fuel source for electricity generation, with energy from renewables dependent on availability, and gas often filling the gap between the two. As the transition to clean energy accelerates, the shift will likely involve nuclear, renewables, and batteries supplying base power, with carbon-intensive fuels like coal and natural gas providing dispatchable power.

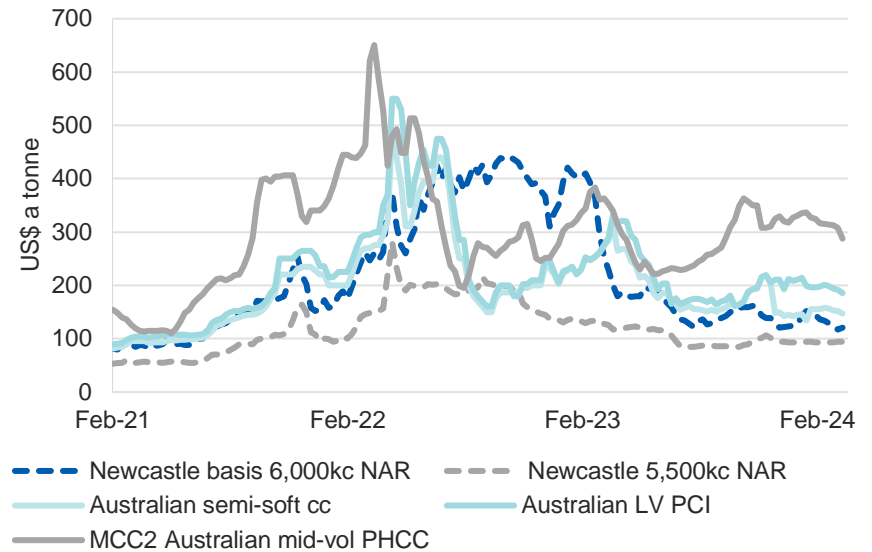
In this scenario, demand for coal could become more volatile and a higher share of transactions could move away from long term contracts towards spot markets.

Figure 6.8: Thermal coal prices — Australian vs Indonesian



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

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



Source: McCloskey (2024)

6.6 Australia

Australian thermal coal export volumes have recovered

Australian thermal coal exports finished 2023 on a strong note, with 18.9 Mt exported in December. This is the highest monthly total since July 2021, and suggests that disruptions to coal mining and transport infrastructure have been largely resolved. Australian thermal coal exports are expected to hold steady at between 205 Mt and 210 Mt through the outlook period, with downside risk from La Niña (Figure 6.10).

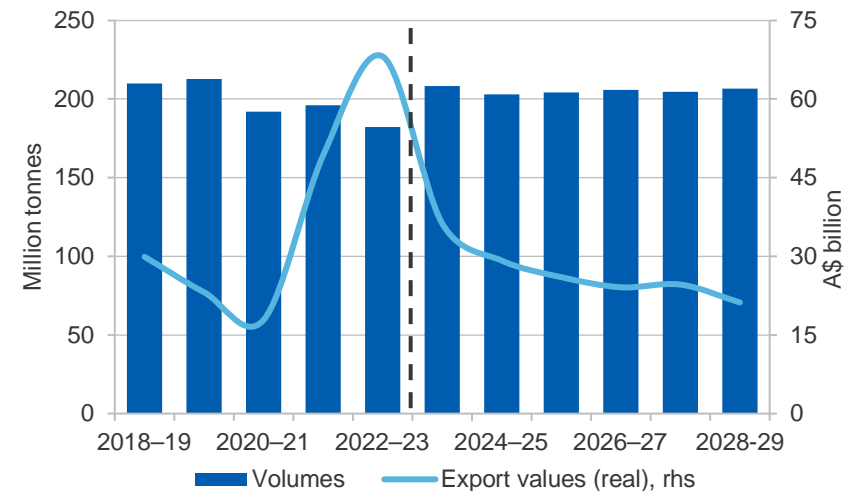
Demand factors remain relatively favourable in the near-term. Thermal coal exports to China have recovered fully since the removal of informal import restrictions in early 2023. Trade sanctions imposed on Russia over its invasion of Ukraine has raised the demand for Australian coal by former importers of Russian coal. Demand prospects over the longer term are less certain, affected by global energy transition.

The diversion of supply from domestic markets to export markets present an upside risk to the forecast. In 2022, Australia used approximately 20% of its thermal coal production for domestic use. The Australian Energy Market Operator's draft 2024 Integrated System Plan forecasts coal-fired power generation will exit the east-coast energy market in 2036-37. As power stations close (e.g., in NSW, Eraring 2,880 MW is currently scheduled to close in 2025, Vales Point 1,320 MW in 2033, Bayswater 2,640 MW in 2033) and where residual coal from their supplying mines and enabling infrastructure is available (such as rail or road networks to ports), a flow of coal would be available to export markets. This presents an upside possibility to the export forecast from 2026.

Australia no longer has a substantial pipeline of new thermal coal projects under construction. This low pipeline partly reflects a decline in the quality of untapped deposits, and partly reflects issues with access to finance and insurance, social licence, and emissions reduction commitments.

Some proposals are nonetheless expected to add to coal supply. These include the ramp-ups at Bravus's Carmichael mine in Queensland, and at Malabar Resources & New Hope Coal's Maxwell mine.

Figure 6.10: Australia's thermal coal exports



Source: ABS (2024); Department of Industry, Science and Resources (2024)

Whitehaven's under-construction Vickery restart continues to face legal challenges but remains in prospect, and New Hope's New Acland mine is progressing with its Stage 3 expansion. Australia Pacific Coal's Dartbrook underground mine is expected to restart.

Further out, Yancoal's proposed Mt Thorley mine is under feasibility study, and has potential to begin production at the end of the outlook period.

On balance, it is expected that thermal coal export volumes will hold steady over the coming years, with new supply offsetting a gradual depletion of output from existing mines. Thermal coal exports are expected to begin declining very late in the outlook period (and more rapidly beyond it) as a rising number of mines begin to deplete.

With export volumes holding steady at just over 200 Mt through the outlook period (Figure 6.10), it is expected that price changes will be the primary influence on export earnings. Falling prices have already produced a sharp correction from the surging revenues of 2022-23, and are expected to bring earnings down gradually further, from \$36 billion in 2023-24 to \$21 billion by 2028-29.

Revisions to the outlook for Australian thermal coal exports

On balance, export earnings have been revised up since the December 2023 REQ: broadly unchanged in 2023–24 and increasing by around \$1 billion in 2024–25. This reflects an upwards revision in prices from the potential supply disruptions of La Niña.

Export earnings have been revised up by around \$2 billion in 2025–26 and by around \$3-5 billion in subsequent years, when compared with long-term forecasts from the March 2023 edition of the REQ. This reflects a higher expectation for baseline thermal coal prices over this period.

Table 6.1: World trade in thermal coal

	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^f
World trade	Mt	1,120	1,096	1,096	1,031	1,008	966	957	-2.6
Thermal coal imports									
Asia	Mt	968	927	931	894	880	845	835	-2.4
China	Mt	372	306	291	240	220	175	161	-13.0
India	Mt	178	186	193	200	203	206	207	2.6
Japan	Mt	127	126	125	123	120	119	119	-1.1
South Korea	Mt	97	96	96	95	93	93	93	-0.6
Thermal coal exports									
Indonesia	Mt	521	518	516	513	507	507	507	-0.4
Australia	Mt	202	202	203	206	205	206	205	0.2
Russia	Mt	133	130	128	125	122	119	119	-1.7
Colombia	Mt	56	53	50	47	44	44	39	-6.0
South Africa	Mt	74	68	64	60	60	60	59	-3.6
United States	Mt	44	42	40	40	40	39	39	-1.9

Notes: **f** Forecast **z** Projection

Source: International Energy Agency (2024); IHS Markit (2024); Department of Industry, Science and Resources (2024)

Table 6.2: Thermal coal outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^f
Contract prices ^b									
– nominal	US\$/t	200	139	132	126	129	129	127	-17.0
– real ^c	US\$/t	200	136	127	119	119	117	112	-18.0
Spot prices ^d									
– nominal	US\$/t	173	133	128	116	119	119	117	-6.3
– real ^e	US\$/t	176	133	125	111	112	109	105	-8.2
Australia	Unit	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^f
Production	Mt	216	252	253	251	252	251	253	2.7
Export volume	Mt	182	208	203	204	206	205	207	2.1
– nominal value	A\$m	65,500	36,270	30,118	27,600	26,192	27,419	24,217	-15.3
– real value ^h	A\$m	68,132	36,270	29,191	26,032	24,102	24,615	21,210	-17.7

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 2024 US dollars; **f** Forecast; **h** In 2023–24 Australian dollars; **z** Projection

Source: ABS (2024) International Trade in Goods and Services, Australia, Cat. No. 5368.0; IHS (2024); NSW Coal Services (2024); Queensland Department of Natural Resources and Mines (2024); Company Reports; Department of Industry, Science and Resources (2024)

Gas



Australia's LNG sector



81m tonnes
exported in 2023

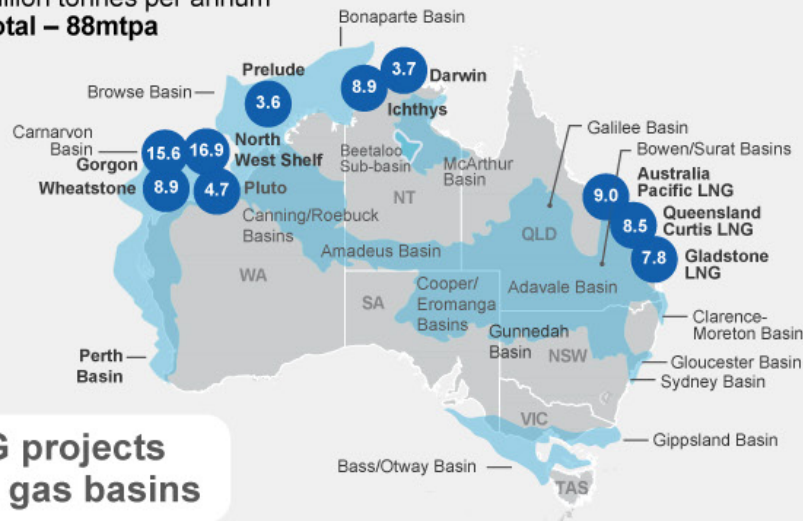


80%
of Australian LNG
exports sold to **Japan,**
China and Korea



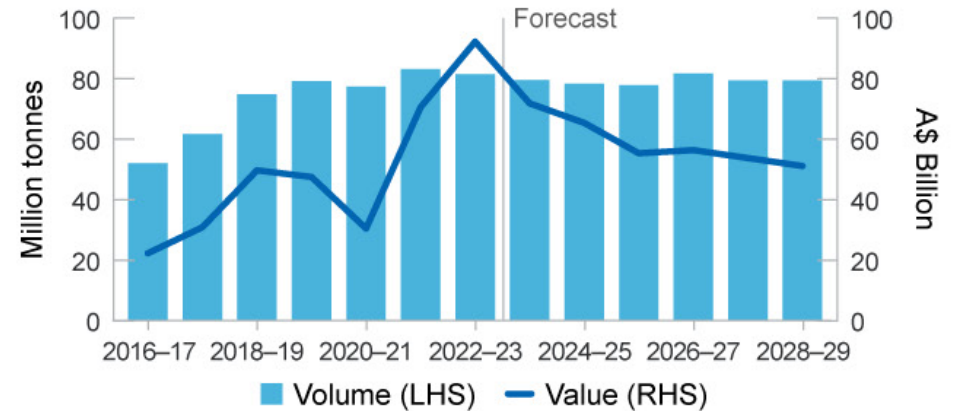
Around 3/4
sold on
long-term
contracts

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



LNG projects and gas basins

Australian LNG exports



Outlook



Earnings set to ease
over the outlook period
as prices drop



Australian output
expected to hold largely
steady, with **small**
declines towards 2030



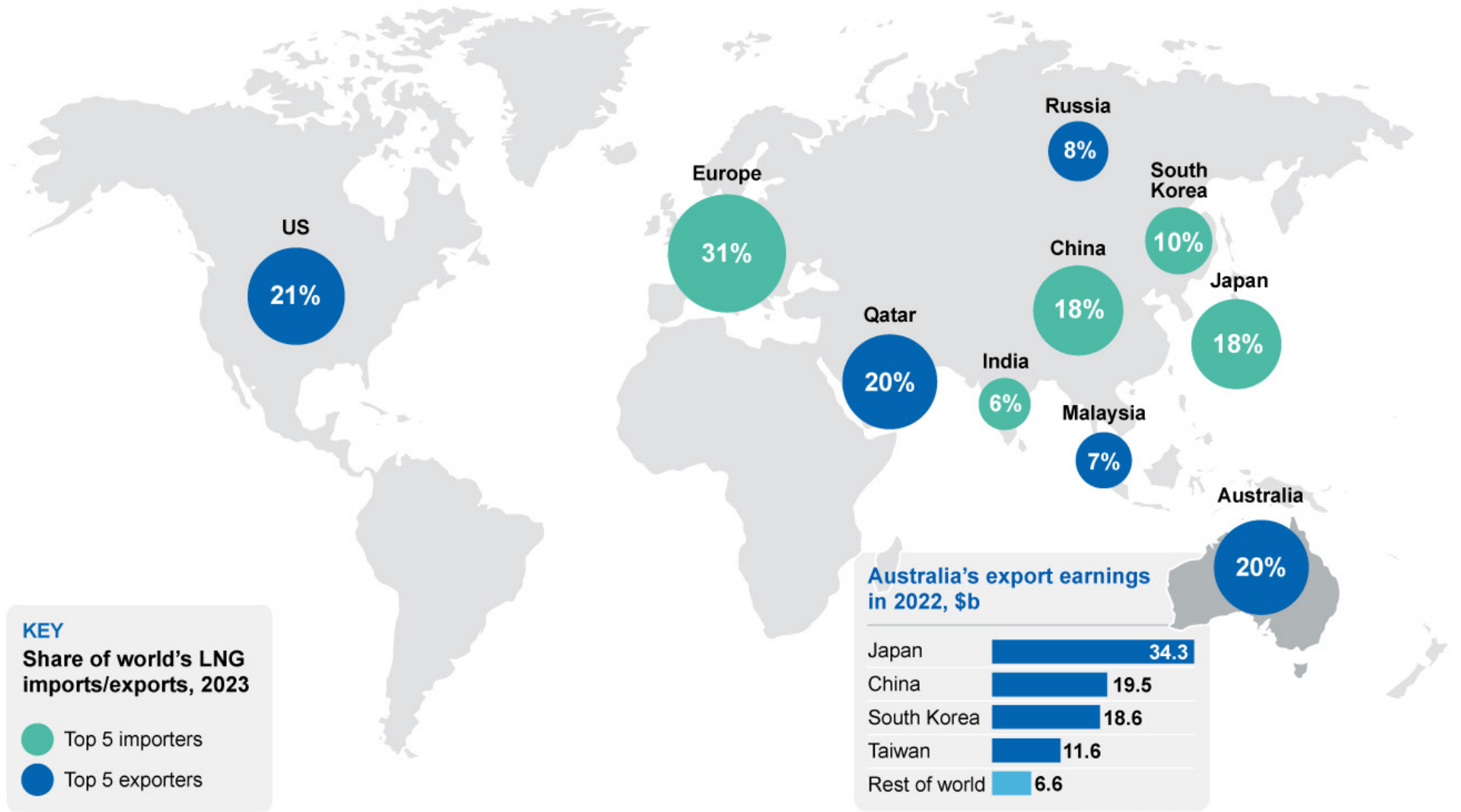
New supply from US
and Qatar is expected
to **ease pressure** on
gas markets



Expenditure on
exploration **remains**
relatively modest

SOURCE: ABS; DISR; OCE

LNG TRADE MAP



SOURCE: World Gas Model; DISR; ABS International Trade

7.1 Summary

- Australia's LNG export revenues are expected to decline from \$72 billion in 2023–24 to just under \$45 billion by 2028–29, as volumes edge down and prices ease. Export volumes are expected to hold close to 80 Mt annually during the outlook period but may decrease in the latter years as producing reserves start to deplete.
- Gas prices eased from the records of 2022 but have subsequently risen slightly as conflicts in Ukraine (in particular) and Gaza continue.
- New supply from the US and Qatar should help to bring prices down in the second half of the outlook period. Prices are forecast to ease from around US\$16/MMBtu in 2024 to just under US\$11/MMBtu by 2029 (in real terms).

7.2 World trade

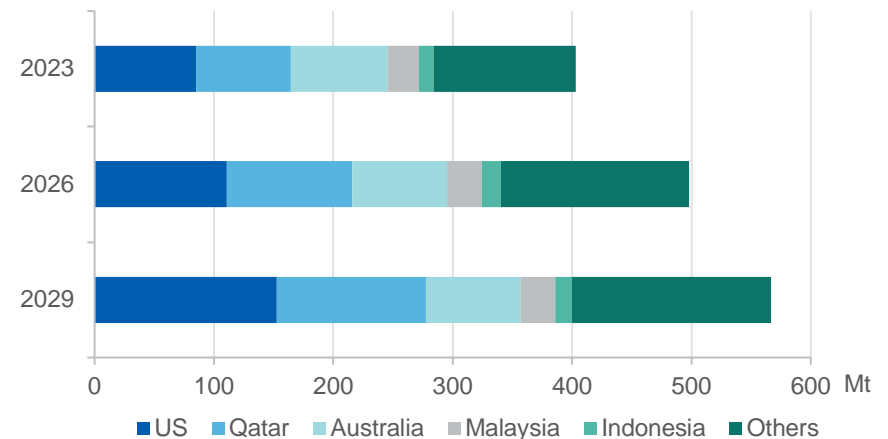
Gas markets have shifted into a slower growth cycle

Gas markets have stabilised over the last few quarters, with the price shocks that flowed from the fallout over the Russian invasion of Ukraine now largely abated. However, the scale of those price shocks is likely to have a long-term effect on gas markets. Growth in gas markets has been structurally slower for the past two years, and this trend is expected to continue. Gas consumption is expected to grow at an average rate of 1.6% per year over the outlook period, compared to 2.5% per year over the five years to 2021 (Figure 7.1).

Growth in gas demand — previously broad-based — is beginning to narrow in its scope, with European growth expected to peak sooner than previously expected. This will see gas demand growth concentrating in key markets in South Asia, Africa and the Middle East.

Gas markets have become less flexible following the disruption of pipeline flows between Russia and Europe in 2022 and 2023. However, markets have been able to adapt through various reforms (see World Imports section). The new structure of global gas markets appears to be durable, albeit with lower rates of growth, and less flexibility (notably around European import sources) than before.

Figure 7.1: Growth in LNG output through the outlook period



Source: Department of Industry, Science and Resources (2024)

Gas markets remain tightly balanced, with the European pivot towards seaborne imports holding US production at near-capacity. Risks remain concentrated in the early part of the outlook period, as markets seek to manage events in Ukraine and the Middle East. Attacks on shipping in the Red Sea have not yet affected LNG shipments significantly, with companies redirecting shipments to alternate routes. However, the potential for further spill-over from the conflict in Gaza remains. Ukraine has recently launched strikes on oil refineries and transportation infrastructure inside Russia, and could strike gas infrastructure in the same way. Russia continues to export over 40 million tonnes of LNG per year despite the curtailment of some trade flows with Europe, and disruptions to these exports could materially affect trade flows and prices. However, no such attacks have happened at the time of writing.

LNG supply growth is likely to be modest in 2024, but more rapid in subsequent years. Prices are expected to remain relatively high in early 2024, affected by potential supply disruptions and the possibility of higher weather-related demand. However, from 2025, new supply from the US (in particular) and Qatar should reduce these pressures and result in steady lowering of prices (Figures 7.2 and 7.3).

The global transition to low-emissions energy will also have implications for gas markets. While highly uncertain as to trajectory, gas is expected to reduce over the longer term as major global economies target net-zero. In the near to medium term, demand is expected to remain strong as gas replaces higher emission fossil fuels as a bridge to renewable energy.

7.3 World imports

European imports are likely to peak earlier than previously expected

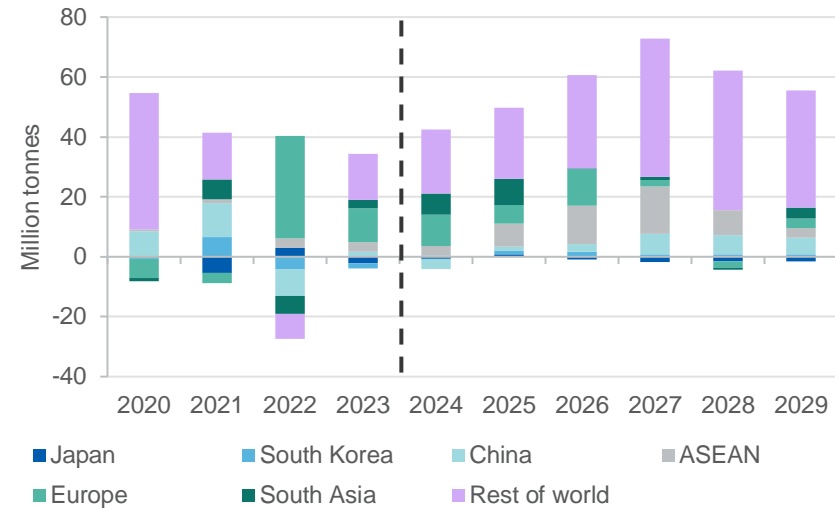
European LNG imports began 2024 relatively strongly (Figure 7.4), despite significant inventory in late 2023 and mild winter weather conditions. Imports are expected to rise from 123 Mt in 2023 to 152 Mt by 2026, before holding largely steady through the second half of the outlook period. Near-term growth reflects falling domestic gas output as well as the ongoing EU pivot away from coal-fired power.

European gas markets are currently managing long-term issues with flexibility. Part of this is due to the cessation of Russian pipeline supply. However, longer term factors have also played a part. Europe has become steadily more import-dependent over time, with the share of imported gas rising from 40% of its gas consumption in 1992, to 80% by 2022. Domestic production has not kept pace with demand, and is expected to decline further as output from the Groningen field in the Netherlands ceases and output from other smaller fields declines. Some offset is expected from new fields in Denmark, Romania and Türkiye, but there is little prospect of any significant rebound in Europe’s domestic gas production during the outlook period.

Europe has become highly dependent on US seaborne LNG, which is now near-capacity. High inventories and ex-US import sources (including Africa and Azerbaijan) present the only significant flexibility available to European gas markets in the near-term, though higher US output after 2025 should eventually mitigate this.

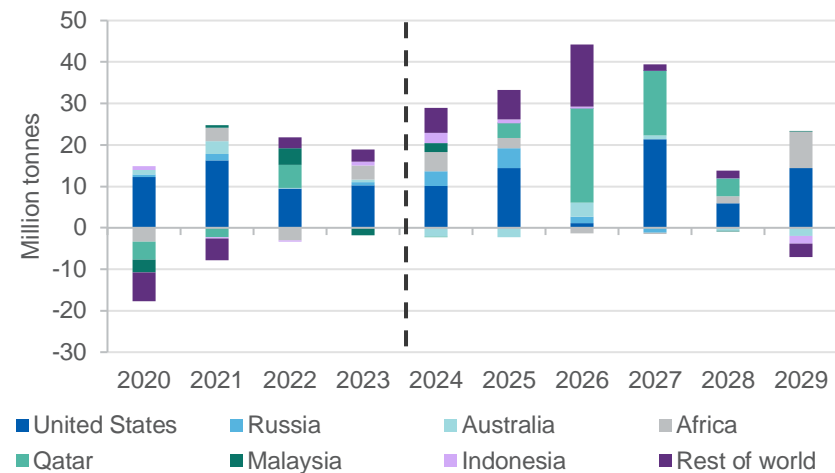
Pivots towards renewable energy have had mixed effects. Rising use of wind power has locked in gas as a balancing source, cutting European discretion to lower LNG use. However, recent French re-investment in

Figure 7.2: Global LNG demand growth forecasts, 2020–29



Notes: 2020, 2021 and 2022 figures based on historical data.
Source: Department of Industry, Science and Resources (2024), Nexant ECA (2024)

Figure 7.3: Global LNG supply growth forecasts, 2020–29



Notes: 2020, 2021 and 2022 figures based on historical data.
Source: Department of Industry, Science and Resources (2024); Nexant ECA (2024)

nuclear energy will act as a direct substitute for gas, potentially lowering gas market pressures late in the outlook period.

Europe succeeded in filling its winter inventories to near 100% in 2023: a notable achievement, though one which may be difficult to replicate if future winters are less mild. Improved energy efficiency has also assisted, with energy saving measures curbing demand during the 2023 winter period by up to 10 Bcm. The next two years will provide challenges to European energy markets, but growing global gas supply, in conjunction with greater energy efficiency, should provide some mitigation in the second half of the outlook period.

China's imports are expected to be increase late in the outlook period

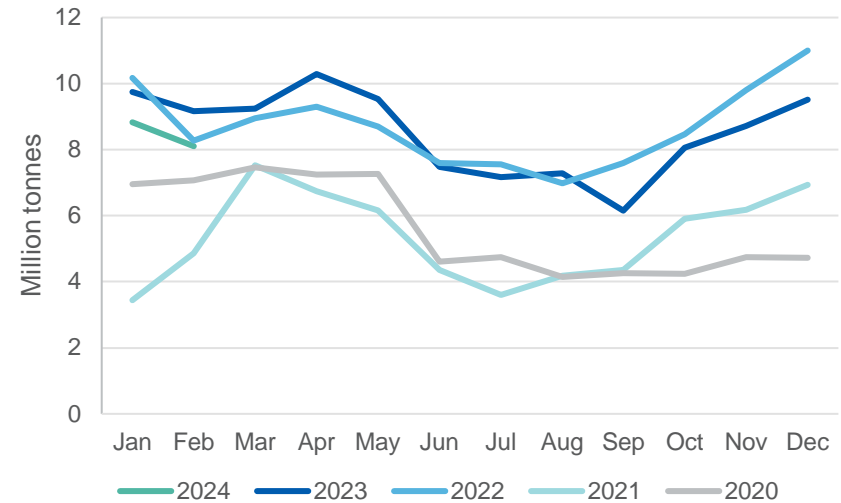
China's LNG imports started 2024 on a relatively strong note (Figure 7.5) following some uncertainty in recent quarters. In annual terms, LNG imports are expected to increase from 72 Mt in 2023 to 92 Mt by 2029, with growth picking up towards the end of the outlook period.

A slowing GDP growth outlook in China has weighed on prospects for gas demand in the near-term. While short-term growth in gas consumption remains constrained, demand is expected to grow a little more rapidly in the second half of the outlook period, as city gas networks expand in parts of the country currently serviced by older and smaller coal plants.

Growth may also be driven by Chinese Government policy. The use of gas in the industrial sector has long been encouraged by the Chinese government, though progress on this front was stalled by the gas price surges of 2022. With prices now easing and policy pressures ongoing, substitution of gas for coal can be expected to resume and potentially accelerate over time. The Chinese Government is also encouraging additional investment in gas production under its 60:40 policy, which includes a target to meet 60% of its gas usage from domestic sources.

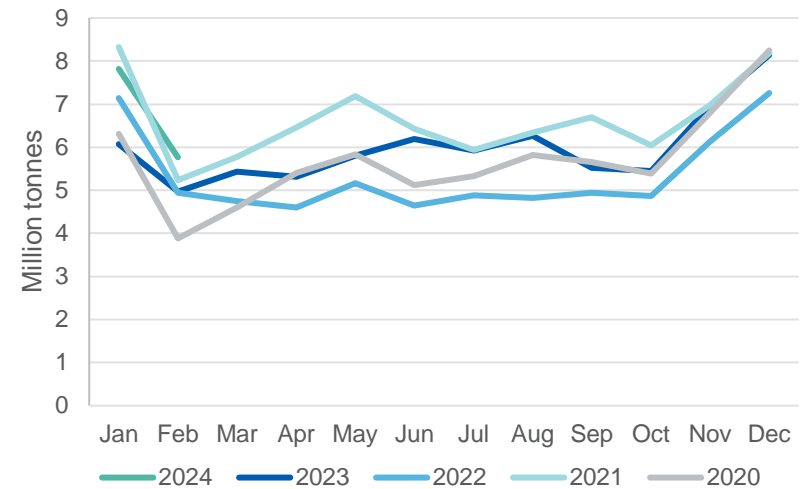
China has built up its investment in domestic gas and oil production significantly over the last three years, aiming to draw more from its large gas reserves and constrain its import growth over the longer term.

Figure 7.4: European LNG imports, 2020–24



Source: Kpler (2024)

Figure 7.5: China's monthly LNG imports, 2020–2024



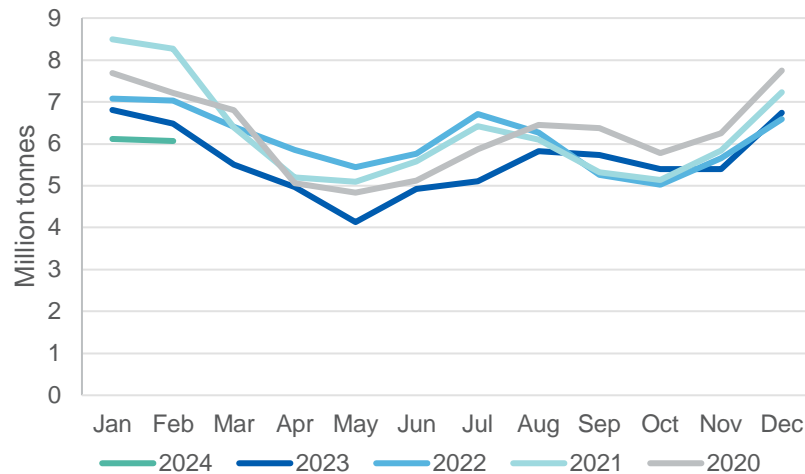
Source: Kpler (2024)

Japan's LNG imports are peaking as nuclear power plants restart

Japan's LNG imports began 2024 at relatively low levels (Figure 7.6), with an increasing share of the country's energy demand being provided by nuclear power. Although many nuclear plants remain in hiatus, reconnections have picked up pace over the last two years. This trend is expected to persist through the outlook period, with potential for a further 5 GW of nuclear power to be reconnected by 2029.

Gas and coal consumption are also being checked by rising renewable energy deployment and tightening efficiency standards. Japan's 6th Strategic Energy Plan projects a 60% growth in the share of renewable energy in the power mix over the 9 years to 2030, with the share of nuclear power rising from 6% to 22%. It is not clear that these targets will be wholly met, but falling gas consumption is now virtually certain.

Figure 7.6: Japan's monthly LNG imports, 2020-2024



Source: Kpler (2024)

Gas and coal consumption are also being checked by rising renewable energy deployment and tightening efficiency standards. Japan's 6th Strategic Energy Plan projects a 60% growth in the share of renewable energy in the power mix over the 9 years to 2030, with the share of

nuclear power rising from 6% to 22%. It is not clear that these targets will be wholly met, but falling gas consumption is expected as part of transition.

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. LNG imports to Japan are forecast to remain around current levels in line with long term contracts, edging down from 73 Mt in 2023 to 67 Mt by 2029.

South Korean imports are expected to hold largely steady

South Korean LNG imports have not changed significantly in recent years, holding at fairly typical levels in early 2024 (Figure 7.7). In annual terms, South Korean LNG imports are expected to edge up from 42 Mt in 2022 to around 45 Mt in 2029, falling just short of the 2021 level of 46 Mt. While South Korea is pivoting away from coal, most of the gap is expected to be made up through nuclear power and renewables rather than LNG.

Recent surges in gas prices have encouraged a shift towards nuclear power generation in South Korea. The country's latest Basic Energy Plan includes a target to expand nuclear energy from 25GW in 2022 to 29 GW by 2026. The plan encompasses a mix of new nuclear plant constructions and extensions to the lifespan of existing plants, and represents a major departure from the previous government's nuclear phase-down policy.

Korean nuclear companies are experienced in plant construction which should assist implementation of recent changes in South Korean nuclear policy. On balance, expansion of competing energy sources is expected to stem any significant rise in LNG imports through the outlook period, and will likely result in falling imports beyond it.

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

Taiwan's LNG imports grew by almost a third over the four years to 2023, reaching 28 Mt in the year. Growing gas power generation is forecast to push Taiwan's LNG imports up further, to 42 Mt by 2029. Taiwan is currently engaged in long-term decommissioning of its remaining nuclear power plants, with an aim to substitute gas-fired power and renewables.

LNG use is rising elsewhere in Asia, with big investments underway

India has been scaling up LNG imports in recent years, albeit with an interruption in 2022 when price-sensitive Indian gas users pulled back in response to surging prices. Imports have since risen again, and are expected to scale up further through the outlook period. LNG imports have been supported by strong economic growth and reforms to open up India's domestic gas market. Most domestic gas use is linked to India's growing industrial sector, but a broadening of use to the household sector is expected over the next five years.

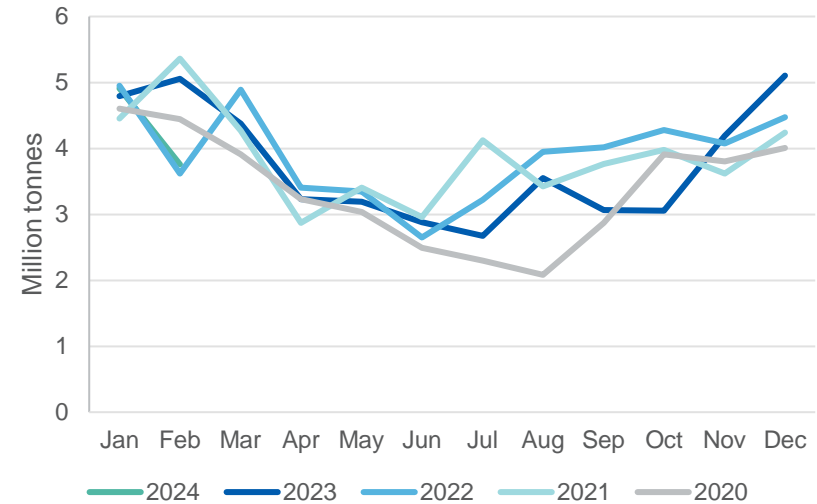
In Vietnam, the Government has released a new Power Development Plan which includes a target build of 22.4GW of LNG-fired capacity by 2030. This extra capacity will require significant investment and a successful rollout of numerous projects currently at early stages of development. Rapid development of these projects may depend on additional policy interventions, including clearer pricing mechanisms and increased tariffs for gas suppliers. Vietnam opened its Thi Vai terminal (with a capacity of 1 MMtpa) in 2023, and experience gained in the construction process could support other proposed constructions in the country.

Imports to the Philippines dropped following the price surges of 2022, but have since recovered, supported by the recent construction of two terminals — the Floating Storage Unit I (with a capacity of 5 MMtpa) and the First Gen Batangas (with a capacity of 3.8 MMtpa).

Rapid import growth is also expected in Indonesia, Malaysia and Thailand, where policies remain supportive and infrastructure is under development. Efforts to lift domestic gas output are evident in several ASEAN nations, with regional energy companies, including Petronas (Malaysia), the Philippines' Department of Energy and PTTEP (Thailand) announcing plans to drill new wells. This extra supply is likely to help meet regional demand, taking further pressure off gas markets from the 2030s.

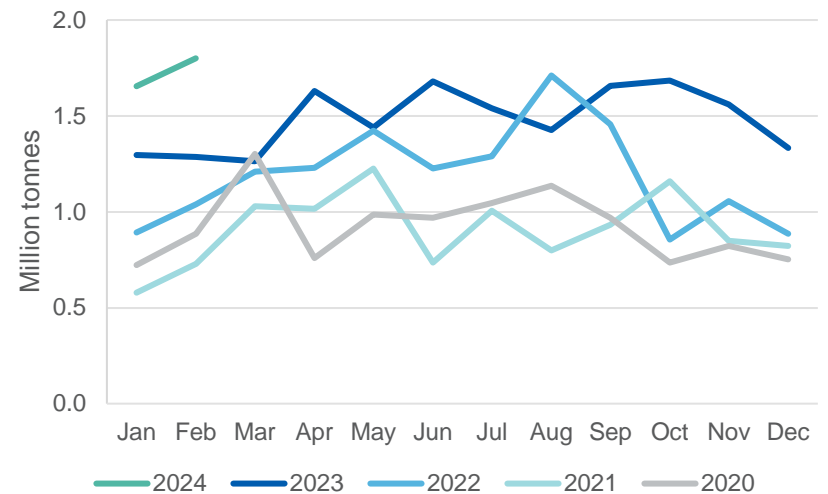
Recent growth in LNG imports among ASEAN countries (Figure 7.8) is expected to continue through the outlook period. However, price changes could undermine demand given the price sensitivity of many buyers in the region.

Figure 7.7: South Korea's monthly LNG imports, 2020-2024



Source: Kpler (2024)

Figure 7.8: ASEAN monthly LNG imports, 2020-2024



Source: Kpler (2024)

7.4 World exports

The US is set to become a dominant global exporter

The US became the world's largest LNG exporter in 2023, and has begun 2024 on a strong note (Figure 7.9). US export growth is expected to account for almost half of global growth in LNG exports over the next five years, with US exports reaching over 150 Mt by the final year of the outlook period.

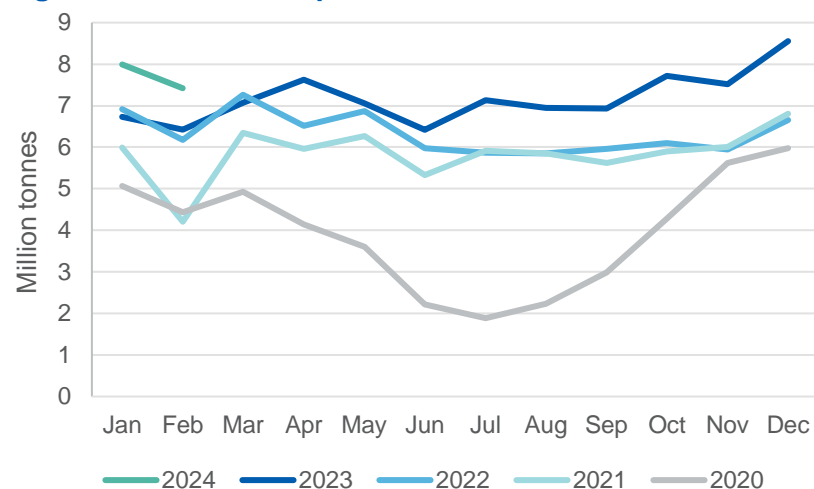
Rising exports reflect a divergence between US production — which is growing rapidly — and US demand — which has peaked. Domestic use of gas is expected to ebb slightly over the next five years as renewable deployment expands and gas-powered generation corrects slightly from the historical highs of 2022 and 2023. Retrofits, deployment of new heat pumps, and improved energy efficiency in the residential sector are all expected to trim gas demand. Renewables are expected to ultimately become the largest source of electricity supply in the US, overtaking gas-fired generation in the second half of the outlook period.

US gas production is expected to grow, supported by significant additional supply from the Permian Basin as well as from shale projects elsewhere. Output from the Plaquemines LNG Phases 1 and 2 (27 bcm/yr), Golden Pass LNG (21 bcm/yr) and the Corpus Christi Liquefaction Stage 3 (13.7 bcm/yr) projects, should all boost output, and the expansion of pipeline capacity to Mexico will help to move the new output to emerging markets.

The US Government has announced a temporary pause in approving new LNG export capacity, which may limit the growth of LNG exports in the future. The pause is limited in its scope, with the US Department of Energy (DoE) noting that it would apply only on 'exports to non-Free Trade Agreement countries', and only on pending approvals at certain stages of the approvals process. The DoE released a public statement on January 26th noting that its policy is for a 'temporary pause on pending applications', and is not a ban. The DoE noted that any decisions would consider 'current authorized exports compared to domestic supply, energy

security, greenhouse gas emissions including carbon dioxide and methane, and other factors'.

Figure 7.9: US LNG exports, 2020–2024



Source: Kpler (2024)

Nearly all additional LNG output over the next five years is already approved and thus not subject to the policy. Only a relatively narrow portion of potential LNG production over the outlook period could be affected given development timeframes.

European demand is likely to absorb the bulk of US LNG exports over the next two years. However, US exports are expected to pivot towards South Asia and other emerging markets as its export capacity rises further.

Qatar is set to bring sizable new capacity online from 2025

Qatari LNG exports are expected to be largely steady (at just under 80 Mt annually) until 2025. Exports are then expected to rise in the second half of the outlook period, reaching 125 Mt in 2028 and 2029. New capacity is expected to come from Qatar's substantial North Field Expansion project, which has commenced construction after receiving final investment

approval in 2023. A further 6 LNG trains are also under construction at Ras Laffan, which should boost transit capacity over the coming years.

Qatari exports currently face some issues with transit due to recent attacks on shipping in the Red Sea. Around 8% of global LNG trade passes through the transit corridor. LNG transit dropped sharply — from 74 vessels in December 2023 to 20 in January 2024. Qatari shipments of LNG to Europe fell by almost half in January 2024 (compared to January 2023), though this is likely to be largely a result of simple delays and longer shipping times. Disruptions in the area are not expected to affect Qatar exports significantly, and no decline in Qatari shipments is expected over 2024 as a whole.

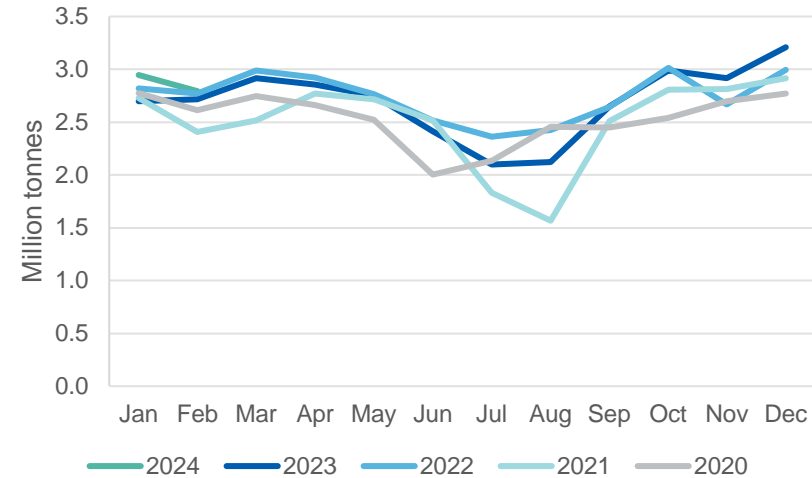
Russian gas exports face challenging conditions and downside risks

Russian natural gas output faced difficult conditions in 2023 as European importers broke ties following the Russian invasion of Ukraine. LNG exports held up reasonably well in 2023 (Figure 7.10), but overall gas production is expected to remain subdued for at least the next two years.

The effects of the war on Russian gas production have been uneven. While piped gas exports to Europe have dropped away, other LNG exports — including pipeline and seaborne exports to Asia — have proven more resilient. This has resulted in uneven impacts for upstream producers. Risks have grown for ageing, price-sensitive gas fields (notably those in Russia's Nadym Pur Taz region). Any closure or hiatus at these facilities would structurally reduce Russian gas production over the coming years.

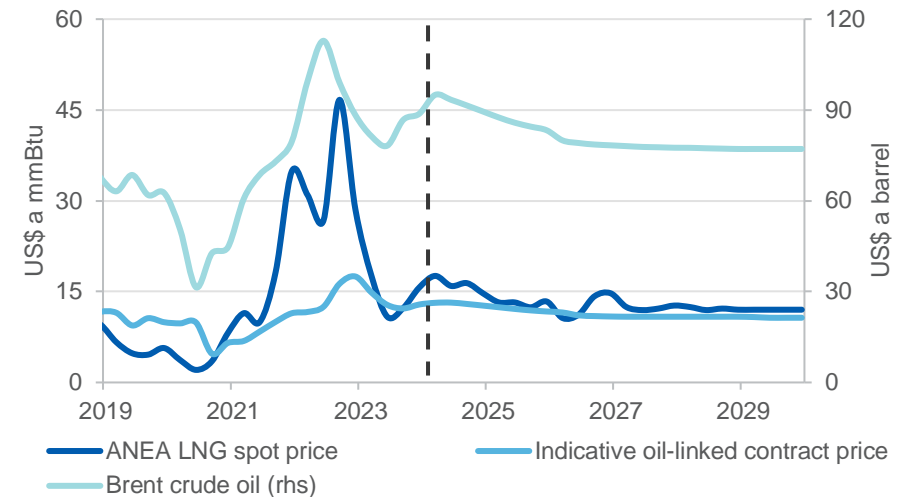
Planned projects in Russia's west (including the Bovanenkovo field expansion and the Tambey field opening) are also on the backburner due to a lack of access to parts and the recent loss of export opportunities. Restrictions on flows of machinery and equipment to Russia have delayed investments in significant quantities of new capacity, but the new Arctic LNG train 1 is completed and is expected to support Russian exports in 2024. The expansion of pipeline gas to China is also expected to benefit producers in Russia's eastern regions, primarily those in Siberia.

Figure 7.10 Russian monthly LNG exports, 2020-2024



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 (2024)

Figure 7.11: LNG spot and contract prices, 2019–29



Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

The war in Ukraine remains the primary risk to Russian LNG production and gas exports. Russian LNG flows continue to pass through Ukraine and Türkiye, but much of this trade will reach the end of its contract period in December 2024. The prospects for contract renewal are uncertain and may depend in part on developments in the war.

Ukraine has recently conducted significant strikes on Russian oil refinery and transport infrastructure. Similar strikes on Russia's exposed gas facilities and pipelines have not occurred at the time of writing, but the war presents an ongoing risk to LNG markets.

7.5 Prices

Prices have risen on conflicts, but are gradually easing again

Gas markets have reorganised following the Russian invasion of Ukraine and consequent collapse of Russian gas exports to Europe. However, prices are expected to remain elevated in 2024, and could lift further if the upcoming northern winter is less mild than in 2023. As conflicts continue in Ukraine and Gaza, prices are forecast to increase from US\$14.20/MMBtu in 2023 to around US\$16.20/MMBtu in 2024 (in real terms).

Prices are expected to stabilise in the short-term — under the influence of high inventories in Europe — and fall in the longer term due to expanding LNG production from the US and Qatar. New LNG supply is expected to bring prices down to around US\$10.8/MMBtu by 2029 (in real terms).

This price forecast is subject to complex risks. At present, the primary risks are geopolitical, but technological change and the transition to low-emissions energy will likely increasingly affect gas markets. The emergence of new emissions reduction policies around the world has potential to either encourage or discourage investment in gas supply, since gas is a fossil fuel but also an essential mechanism for firming up low-emission energy sources such as solar and wind. Some economies (including Japan) are transitioning from gas towards nuclear power, while others (such as Taiwan) are doing the opposite. Energy policies are likely to become increasingly complex — and increasingly influential — as the outlook period progresses.

Policy influence is not limited to energy transition. Some gas-using countries have imposed price caps in the wake of recent price surges, and some gas producers (such as Australia) have enacted measures to support their domestic supply. The sensitivity of many economies to movements in gas prices means that gas will continue to face strong scrutiny in the years ahead, and the eventual peak in European gas use is now expected in 2025: earlier than previously thought. However, gas still has a sustained (but slowing) growth cycle ahead, and easing prices should support its competitiveness. Price risks remain weighted to the upside, but with greater balance over time as new supply begins to outstrip growth in demand.

7.6 Australia

Australia's LNG export volumes face growing pressure as gas projects age

Australia has 10 LNG facilities at present, whose combined output supports domestic LNG use and generates LNG exports summing to around 80 million tonnes annually. However, this gas production is likely to come under growing pressure in the late 2020s. Gas exploration has been persistently low for the last five years (Figure 7.13) and there is a risk that the current pipeline of gas projects under development becomes insufficient to offset declining reserves. Several projects are likely to start running short of reserves in the next 5-10 years, including the large North West Shelf project in Western Australia. There is potential for the North West Shelf to be supported by third party gas, which operator Woodside and its partners are attempting to secure. However, falling reserves will affect a wider array of projects over time, and higher domestic gas use (driven by the closure of domestic coal plants) could put pressure on supply.

Progress at the Pluto LNG facility should help to shore up exports during the outlook period. The first three (of 51) Pluto 2 train modules have recently arrived at the site. When assembled, the full production train will be the second at the Pluto LNG facility and will have a 5mtpa capacity. The connected Scarborough field is also under development, with thirteen

wells to be built. Woodside has noted that the Scarborough project is 'more than 55% complete', with output from Pluto 2 expected in 2026.

Australian LNG export volumes are expected to be mostly steady (at just under 80 Mt annually) over the outlook period, with a brief rise in 2026–27 when the Pluto 2 train commences operation. However, growth at this site will be offset by falling output at other facilities, and overall exports are expected to start falling late in the outlook period — and more rapidly beyond it — if no other significant developments occur (Figure 7.12).

Australia LNG earnings have fallen, and are expected to ease further

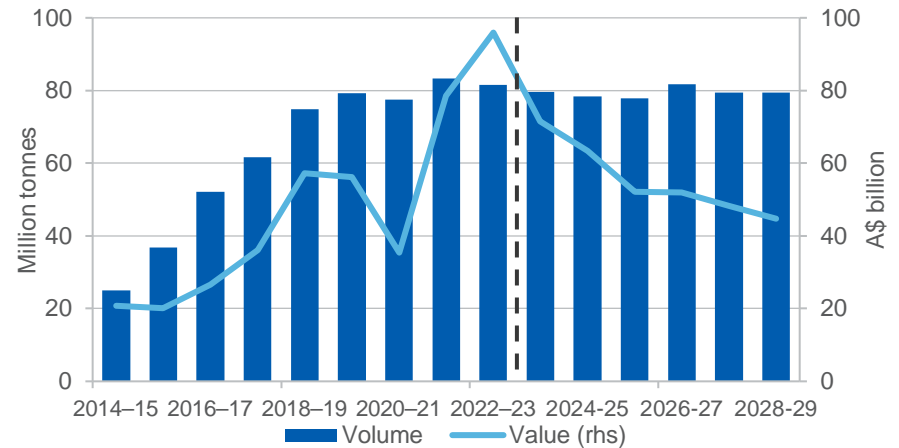
Australian LNG export earnings are expected to fall to A\$72 billion in 2023–24, easing further to A\$45 billion by 2028–29 (in real terms). This decline is largely a result of falling prices, with export volumes projected to be broadly steady over the next five years.

Oil prices will remain a significant influence on 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). These prices are expected to ease slightly through the outlook.

Revisions to the outlook

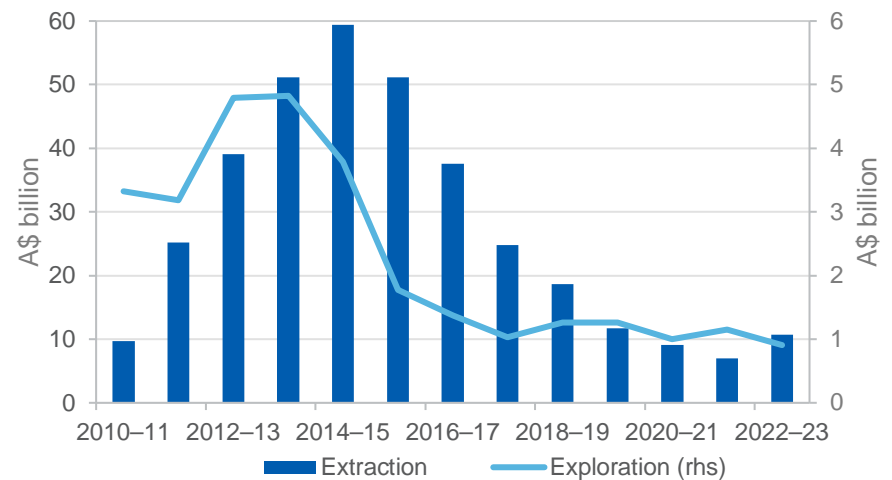
Australian LNG export earnings forecasts have been revised down by just under \$1 billion for 2023–24 and revised up by a similar amount in 2024–25. This reflects recent geopolitical events which have influenced prices slightly since the December 2023 *Resources and Energy Quarterly*. Export earnings projections for the subsequent two years of the outlook period have not changed significantly since the March 2023 edition. However, the earnings projection for 2027–28 has been revised up by around \$3 billion.

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



Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

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

Table 7.1: Gas outlook

World	Unit	2023	2024 f	2025 f	2026 z	2027 z	2028 z	2029 z	CAGR r
JCCC oil price ^a									
– nominal	US\$/bbl	86.7	86.3	79.3	73.0	71.8	71.3	71.1	-3.2
– real ^l	US\$/bbl	88.6	86.3	77.8	70.1	67.6	65.7	64.2	-5.2
Asian LNG spot price									
– nominal	US\$/MMBtu	13.9	16.2	13.1	12.7	12.3	12.2	12.0	-2.4
– real ^{h,i}	US\$/MMBtu	14.2	16.2	12.8	12.2	11.6	11.2	10.8	-4.4
LNG trade	Mt ^e	403.2	425.5	455.6	498.0	535.9	548.9	566.9	5.8
Gas production	Bcm	4,038	4,132	4,214	4,327	4,375	4,431	4,480	1.7
Gas consumption	Bcm	4,036	4,132	4,223	4,301	4,357	4,405	4,446	1.6
Australia	Unit	2022–23	2023–24 f	2024–25 f	2025–26 z	2026–27 z	2027–28 z	2028–29 z	CAGR r
Production ^b	Bcm	164	164	157	157	162	159	159	-0.5
– Eastern market	Bcm	58	57	54	52	52	51	51	-2.0
– Western market	Bcm	91	87	86	84	87	85	82	-1.7
– Northern market ^d	Bcm	15	17	17	17	20	21	22	6.6
LNG export volume	Mt ^e	82	80	78	78	82	79	79	-0.4
– nominal value	A\$m	92,237	71,540	65,394	55,358	56,403	53,770	51,153	-9.4
– real value ^f	A\$m	95,944	71,540	63,382	52,213	51,901	48,271	44,802	-11.9
LNG export unit value ^h									
– nominal value	A\$/GJ	21.4	17.1	15.8	13.5	13.1	12.8	12.2	-9.0
– real value ^f	A\$/GJ	22.3	17.1	15.3	12.7	12.0	11.5	10.7	-11.5
– nominal value	US\$/MMBtu	15.2	11.9	11.6	10.4	10.3	10.2	9.7	-7.3
– real value ⁱ	US\$/MMBtu	15.8	11.9	11.2	9.8	9.5	9.1	8.5	-9.9

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 2023 and 2029 or 2022–23 and 2028–29; **s** Estimate; **z** Projection.

Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024); Company reports; Nexant (2024) World Gas Model.

Oil



Australia's oil sector



0.3%

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



41%

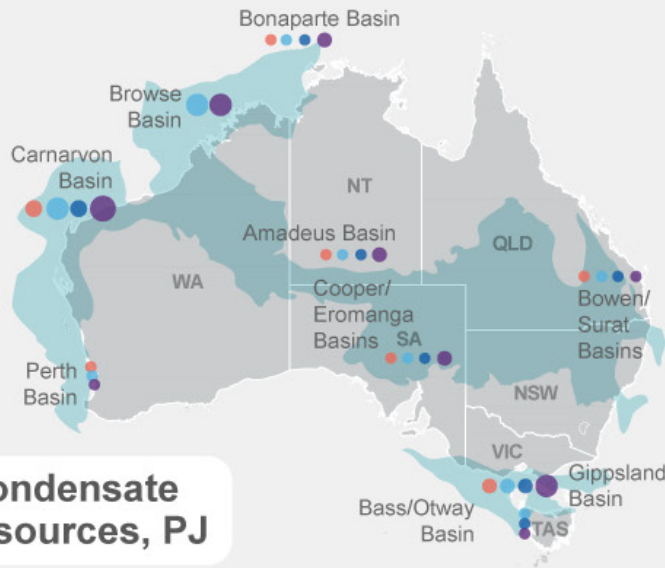
of crude & condensate exported to Singapore and S. Korea



Around 2/3

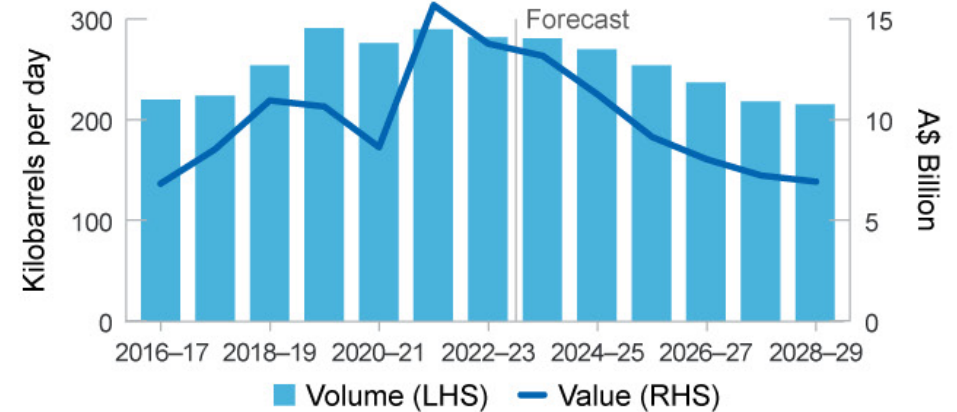
crude & condensate produced at Carnarvon basin, offshore WA

- Crude
- Condensate
- LPG
- Total
- <500
- 500–1,000
- 1,001–2,000
- 2,001–4,000
- 4,001–7,000



Crude oil condensate and LPG resources, PJ

Australian oil exports



Outlook



Oil prices will begin to weaken from high North and Latin American supply



Earnings to fall from 2024-25 as prices fall and basins deplete



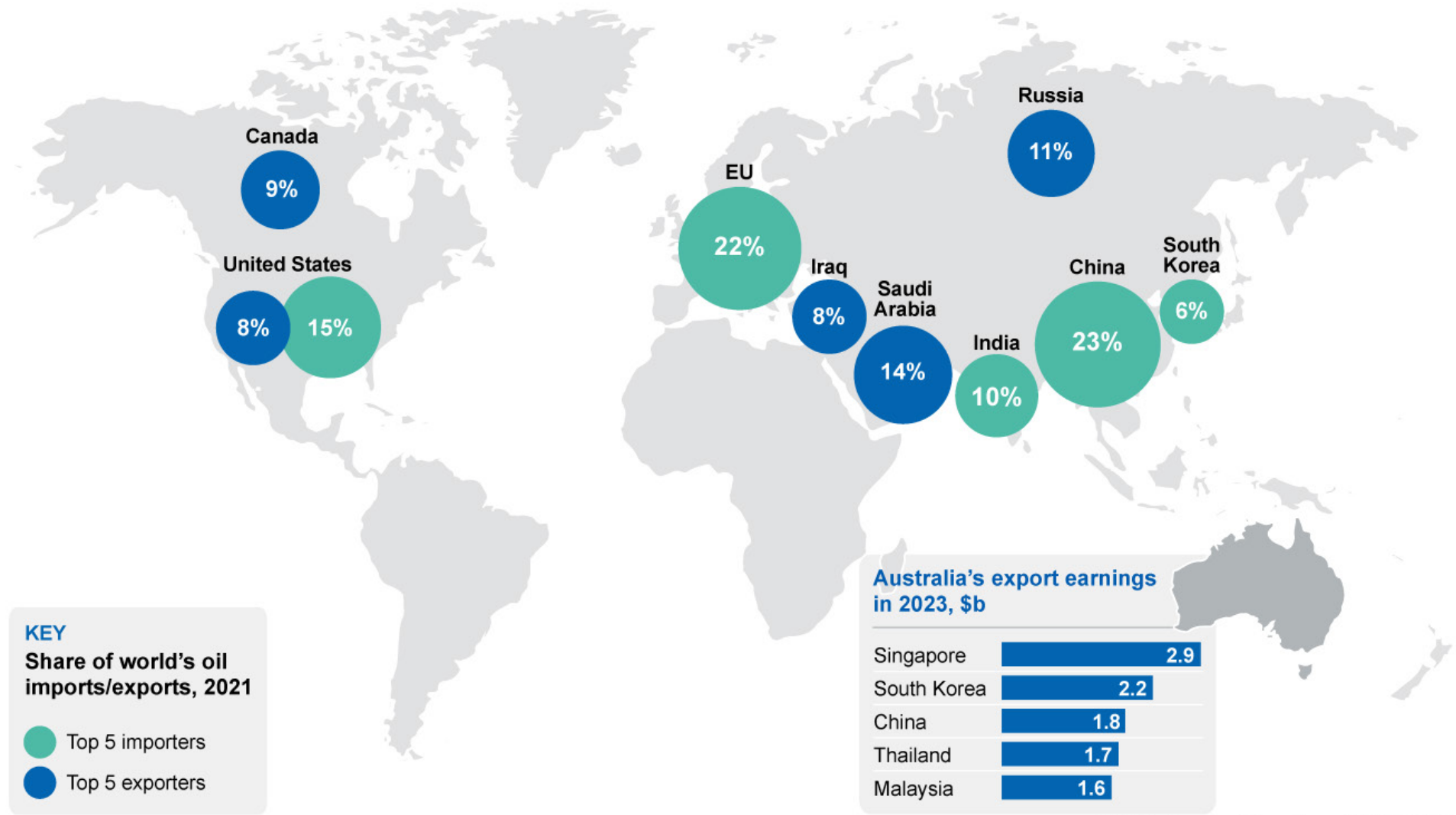
Australian production volumes ease as offshore fields deplete



Petroleum exploration expenditure rose in the December quarter of 2023

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, additives and other hydrocarbons

8.1 Summary

- The Brent crude oil price is projected to fall from an average US\$84 a barrel in 2023 to US\$66 a barrel (in real terms) by 2029. The fall will be driven by both weak demand and gains in non-OPEC production.
- Australia's crude and condensate production is projected to fall steadily, from 282,000 barrels a day in 2023–24 to about 215,000 barrels per day by 2028–29, as North-West Shelf output falls.
- Australia's crude and condensate export earnings (in real terms) are projected to fall from A\$13.2 billion in 2023–24 to A\$6.9 billion by 2028–29, as prices fall and output declines.

8.2 World consumption

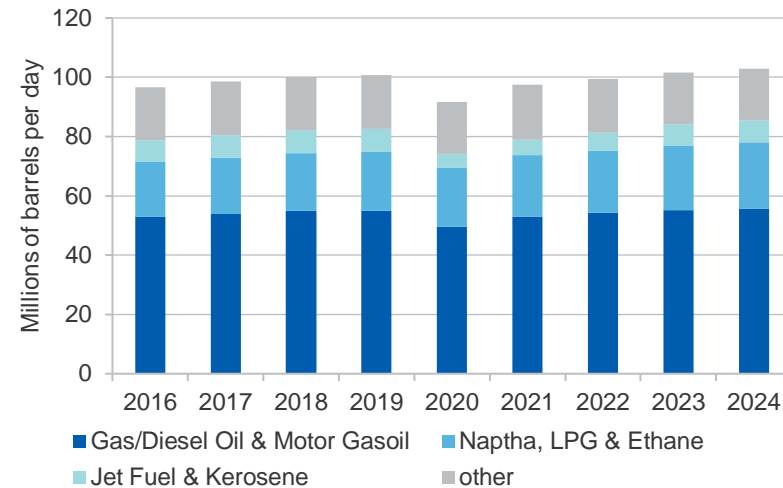
Growth in global oil demand to slow throughout the outlook period

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, account 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 the production of chemicals used to make polymers.

The International Energy Agency (IEA) estimates that annualised growth in global oil usage eased to 1.8 million barrels a day (mb/d) in the December quarter 2023. This was a fall from 2.8 mb/d in the September quarter 2023 and marked a return to pre-pandemic baselines.

Global oil consumption is forecast to rise by 1.1% (CAGR) between 2024 and 2029, plateauing over the final few years. Growth in oil consumption throughout the outlook period is projected to be led by a rise in the demand for LPG, naphtha and jet fuel and a decrease in the overall consumption of petrol. Overall demand for crude is projected to reach 106 mb/d by the end of the outlook period. Demand changes through 2023 and 2024 will have been primarily driven by Chinese transport fuel and petrochemical demand, as well as other non-OECD demand, while OECD demand is forecast to be steady.

Figure 8.1: Global oil consumption by refined petroleum product



Source: International Energy Agency (2024)

Jet fuel and petrochemical demand drives growth

According to the IEA, the largest increase by product use will be in jet fuel demand. During the COVID-19 pandemic jet fuel demand fell by 40% between 2019 and 2020, and has since been slowly recovering. The Airports Council International's (ACI) forecasts that global air travel is to reach and then surpass pre pandemic levels in 2024. However, jet fuel consumption is only likely to surpass 2019 levels in 2027, due to improvements in aircraft fuel efficiency. Unlike road transport, low-carbon alternatives are unlikely to substitute large volumes of petroleum jet fuel over the outlook period. Low carbon — green hydrogen-based — alternatives are being developed but are unlikely to be produced in significant quantities during the outlook period, and batteries do not provide the energy density needed to power commercial flight.

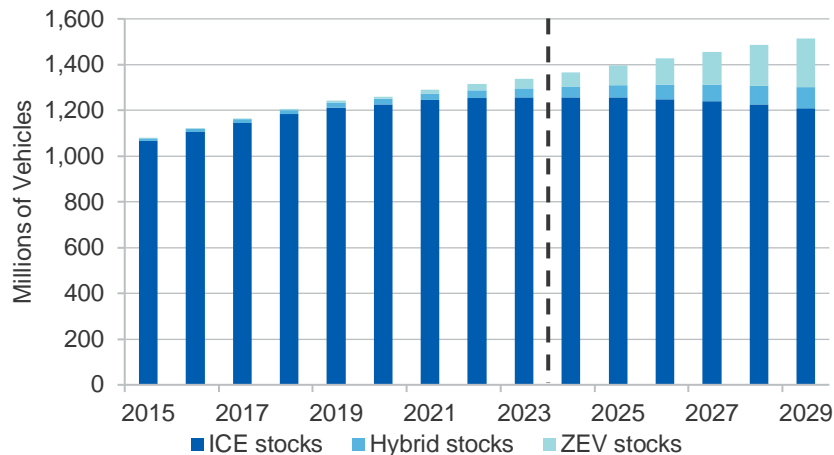
Global polymer demand is expected to rise steadily over the outlook period, driving up oil demand. Aircraft and vehicles are increasingly replacing metal components with plastics to reduce weight — and thus improve fuel efficiency — while sensors and other electronic components in EVs also use additional 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.

EV adoption and efficiency gains to reduce diesel and petrol demand

The share of electric vehicles (EVs) in the global passenger vehicle market is forecast to exceed 20% by 2029, with strong adoption expected in China (37%) and Europe (22%) (see fig 8.2). The shift in the composition of the global vehicle fleet towards EVs will accelerate over time.

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 (2024)

As a result of increased EV sales, the global internal combustion engine (ICE) passenger vehicle fleet is forecast to plateau over the next year and then fall throughout the outlook period. The number of ICE passenger vehicles is set to plateau in 2024 at 1.3 billion vehicles and then fall to 1.2 billion vehicles by 2029, a reduction of 4.7%.

China remains the world's largest user as post pandemic recovery slows

China is the world's largest consumer of oil, with demand of 16.4 mb/d in 2023. Following the easing of pandemic restrictions, demand for oil in China has been growing rapidly — increasing from 14.3 mb/d in 2022 to 16.4 mb/d in 2023. However, as China leaves its COVID recovery period, demand growth is expected to slow.

China is expected to lead petrochemical growth, with 51% of new olefin (a precursor to synthetic polymer) production capacity to be built in China. Most of the new Chinese production capacity is expected to use naphtha as a feedstock.

Domestic aviation in China is strengthening with travel around Lunar New Year surpassing pre-2019 levels. However, with efficiency gains, the demand for jet fuel for domestic flights has not surpassed 2019 levels.

India to be the largest driver of oil demand

India's demand for oil is set to increase across all oil products over the outlook period. India is the world's second largest oil user after China and is set to have the largest rise in demand through the outlook period.

Road transport is one major area of growth in India and is set to contribute to a rise in oil demand. While EV adoption is expected to be strong — with over 3.5 million zero emission vehicles by 2029 — it is outpaced by ICE vehicle growth from 60 million in 2023 to 75 million by 2029.

Domestic air travel in India remains relatively low and is reflective of India's GDP per capita. As the economy continues to grow and GDP per capita increases, we can expect to see an increased demand for air travel — and therefore increased demand for jet fuel.

OECD demand set to decline

OECD demand is set to decline over the outlook period; the IEA forecasts that OECD oil demand is set to decline slightly (by 0.12 mb/d) in 2024 and is then expected to continue to fall further through the outlook period. The reduction in demand is to be led by a combination of relatively weak economic growth, EV adoption and efficiency gains.

8.3 World production

World supply continues to rise, driven by production in the Americas

In the outlook period, world oil supply will continue to slowly rise before plateauing, reaching 106 mb/d by 2029. This rise in production is likely to be largely driven by the Americas, particularly Guyana, the US and Brazil.

US supply has been increasing and hit record production of 13.2 mb/d in the December quarter 2023. However, poor weather conditions in the northern Atlantic have recently cut North American output by 0.9mb/d. Production is expected to recover over the outlook period.

New supply is also expected from Guyana. After a series of discoveries beginning in 2008, offshore production in Guyana began in 2019, and projects currently in the pipeline are expected to continue to bring additional capacity online. Over the outlook period, Wood Mackenzie forecast Guyana’s output to rise by 0.5 mb/d to about 1.3 mb/d by 2029. About 66% of Guyana, including much of its oil reserves, is territory disputed by Venezuela. In recent months, Venezuela has increased its military presence on the border, further increasing chances of regional conflict that would threaten Guyanese oil supply.

Venezuela possesses the world’s largest proven oil reserves, and oil exports in 2013 were almost 2.4 mb/d. However, supply fell to 0.75 mb/d in 2023 in part due to US sanctions. Conflict with Guyana and possible military action may see sanctions reapplied and further falls in oil supply as a result.

Brazil joins OPEC+ and Angola leaves

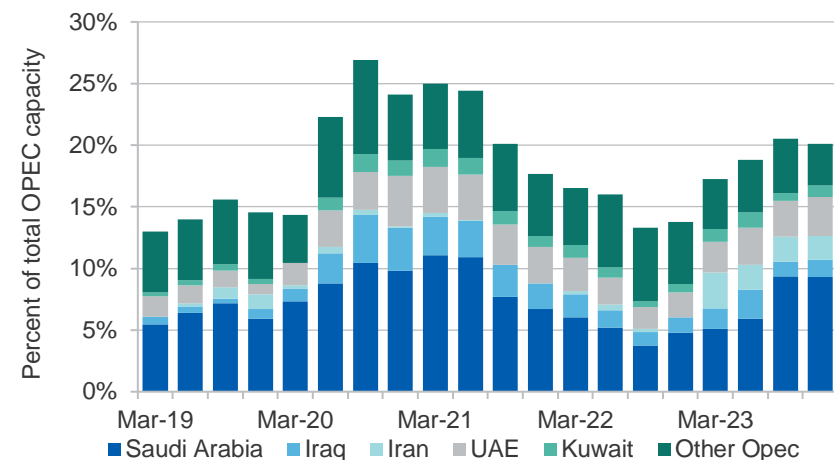
OPEC+ (The Organisation of Petroleum Exporting Countries + other oil-producing countries) agreed to voluntary cuts of 2.2 mb/d following the November OPEC+ meeting. The cuts were then extended till the middle of the year in the February meeting. The meeting also saw Brazil join OPEC+ and Angola announce it was leaving the organisation. Angola left following a dispute with OPEC, citing a desire to stabilize production at over 1 mb/d. Angola is one of Africa’s largest oil exporters, currently exporting 1.1 mb/d and is no longer subject to quotas.

Brazil currently has not made commitments to curtail output after joining OPEC+. Petrobras — Brazil’s state run publicly traded oil company — has stated that, as a publicly traded company, it cannot participate in quotas. Brazil has been a major driver of increased supply that has come online over the last year. Further, Petrobras intends to increase its planned investments up to \$102 billion over the next 5 years. This funding would allow Petrobras to lift its production from 2.8 mb/d to 3.2 mb/d. The funding program also includes funds for green energy and fertiliser projects.

Saudi Arabia has suspended its plans to increase its production capacity by 1 mb/d up to 13 mb/d by 2027. The target to increase production was originally announced in 2020. Given that Saudi Arabia has already made production cuts of almost 25% of its total production capacity, the suspension of this additional capacity is unlikely to impact overall supply.

In the December quarter 2023, OPEC crude oil spare capacity was estimated at 20% (Figure 8.3) and is expected to be higher in the March quarter 2024 as the cuts announced in November are fully implemented.

Figure 8.3: OPEC spare crude oil capacity, as a percentage of total



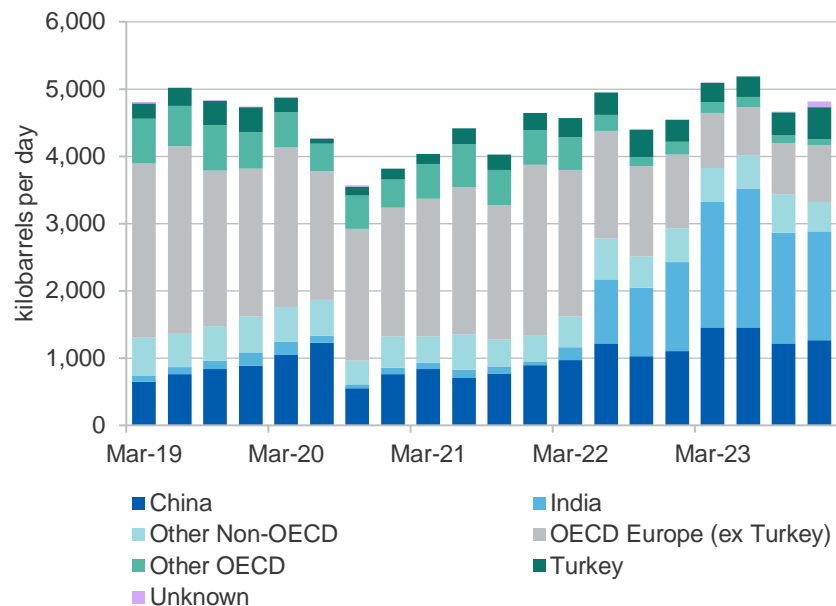
Notes: Spare capacity is the estimated capacity which can produce within 90 days. Condensate excluded.

Source: Wood Mackenzie (2023), International Energy Agency (2024), Department of Industry, Science and Resources (2024)

Russia redirects oil exports

Since the invasion of Ukraine in the March quarter of 2022, Russian oil exports have diverted away from OECD countries, with India becoming the largest consumer for Russian seaborne crude oil exports (Figure 8.4). The G7, EU and Australia all imposed the price caps on seaborne exports of Russian crude oil and refined petroleum products from 4 December 2022

Figure 8.4: Russian seaborne crude oil and condensate exports



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

Source: Kpler (2024)

Price caps imposed on Russian oil have required new and complex monitoring and enforcement measures. Russian oil exports are now largely carried by a fleet of older tankers operating outside of the Western shipping system, in order to circumvent the insurance bans and price caps. The Kyiv School of Economics estimates that 31% of Russian

seaborne crude oil exports were shipped by tankers using insurance from G-7 and EU firms in September 2023.

On some occasions, sanctions on Russian cargoes have caused cargo ships to be prevented from docking or rerouted entirely. In January 2024, 10 million barrels of Russian crude were stranded outside of Seoul due to payment issues and sanctions. Russia has also experienced similar issues with receiving payments for its exports to India.

Discounts on Russian crude have narrowed substantially in 2023. The IEA weighted average FOB price for seaborne Russian crude rose to US\$65.42 a barrel in January 2024, above the US\$60 price caps imposed by US, EU and Australia. The difference between the Brent crude oil price and the IEA weighted average FOB price fell from US\$30 a barrel in January 2023 to US\$14.84 in January 2024.

8.4 Prices

High supply and soft demand

Demand for transport fuels is expected to grow slowly and then decline over the outlook period. Most of the growth in oil demand will come from jet fuel and petrochemical usage (see *world consumption section*). In addition, growth of non-OPEC supply will continue to put downward pressure on prices. Therefore, WTI and Brent prices are projected to decline steadily through the outlook period, both in real and nominal terms. By 2029, Brent is expected to fall to US\$65 a barrel (in real terms) and WTI to reach US\$62 a barrel (in real terms).

Tensions in the Middle East and risk premiums

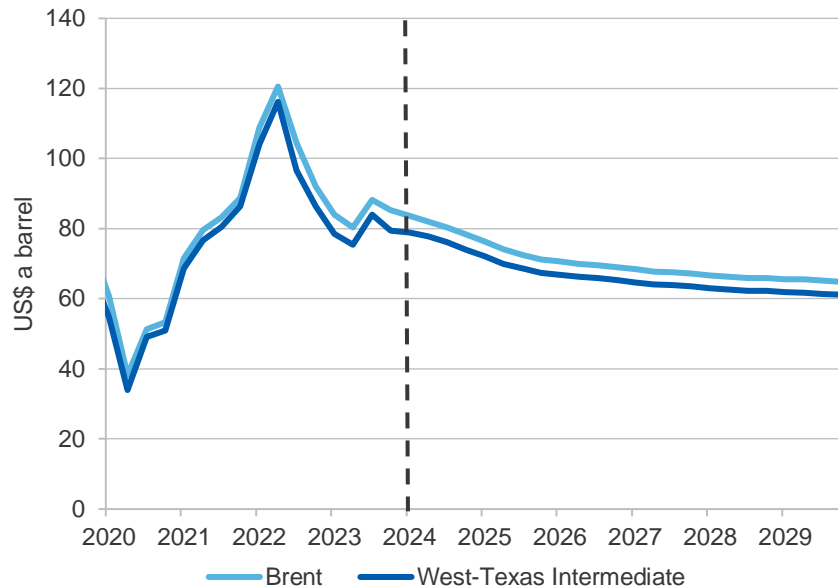
One caveat to prices steadily decreasing through the outlook are potential disruptions in the Middle East. These tensions are centred around two areas: the Red Sea and the Persian Gulf.

Through the December quarter 2023 and early in the March quarter 2024, tensions in the Red Sea have been escalating, after Houthis began attacking ships transiting via the Red Sea. Disruptions to Red Sea trade due to the Houthi attacks has not resulted in a significant impact on the

price of oil. There was an initial drop in the quantity of crude oil transiting from east of the Suez Canal to Europe, however, January 2024 volumes recovered to pre attack levels. Volumes of refined products have been impacted in both directions, however, the long-term impacts are yet to be seen. Global volumes traded have not significantly changed since the start of the conflict; this can largely be attributed to a realignment of contracts and the rerouting of ships around the Cape of Good Hope.

The other area that presents a risk for disruptions is the Persian Gulf, as US-Iranian tensions rise. In January 2024, Iran seized an oil tanker that the US had previously seized in 2023. The Persian Gulf contains ports where some of the largest exporters of oil transit their oil supply. In 2023, 20 mb/d (or 29%) of global seaborne supply transited via the Persian Gulf and out of the Gulf of Oman into the Red Sea. If tensions do escalate in the Persian Gulf an additional risk premium may be applied to the oil price.

Figure 8.5: Price outlook



Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

Due to the aforementioned events, some risk premium has already been applied to oil prices, however, this has been tempered by strong supply. If the chances of disruptions increase, an increased risk premium will likely be applied to the price of oil. Any increase in the price likely will be tempered by any spare OPEC capacity at the time, as that capacity may return to production in response to any disruptions.

8.5 Australia

Delays over investment decision causing uncertainty over outlook

Australian crude oil and condensate export earnings fell by 8% year-on-year to \$3.1 billion in the December quarter 2023, as prices fell back from the elevated levels triggered by the Russian invasion of Ukraine in 2022. The value of refined oil product export values fell by 2.7% year-on-year.

Australian crude oil and condensate output fell by 10% in 2023, to 284 kb/d from 316 kb/d in 2022. 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 227 kb/d in 2028–29 — as Carnarvon Basin fields deplete further.

Export values are projected to fall by 12.4% (CAGR) to \$6.8 billion (in real terms) by 2028–29, as production and prices both fall throughout the outlook period (Figure 8.6).

A final investment decision for the Dorado oil and gas field is expected this year, having been delayed from the second half of 2022. Carnarvon Energy divested a 10% stake in the project to Taiwan’s CPC Corporation in February 2023. If the project proceeds, it will bring around 90 kb/d of additional production capacity online.

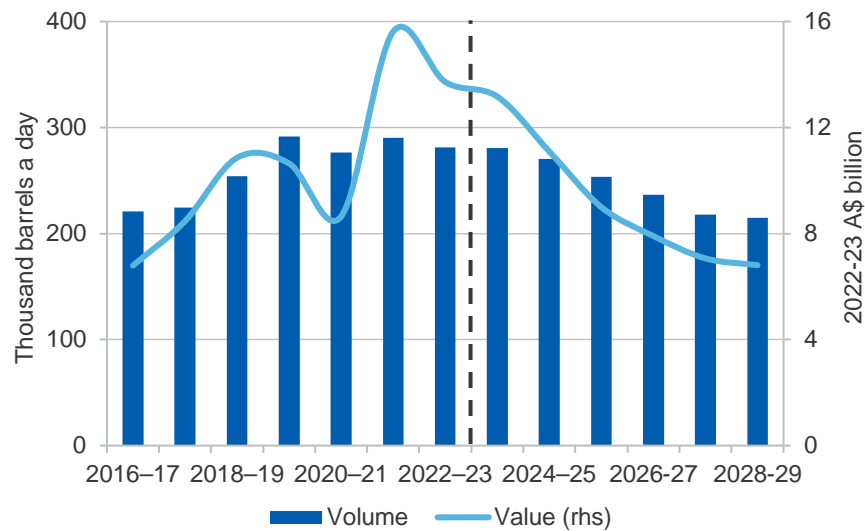
Australian refineries to remain open with government support

In 2021, falling demand resulted in the closure of two of Australia’s oil 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 4.7% year-on-year in the December quarter 2023. The gain was driven by a 23% lift in usage of jet fuel, and reflects the ongoing recovery in air travel since the opening of Australia’s international borders in November 2021. Consumption of automotive gasoline rose 0.7% year-on-year in 2023. Rising adoption of electric vehicles is expected to reduce demand for petrol over the outlook period.

Figure 8.6: Australian crude oil and condensate exports



Source: Australian Bureau of Statistics (2024); Department of Climate Change, Energy and Water; Department of Industry, Science and Resources (2024).

Exploration

Australia’s petroleum exploration expenditure in 2023 was \$1.06 billion, up slightly on the \$0.97 billion in 2022 but still below the highs of 2010-2020. The increase was driven by an increase in onshore exploration, that rose from \$591 million in 2022 to \$664 million in 2023. Offshore exploration has remained largely steady.

Revisions to forecasts

Since the December 2023 *Resources and Energy Quarterly*, the forecast for Australia’s crude and condensate export earnings has been revised, due to revisions in the price outlook for oil. Earnings in 2023–24 have been revised down to \$13.2 billion, while 2024–25 earnings have been revised up slightly to \$11.1 billion in 2024–25.

Since the March 2023 *Resources and Energy Quarterly*, forecast export volumes in 2027–28 have been revised down to 218 kb/d from 299 kb/d, and values have fallen to \$7.9 billion from \$11.4 billion, driven by declining production volumes due to basin depletion.

Table 8.1: Oil Outlook

World	Unit	2023	2024^f	2025^f	2026^f	2027^f	2028^f	2029^f	CAGR^r
Production ^a	mb/d	102	103	105	105	106	106	106	1.0
Consumption ^a	mb/d	102	103	105	105	106	106	106	1.1
WTI crude oil price									
– nominal	US\$/bbl	78	77	72	70	69	69	69	-5.2
– real ^b	US\$/bbl	79	77	70	67	65	63	62	-7.4
Brent crude oil price									
– nominal	US\$/bbl	83	82	76	74	73	73	73	-5.1
– real ^b	US\$/bbl	84	82	74	71	69	67	66	-7.4
Australia	Unit	2022–23	2023–24^f	2024–25^f	2025–26^f	2026–27^f	2027–28^f	2028–29^f	CAGR^r
Crude oil and condensate									
Production ^a	kb/d	291	285	275	260	245	228	225	-6.3
Export volume ^a	kb/d	282	274	270	254	237	218	215	-4.6
– nominal value	A\$m	13,193	13,103	11,568	9,646	8,708	7,977	7,880	-9.0
– real value ^g	A\$m	13,723	13,103	11,212	9,098	8,013	7,162	6,901	-12.2
Imports ^a	kb/d	169	183	192	191	189	188	187	0.7
LPG Production ^{ac}	kb/d	93	101	105	104	108	107	105	-0.1
Refined products									
Refinery production ^a	kb/d	252	253	248	247	245	244	242	-1.5
Exports ^{ad}	kb/d	6	5	4	4	3	3	3	-14.3
Imports ^a	kb/d	856	902	904	905	905	902	897	3.3
Consumption ^{ae}	kb/d	1,021	1,058	1,059	1,059	1,057	1,053	1,047	2.0

Notes: **a** 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 2023 to 2029 or for the equivalent financial years.

Source: ABS (2024) International Trade in Goods and Services, Australia, Cat. No. 5368.0; International Energy Agency (2024); US Energy Information Administration (2024); Department of Industry, Science and Resources (2024); Department of Climate Change, Energy and Environment (2024).

Uranium



Australia's uranium sector



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

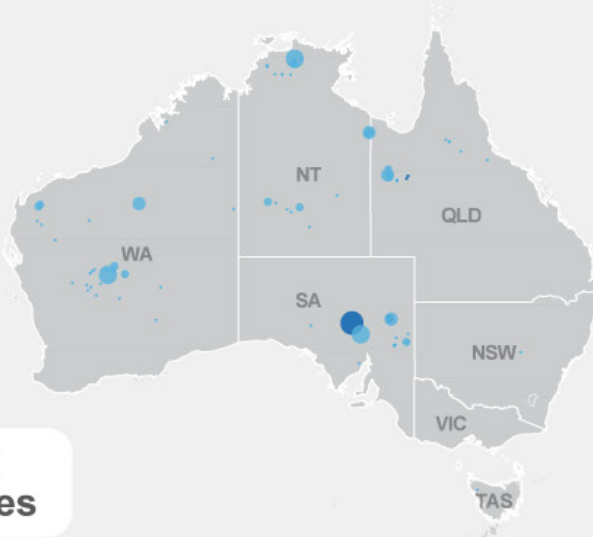


4,809 tonnes
exported in
2022–2023



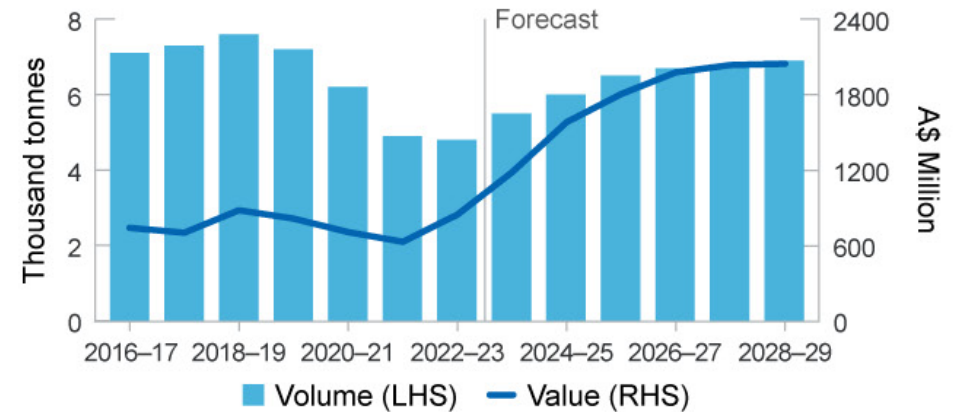
\$812 million
value of exports
2022–2023

- Deposit
- Operating mine
 - <2,967
 - 2,968–9,762
 - 9,763–17,571
 - 17,572–59,338
 - >59,339



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 pushed uranium prices above US\$100 a pound in the early part of the March quarter, effectively doubling the price of a year ago.
- Price pressures are expected to persist through the full outlook period, with the price settling at US\$109 per pound (in real terms) by 2029.
- Price and volume growth are projected to lift Australian export values from A\$0.8 billion in 2022–23 to A\$2 billion by 2028–29.

9.2 World Consumption

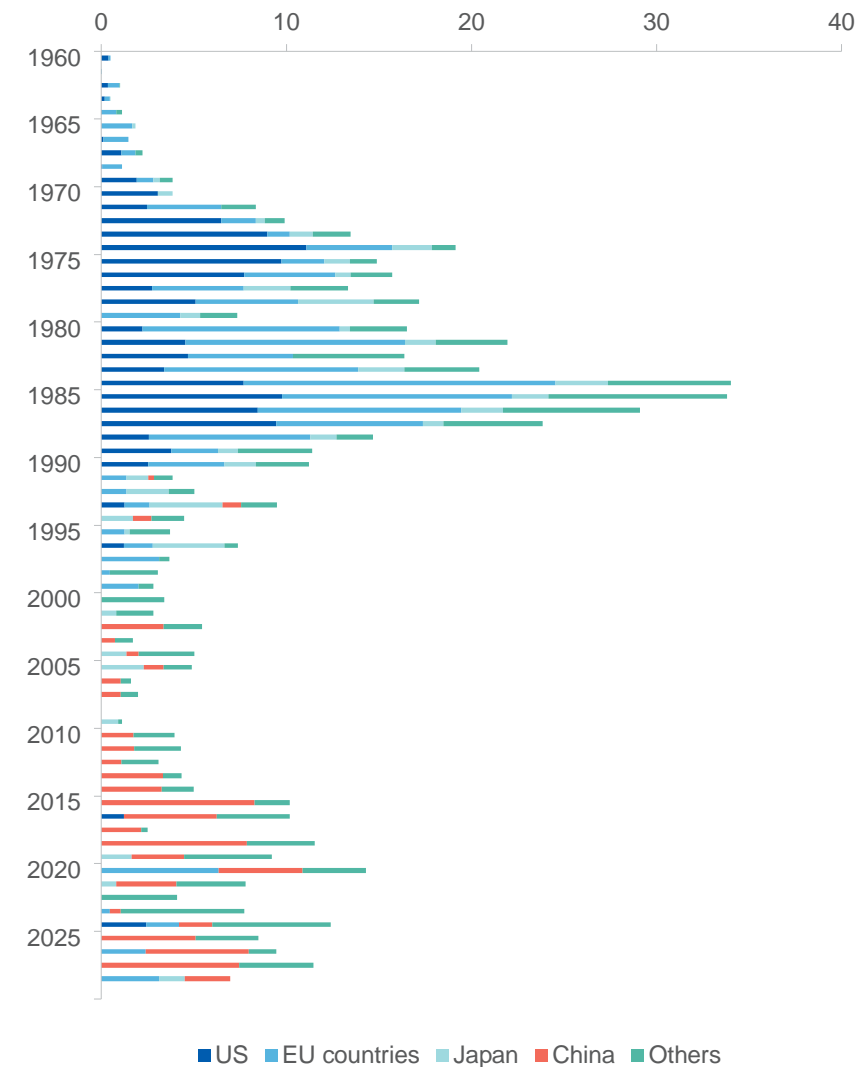
Global deployment of nuclear power is broadening and accelerating

Globally, uranium is primarily used to generate energy in nuclear reactors. Reactor construction rates have risen significantly since the early 2000s (Figure 9.1). Reactors typically consume a relatively steady quantity of uranium over time, replacing a portion of their fuel load each year. New reactors have a much higher initial demand as they need to be supplied with a full fuel load in advance before they commence operation. The pace of reactor construction is therefore a significant driver of uranium demand.

Worldwide reactor demand is estimated to reach a short-term peak of 98 kilotonnes (kt) of U3O8 (unenriched uranium oxide concentrate) in 2024 (including inventory build), of which both US and China are both expected to account for 21 kt of this each (Figure 9.2). The increase in global demand is driven by efforts among a range of countries to achieve net zero targets, reduce domestic energy prices, and improve their energy security.

Among these nations is the UK, which aims to scale up its nuclear capacity from up 6.5 GW to 24 GW by 2050. The UK has several large reactors mooted for development and is shortlisting six potential suppliers of Small Advanced Modular Reactors (SMRs). France is also scaling up its nuclear ambitions over the next 5 years, with its largest nuclear power companies (EDF, Framatome and Orano) all reporting strong production and profit results for 2023.

Figure 9.1: Growth in world nuclear power generation built and under construction (GWe)



Source: International Energy Agency (2024); World Nuclear Association (2024); Department of Industry, Science and Resources (2024)

Nuclear energy ambitions are also growing in Asia. Almost 20 reactors could come online during the outlook period in China alone. India has announced plans to build 18 more reactors by 2031–32. Japan has reconnected 12 units, with the pace of reconnection accelerating. Around 15 further reactors remain under review for future connection, and the Japanese Government is scaling up plans to pivot away from gas- and coal-fired power generation.

Other countries are developing nuclear power for the first time. The UAE had its first reactors come online in 2023, and Bangladesh is due to have its first reactor come online in 2024. Türkiye has planned for 4800MWe of capacity by 2029.

The US bans imports of nuclear fuel from Russia

The US has banned the importation of nuclear fuel (enriched uranium) from Russia. Russia is projected to hold 42% of the world’s enrichment capacity by 2025, while the US is set to consume 23% of global uranium output. It would be feasible for the US to acquire all its uranium fuel from sources outside of Russia, however this might be difficult because production may already be committed due to pre-existing contracts.

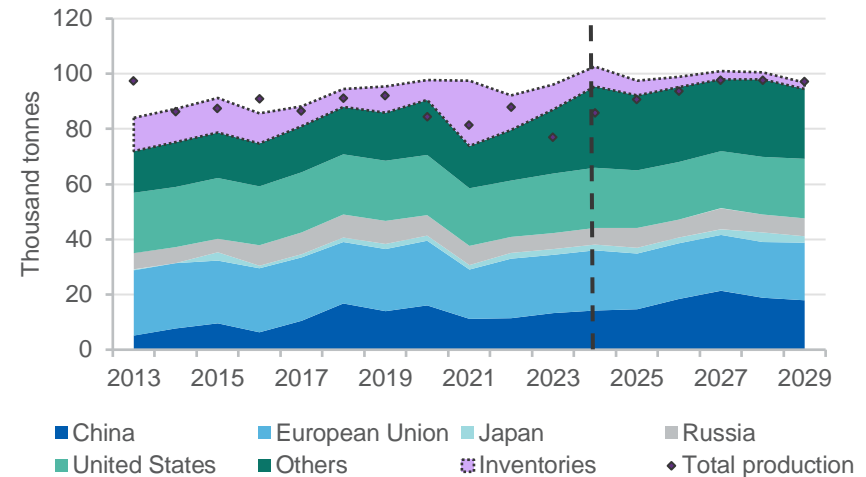
If the US is unable to procure sufficient fuel from non-Russian sources it would be necessary to larger quantities of fuel using the same enrichment capacity. However, increasing production from the same enrichment capacity requires increasing the ratio of input uranium to fuel product, and will put additional pressures on unenriched uranium demand.

Increasing prices are unlikely to affect uranium demand

Recent price growth is not expected to constrain demand by nuclear energy producing utility companies or significantly affect the cost competitiveness of nuclear energy. The price of nuclear energy is largely determined by the capital costs of nuclear reactors, with fuel costs only accounting for only a marginal share.

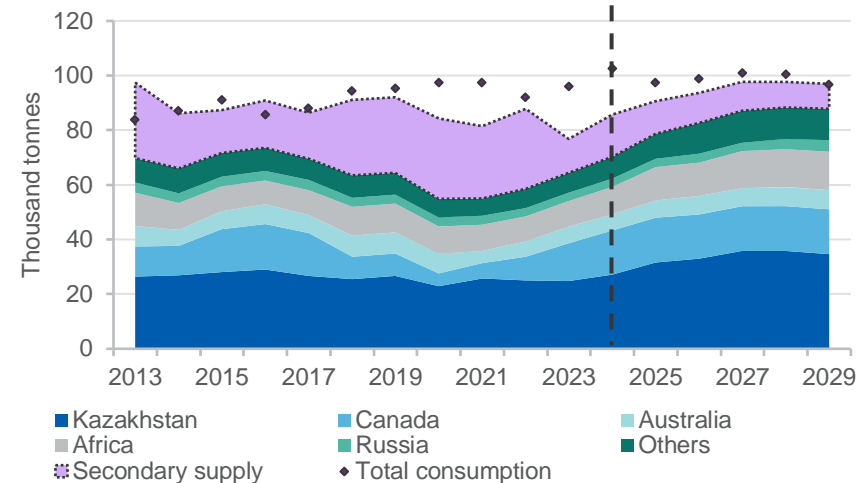
Analysis by the World Nuclear Association shows that an increase in the price of U3O8 from \$25 to \$50 a pound will increase the cost of fuel per KWh from 0.50 USc/KWh to 0.62 USc/KWh.

Figure 9.2: World uranium consumption and inventories (U3O8)



Source: International Energy Agency (2023); World Nuclear Association (2024); Ux Consulting (2023)

Figure 9.3: World uranium output (U3O8)



Source: International Energy Agency (2024); World Nuclear Association (2024); Ux Consulting (2023)

The IEA estimates that the levelized cost of energy for nuclear power in the US is approximately 7.1USc/KWh for a 1100MW reactor.

Uranium-generated power is thus less exposed to changes in the cost of its fuel source than other forms of energy, and recent price growth for uranium is not expected to add much to the cost of nuclear energy overall. Therefore, reactor shutdowns, cancellations and a loss of appetite for nuclear, resulting in a fall in the demand outlook due to high uranium prices are unlikely, and high prices are largely expected to lead to a lift in production rather than a reduction in demand (see [World Production](#) section).

9.3 World production

Production is growing, but sulfuric acid shortages are affecting production

Recent uranium price gains reflect an emerging market shortfall linked to years of global under-investment. World supply has picked up recently, but shortfalls through to 2030 are still expected (Figure 9.3).

Some of the supply shortfall may be addressed from existing mines, though ramp-ups are not always smooth. After revising its production forecasts up for 2024 and 2025, Kazatomprom — the world's largest supplier, located in Kazakhstan — has revised them down due to sulphuric acid shortages. This issue could persist into 2025, keeping mined uranium output in Kazakhstan below capacity. Given that Kazakhstan is the largest producer of uranium in the world, accounting for 24.7kt from a total of 64.4kt mined world-wide in 2023, any disruptions to Kazatomprom's supply chains are likely to exacerbate the supply shortfall.

Canada and Australia are the 2nd and 4th large suppliers of uranium, and both countries have potential to ramp up supply. Canada previously reduced its output due to low prices through the 2010s. Inventories and secondary sources (such as depleted uranium reprocessors) typically provide additional supply as needed, and high prices will provide a strong incentive to keep overall supply and demand in balance over coming years. Government and utility stockpiles are projected to be sufficient to support uranium demand through the outlook period.

New mine supply is needed to balance the uranium market over the longer term. This growth will likely be concentrated in Africa, with mines projected to open in Niger and Namibia during the outlook period. The Tumas uranium project in Namibia is expected to be first, with a final investment decision expected in the first half of 2024.

There were fears that the Dasa mine in Niger would be affected by the recent coup d'état, but the mine has continued to operate, albeit with some disruptions from border closures. With the period of greatest risk now passed, the mine is expected to remain open through the outlook period.

9.4 Prices

Prices rose sharply in H2 2023, with more growth expected

Uranium prices rose sharply in H2 2023 and continued to rise in early 2024, highlighting the scale of underinvestment (Figure 9.4). High prices are not expected to significantly affect the cost or use of nuclear power, and instead will likely motivate substantial efforts on the supply side. Higher prices will incentivise governments and private holders of uranium to sell off stockpiles, which remain substantial. Uranium miners will have a stronger incentive to maximise output from existing mines and facilities, many of which have been operating at low capacity for some years.

Over the longer term, prices are likely to encourage more development of new mine capacity, though, this is not likely to have a significant effect on supply until after the outlook period. With a primary market shortfall expected to persist, prices are projected to remain high throughout the outlook period, with stockpiles and existing mine capacity coming under growing pressure.

Price speculation could add to volatility

Higher prices will likely attract greater interest from financial institutions such as holding funds, which may buy and hold uranium for speculative purposes. Greater interest from speculative investors will add volatility to the price outlook, placing upward pressure on prices in the short-term, but potentially accelerating downward pressure when stored supply is returned to markets.

9.5 Australia

Higher prices and volumes are set to boost export earnings

Australia's uranium exports are currently produced at the Four Mile and Olympic Dam mines, and from Boss Energy's newly reopened Honeymoon mine (all in South Australia). Honeymoon recommenced operations in December quarter 2023 and is currently ramping up, targeting annual nameplate capacity of 1.2 kt by 2026.

Deep Yellow Limited's Mulga Rock mine (Western Australia) is expected to commence production late in the outlook period, following a definitive feasibility study in 2024 and pending a successful final investment decision in 2026. Recent price growth may to support exploration and the development of further new mines in Australia. However, no new capacity is not expected to appear during the outlook period.

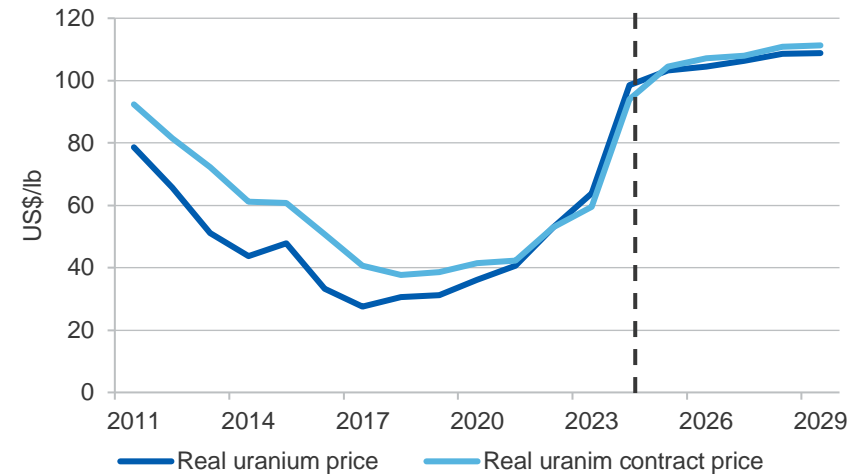
The ramp-up at Honeymoon is expected to push export earnings up to around \$1.2 billion in 2023–24 (Figure 9.5), with further growth in subsequent years. Revenue is expected to reach \$2 billion by 2028–29.

Revisions to the outlook

Since the December 2023 *Resources and Energy Quarterly*, the forecast for Australia's uranium export earnings have been revised up by \$91 million to \$1.6 billion in 2024–25.

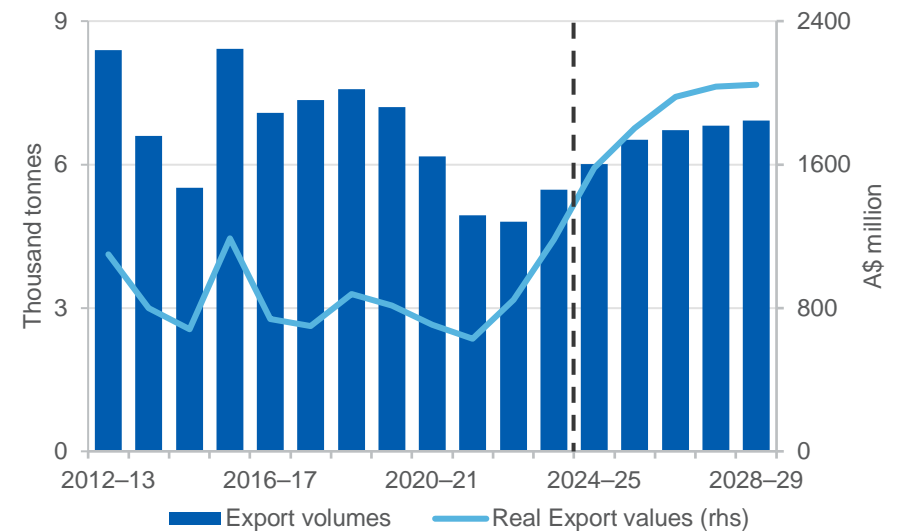
Longer term export earnings forecasts have been revised up significantly since the March 2023 *Resources and Energy Quarterly*. Real Export earnings for 2027–28 have been revised up to \$2 billion due to the emergence of a stronger price environment.

Figure 9.4: Uranium price outlook (Real terms)



Source: Cameco Corporation (2024) Uranium Spot Price; Ux Consulting (2023) Uranium Market Outlook

Figure 9.5: Australia's uranium exports



Source: Department of Industry, Science and Resources (2024)

Table 9.1: Uranium outlook

World	Unit	2023	2024	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
Production	kt	64.4	70.1	78.7	82.7	87.1	88.3	87.9	5.3
Africa ^b	kt	9.2	10.1	12.2	12.2	13.5	13.9	14.1	7.4
Canada	kt	13.7	16.3	16.3	16.3	16.3	16.3	16.3	2.9
Kazakhstan	kt	24.9	27.1	31.6	32.9	35.8	35.8	34.6	5.6
Russia	kt	3.2	3.1	3.1	3.2	3.1	3.8	4.1	4.3
Consumption	kt	87.0	95.4	92.1	95.1	98.1	97.9	94.6	1.4
China	kt	13.2	14.1	14.6	18.3	21.3	18.8	17.8	5.1
European Union 28	kt	21.2	22.0	20.3	20.3	20.3	20.3	21.0	-0.2
Japan	kt	2.0	2.0	2.0	2.0	2.0	3.4	2.3	2.2
Russia	kt	6.0	6.0	7.3	6.6	7.6	6.6	6.6	1.5
United States	kt	21.5	21.8	20.8	20.8	20.8	20.8	21.5	-0.0
Spot price nominal	US\$/lb	62.5	98.6	105.2	108.9	113.1	117.7	120.6	11.6
- real ^c	US\$/lb	63.9	98.6	103.3	104.6	106.4	108.5	108.8	9.3
Australia	Unit	2022-23	2023-24	2024-25 ^f	2025-26 ^z	2026-27 ^z	2027-28 ^z	2028-29 ^z	CAGR ^r
Production	t	5,873	6,024	6,012	6,517	6,717	6,817	7,217	3.5
Export volume	t	4,809	5,478	6,012	6,517	6,717	6,817	7,217	7.0
- nominal value	A\$m	812	1,181	1,630	1,913	2,148	2,267	2,335	19.3
- real value ^d	A\$m	844	1,181	1,580	1,804	1,977	2,035	2,045	15.9
Average price	A\$/kg	168.7	215.6	271.2	293.5	319.8	332.5	323.6	11.5
- real ^d	A\$/kg	175.5	215.6	262.9	276.8	294.3	298.5	283.4	8.3

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2024 US dollars; **d** in 2022-23 Australian dollars; **s** estimate; **f** forecast; **r** Annual growth rate; **z** Projection.
Source: Department of Industry, Science and Resources (2024); Cameco Corporation (2024); Ux Consulting (2024) Uranium Market Outlook

Gold



Australia's gold sector



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

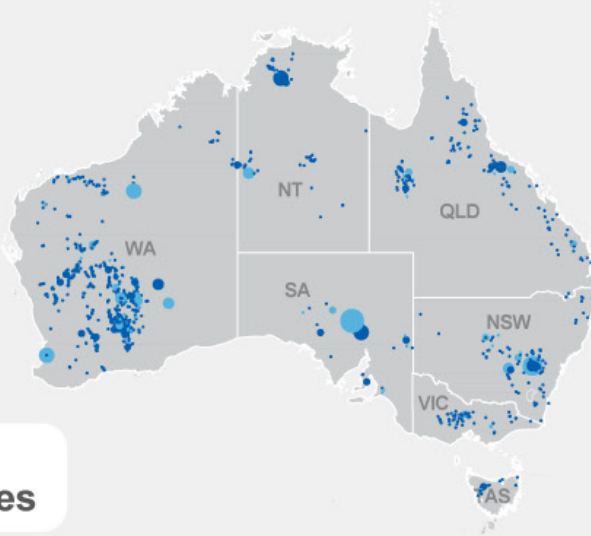


Largest
known global share
of gold resources,
at **22%**



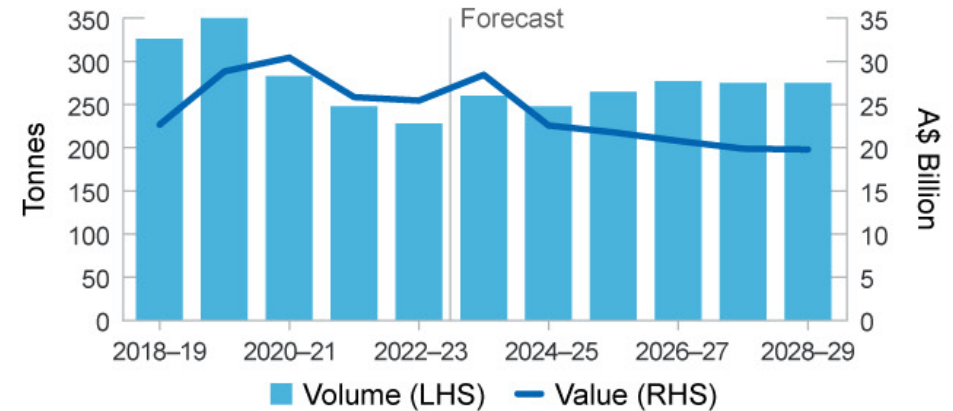
228 tonnes
exported in
2022-23, valued at
\$24 billion

- Deposit
- Operating mine
- <20
- 21-70
- 71-185
- 186-473
- 474-1,028
- >1,028



**Major gold
deposits, tonnes**

Australian gold exports



Outlook



Due to demand, prices expected to **remain elevated** in 2024-25, then ease long-term



Export earnings are **forecast to fall** in real terms, due largely to lower forecast prices



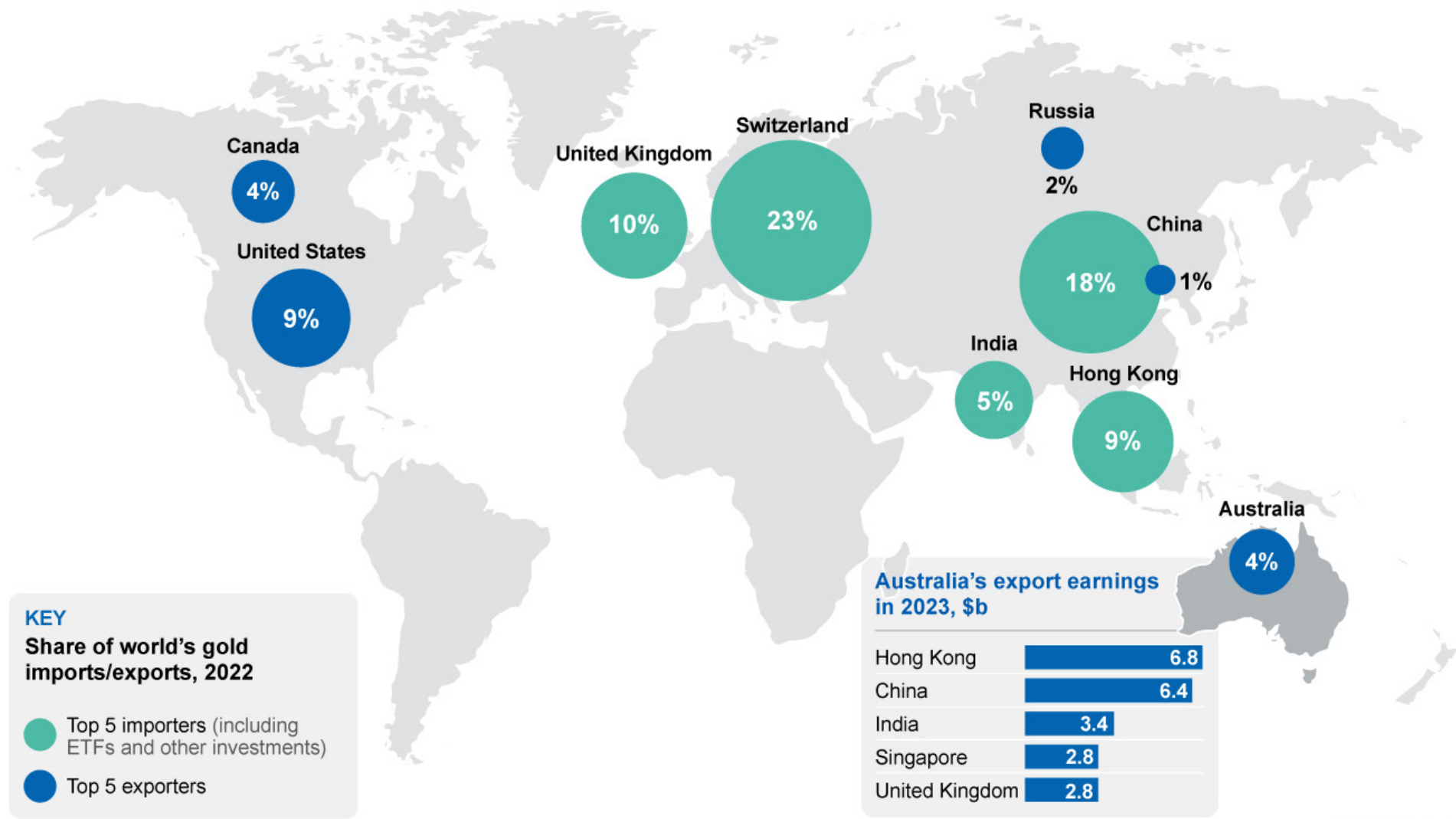
Production to **increase** as new projects and expansions come online



Exploration spending at a **4-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

- Gold prices averaged US\$1,940 an ounce in 2023, supported by strong demand from investors and central banks. Prices are forecast to remain elevated throughout 2024 and 2025, before softening in real terms to average around US\$1,750 an ounce by 2029.
- Australian gold production decreased to 294 tonnes in 2023, impacted by adverse weather events in H1 2023 and lower grades and planned maintenance in H2 2023. Production is forecast to grow over the long-term as major new projects and expansions come on-stream.
- Gold earnings are forecast to decline in real terms, from \$28 billion in 2023–24 to around \$20 billion in 2028–29, as higher export volumes are outweighed by the impact of lower Australian gold prices in real terms.

10.2 World consumption

World gold usage decreased in 2023, buoyed by official sector demand

World gold demand decreased by 5.3% year-on-year to 4,440 tonnes in 2023, easing from a 10-year high in 2022. This fall was largely driven by a 15% year-on-year decline in investment demand, with central bank demand and technology consumption also lower.

Official sector (central banks and other government financial institutions) buying declined by 4.1% year-on-year to 1037 tonnes in 2023. Despite the fall, this still amounted to the second-highest annual total in the World Gold Council's (WGC) records. 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, China was the largest buyer, adding a reported 225 tonnes (around 10%) to its gold reserves in 2023. The National Bank of Poland (NBP) purchased 130 tonnes, raising its gold reserves by 57% year-on-year. The President of the NBP said the central bank intends to continue building its gold reserves. Other notable purchases were reported by Singapore and various emerging market central banks including India, Libya and Iraq. Sales by central banks during the year were comparatively small, with

Kazakhstan selling 47 tonnes from its reserves from January–November and Uzbekistan reporting 25 tonnes sold for the year.

Gold purchases by non-government buyers in 2023 were lower year-on-year, with slight growth in jewellery demand offset by weaker investment demand — which fell to a 10-year low.

Overall, 244 tonnes of gold flowed out of gold-backed exchange-traded funds (ETFs) in 2023, following 110 tonnes of outflows in 2022. (ETF outflows are counted as reducing gold demand, while inflows are counted as additional.) Demand for gold ETFs was weak in Western markets (particularly Europe) due to rising bond yields and stronger currencies.

Retail investment in gold bars and coins declined by 3% year-on-year in 2023. Year-on-year declines were partly driven by weaker demand in the West and by base effects — following strong demand from 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 28% year-on-year) and India (up by 7%), where Rupee depreciation supported record domestic prices. Demand in China was strong due to base effects — following a COVID-disrupted 2022 — as well as economic uncertainty and weak performance from other asset classes (such as property and shares).

Gold jewellery demand rose marginally year-on-year in 2023, despite record domestic prices in key consumer markets. Jewellery consumption in China rose by 10% year-on-year to 630 tonnes, supported by elevated consumer saving intentions and base effects (given a weak December quarter 2022). Indian jewellery consumption fell by 6% year-on-year in 2023 as consumers reacted to record high domestic prices. According to the WGC, Chinese and Indian consumers responded to elevated prices by purchasing jewellery with lower average weight or gold content.

Demand for gold in technological applications declined by 3.5% year-on-year to 298 tonnes in 2023: a record low in the WGC's data series. Weak demand for consumer electronics translated to lower demand for gold in electronics such as in light-emitting diodes (LEDs), memory chips and printed circuit boards.

Gold consumption forecast to decline over 2024 and 2025

World gold consumption is forecast to decrease by 2.5% a year on average to 4,200 tonnes in 2025 (Figure 10.1). The decline is expected to be mainly driven by lower official sector (central banks and other institutions) demand, easing from record levels seen in 2022 and 2023.

Official sector demand is forecast to ease to 700 tonnes in 2025, a 33% decline from strong levels in 2023 but remain elevated compared to historical averages. This forecast decline is premised on the expectation that some central banks have likely met near-term targets for increasing gold reserves, following two record years of buying.

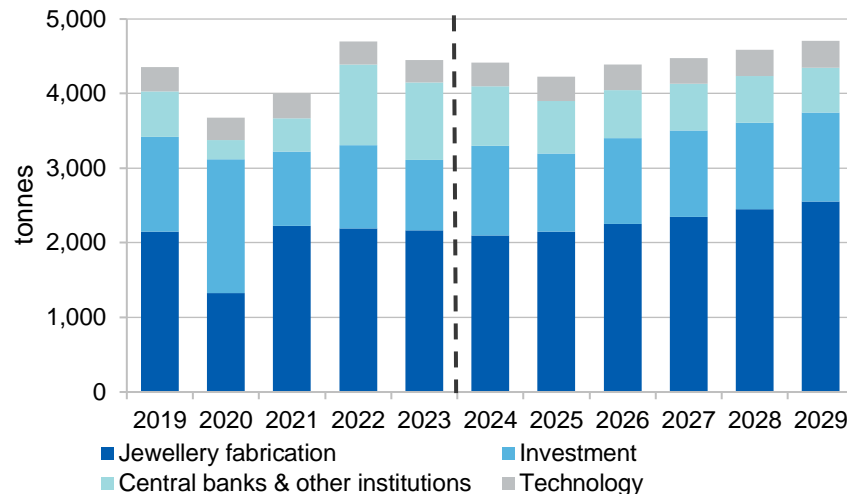
Investment demand (gold-backed ETFs or bar/coin holdings) is expected to recover from low levels seen in 2023, to be 11% higher by 2025. Gold bar and coin demand is expected to continue at recent levels despite gains in gold prices. Ongoing economic and geopolitical uncertainty, currency

volatility and poor performance of other assets (such as property and equities in China) in key markets will support physical gold demand.

Strong growth in investment demand is expected in 2024, driven by flows into ETFs over H2 2024 as interest rate cuts are expected to commence in advanced economies. Gold-backed ETFs have been consistently shedding gold volumes since the June quarter 2022. Continuation and acceleration of monetary easing in 2025 is expected to support further strong inflows into ETFs in H1 2025, however high prices may lead to selling off (profit-taking) over H2 2025.

Jewellery consumption is forecast to rise by 2.8% to 2,150 tonnes by 2025, with growth weighed down by forecast strength in gold prices. India is expected to lead growth in jewellery consumption, driven by continued robust economic growth and rising real incomes (as inflation eases).

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: Department of Industry, Science and Resources (2024); Metals Focus (2024); World Gold Council (2024)

Gold consumption to grow over the outlook period

World gold consumption is forecast to grow by 2.7% a year from 2026 to reach 4,700 tonnes in 2029. Demand growth in this period is expected to be largely driven by rising jewellery consumption, with gradual increases also expected in investment demand and high-tech manufacturing.

Jewellery consumption is forecast to grow by 4.4% a year on average from 2026 to reach 2,550 tonnes by 2029. Consumption will be supported by easing gold prices, improving consumer sentiment and rising incomes — particularly in the key markets of China and India.

Investment demand is forecast to grow 3.4% a year on average from 2026 to reach 1,200 tonnes in 2029. It is likely that central banks' rate policy easing campaigns will be nearing completion in 2026; this is forecast to drive some price correction in 2026 as investors in Western markets sell some holdings (to claim profits). Investment demand will nonetheless grow over the outlook period as retail investors take advantage of lower prices to increase holdings — especially of bar and coin in emerging markets. Institutional investors are also expected to support demand growth over the long-term as they increase gold holdings to maintain portfolio balance — assuming equity markets resume long-term growth.

Official sector demand is forecast to ease further to 600 tonnes by 2029, a long-run level that still exceeds historical averages. Buying is projected to continue at higher levels than prior to 2022, driven by emerging market central banks with long-term goals to diversify their reserves with gold.

Historically, economic and geopolitical uncertainty have increased a country's propensity to increase gold reserves, as has the presence or threat of sanctions from major currency nations¹. Non-western economies have actively increased gold holdings in foreign exchange reserves since sanctions were issued on Russia following the invasion of Ukraine. In particular, the freezing of Russia's offshore reserves. With no indication of when the current geopolitical landscape will improve, long-run official sector gold demand has been revised up to 600-650 tonnes from 500 tonnes in the March 2023 *Resources and Energy Quarterly*.

10.3 World production

World supply increased in 2023

World gold supply increased by 3.1% year-on-year to about 4,900 tonnes in 2023, driven by both higher mine production and increased recycling.

Global mine production reached 3,644 tonnes in 2023, the second-highest total on record. Production was on track to exceed the 2018 record (of 3,656 tonnes) if major disruptions to several operations had not occurred in the December quarter 2023. Full year production growth was led by increases in South Africa, Russia and Brazil.

Production in China — the world's largest gold producing nation — rose marginally year-on-year to 375 tonnes in 2023. Production in Russia — the second largest producer — rose by 2% year-on-year to 332 tonnes, led by increased high-grade ore output from the large Olimpiada mine.

Production in the United States fell by an estimated 3% year-on-year to about 168 tonnes in 2023. The decrease was due to lower output from major operations in Nevada (such as Bald Mountain and Carlin), as well as lower production from the Fort Knox mine in Alaska.

¹ Arslanalp, S, Eichengreen, B, Simpson-Bell, C 2023, Gold as International Reserves: A Barbarous Relic No More?, IMF WP/23/14, Washington DC, USA.

Production in Canada decreased by 1.5% year-on-year to about 189 tonnes in 2023, with lower production reported in British Columbia and Ontario. Production was down by an estimated 5.7% year-on-year at Newmont's recently acquired 8.9 tonnes per year Brucejack project (British Columbia), while production at Agnico Eagle's 21 tonnes per year Detour Lake project (Ontario) was down by 13% year-on-year.

In Australia — the world's third-largest gold producing nation — output decreased by 2.8% year-on-year in 2023, to 294 tonnes. Australian mine production fell due to disruptions from heavy rainfall in the first half of the year, alongside decreasing mine grades and several mine closures (see *Australia section*).

Gold recycling increased by 9% year-on-year to 1,237 tonnes in 2023, largely due to record gold prices in China and India. Recycling activity outside of these two key markets was weaker than would have been expected in a record year of gold prices: the WGC attributes this to recent years of strong recycling (limiting stocks of jewellery ready for recycling) and fiscal support for consumers reducing the need for distress selling. The WGC also suggested another factor could be consumers in countries with a high degree of economic uncertainty (such as Egypt, Iran and Türkiye) preferring to hold onto their gold as an asset of last resort.

World supply to stabilise after peaking in 2025

Global gold supply is forecast to grow to a peak of 5,050 tonnes by 2025, with increasing world gold mine production supported by further strength in recycling activity (Figure 10.2).

Gold recycling activity is forecast to rise to 1,275 tonnes in 2025, in line with a forecast peak in gold prices. World gold mine production is forecast to rise by 1.9% a year on average by 2025 to 3,780 tonnes, led by gains in Canada, the US, Chile and Brazil.

In the short-term, Newmont's 4 tonnes per year Peñasquito mine is expected to return to full production following lower production in 2023

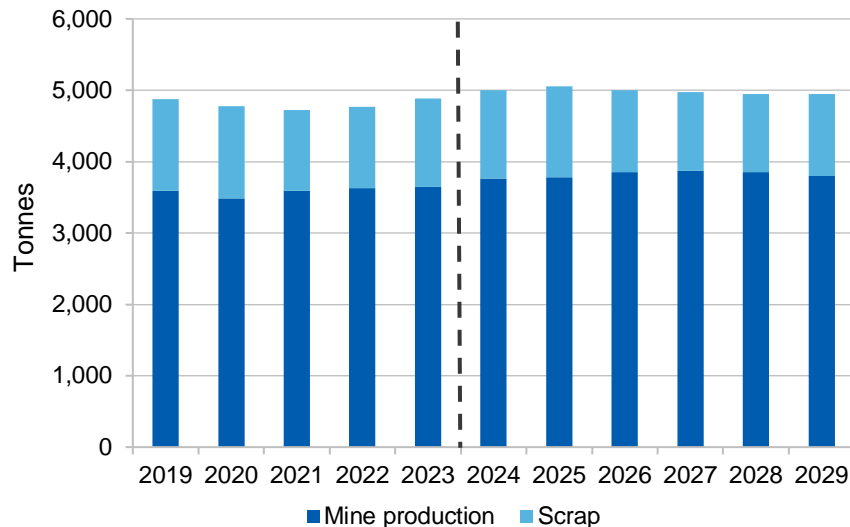
(due to industrial action). Gold Fields' 10.9 tonnes per year Salares Norte project remains under construction, with first gold recently delayed to April 2024 and steady state production expected in 2025.

Canadian mine output is forecast to rise by 24% from 2023 to 2025, to reach 249 tonnes, driven by significant new projects and expansions. 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.

From 2025, world gold supply is projected to stabilise at around 4,950 tonnes, as mine production reaches a medium-term peak of 3,875 tonnes in 2027 and recycling volumes ease.

After reaching a peak of 326 tonnes in the middle of the outlook period, Australian mine production is projected to stabilise; increasing production from major new projects and expansions will be offset by the impact of declining grades and mine reserve depletion in existing projects.

Figure 10.2: World gold supply



Source: Department of Industry, Science and Resources (2024); Metals Focus (2024); World Gold Council (2024).

Production in Russia is expected to increase over the long-term as the substantial Sukhoi Log project comes online in 2027, following extensive delays. A definitive feasibility study is still forthcoming, however production capacity estimates centre on 1.6 million ounces (50 tonnes) a year. Sukhoi Log is one of the largest gold deposits in the world.

Continued environmental regulations and industry consolidation in China is forecast to see output fall in the medium-term, alongside reserve depletion and grade decline in current projects. With that said, China is unlikely to lose its position as the world's largest producer in the outlook period.

10.4 Prices

Gold prices rose in 2023, reaching a new record in December

The London Bullion Market Association (LBMA) gold price averaged about US\$1940 an ounce in 2023 — 7.9% higher than in 2022. Price strength over the year was driven by strong safe-haven demand, given economic uncertainty, financial stability concerns in the US banking sector and geopolitical risks (such as the Hamas-Israel conflict). Prices were also supported by ongoing strength in central bank buying throughout the year.

Expectations of an imminent monetary easing in the US led to rapid declines in US Treasury yields and the US dollar in the December quarter 2023, driving gold prices to a new record high of US\$2,078 an ounce on 28 December. Changing expectations during this time were reinforced by the US Federal Reserve's December economic projections surprising markets with a median expectation for 75 basis points of rate cuts in 2024.

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

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 since persisted as a driver, muting the effect of higher interest rates.

Gold prices to remain elevated in 2024 after reaching new record highs

Gold prices have continued to hold up remarkably well despite downward pressure from various sources such as high real yields, a strong US dollar (Figure 10.4) and continued ETF outflows.

Gold prices are forecast to average about US\$2,020 an ounce in 2024 — a 6% upward revision compared with the December 2023 *Resources and Energy Quarterly*. Prices have been volatile due to changing expectations for the timing and scale of monetary easing. As of 15 March 2024, the LBMA gold price remained slightly below its 11 March record price of US\$2,180 an ounce, driven by greater expectations for monetary easing: markets expect US rate cuts to commence in July 2024. This recent surge to record price levels has been supported by strong investor demand.

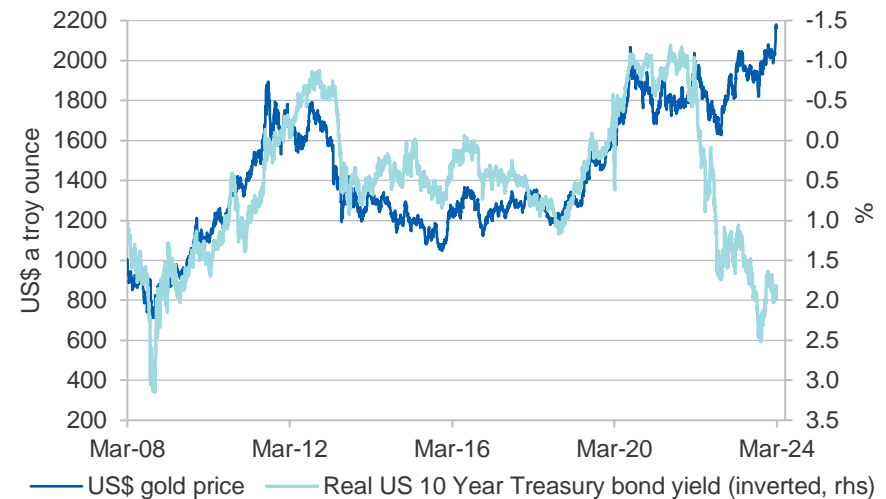
Prices are forecast to remain steady throughout 2024, centred around a scenario where monetary easing commences in the US and other major economies over the second half of the year. In this scenario, investor demand is expected to remain particularly strong over the first half of the year as bond yields and the US dollar ease in anticipation of rate cuts.

Once monetary easing commences, gold prices are then expected to receive a further boost leading into 2025, as the US dollar eases and investors gain greater clarity on the pace and scale of further rate cuts. Gold prices are forecast to average US\$2,030 an ounce in 2025, supported by monetary easing and continued strength in demand from both investors and central banks.

Compared with the December 2023 *Resources and Energy Quarterly*, price forecasts have been revised up sharply over the short-term, in recognition of recent strength in investor demand and ongoing strength from safe-haven and central bank demand.

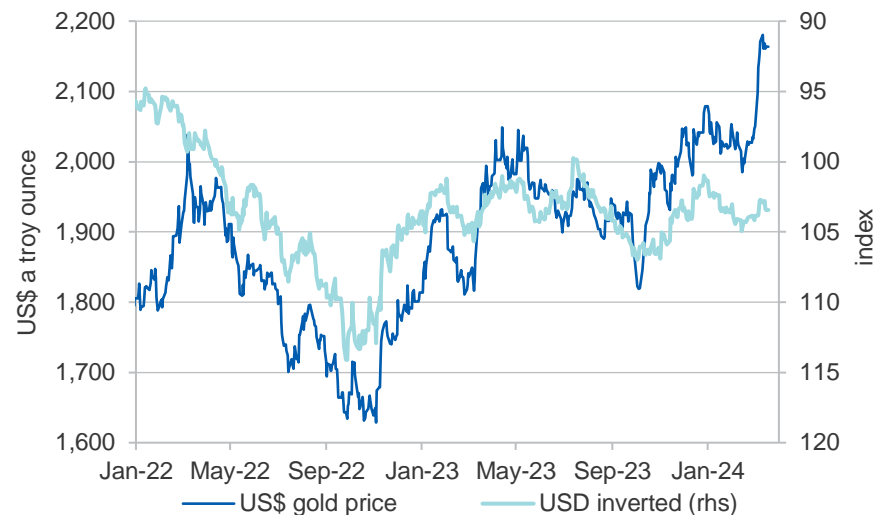
Some degree of geopolitical risk premium is expected to persist over the forecast period: higher than was expected in the December 2023 *Resources and Energy Quarterly*, and far more than expected in the March 2023 *Resources and Energy Quarterly*.

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



Source: Bloomberg (2024); LBMA (2024) Gold price PM

Figure 10.4: Gold price and the US dollar



Notes: USD refers to a trade-weighted index of the US dollar

Source: Bloomberg (2024); LBMA (2024) Gold price PM

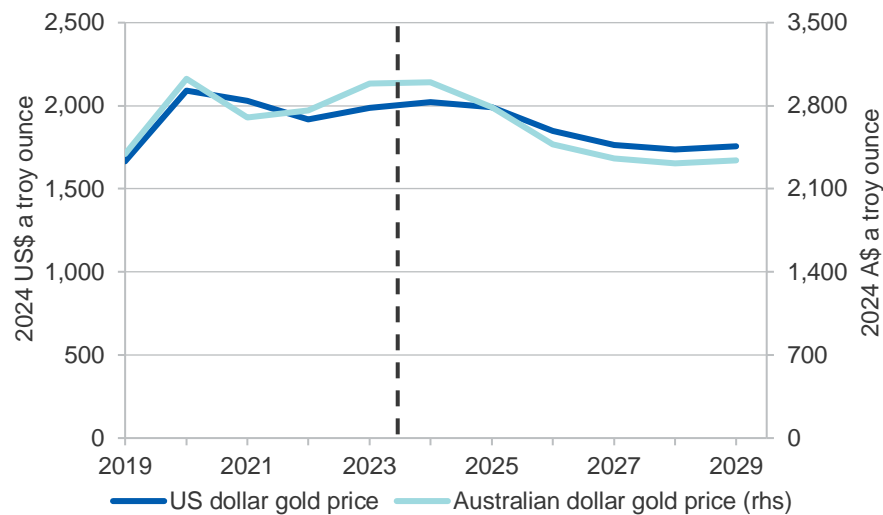
Gold prices to ease, but remain elevated over the long-term

After 2025, gold prices are forecast to gradually fall to a low of around US\$1,860 an ounce (US\$1,730 in 2024 dollars) in late 2027 as monetary easing cycles conclude, central bank purchasing slows and safe-haven demand eases to some extent. From early 2028 onwards prices are then projected to gradually rise in line with growth in institutional investment — discussed in the gold consumption section above — to average about US\$1,950 an ounce in 2029 (about US\$1,760 in 2024 dollars).

In combination with an assumed appreciation in the Australian dollar against the US dollar, the Australian dollar gold price is projected to decline over the forecast period, from around A\$2,900 an ounce in 2023 to around A\$2,600 an ounce in 2029 (A\$2,300 in 2024 dollars) (Figure 10.5).

Prices are forecast significantly higher than in the March 2023 *Resources and Energy Quarterly*, due to persistence of safe-haven demand from both investors and consumers, as well as expectations for structurally higher official sector demand over the forecast period.

Figure 10.5: US and Australian dollar gold prices



Source: Department of Industry, Science and Resources (2024); LBMA (2024) Gold price PM

10.5 Australia's trade, production and exploration

Australian gold exports rose to record levels in 2023

Australia's gold exports rose by 21% year-on-year to \$28 billion in 2023, a record in nominal terms. The gain was driven by higher Australian dollar gold prices (up by 13%) and a lift in export volumes.

Growth in Australian exports was led by a 39% year-on-year increase to the financial hubs (US, UK, Switzerland, Hong Kong and Singapore), which collectively purchased \$16 billion worth of gold. Within the financial hubs, exports to Hong Kong increased by 37% to \$6.8 billion, decreased slightly to Singapore (\$2.8 billion) and Switzerland (\$2.0 billion) and increased dramatically to the United Kingdom (\$2.8 billion). Among the key consumer markets, gold exports to China fell by 11% year-on-year to \$6.4 billion, while exports to India more than doubled to \$3.4 billion.

Australian gold export earnings to decline over the long-term

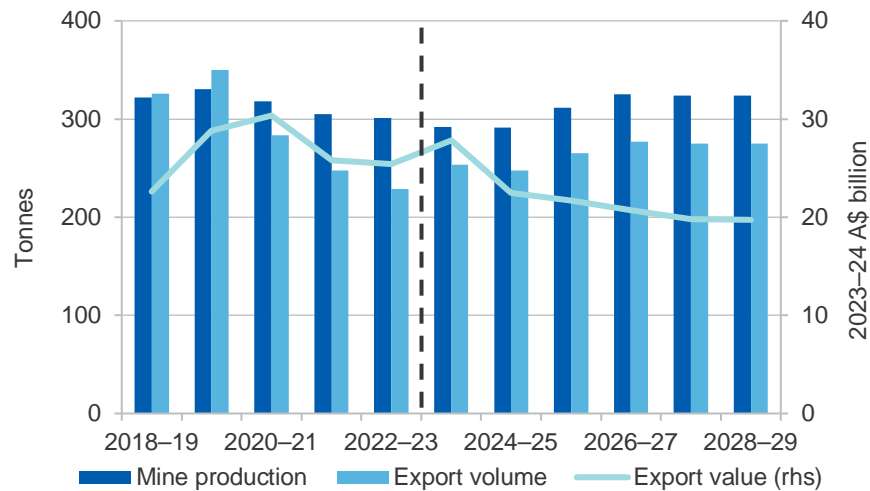
Australian gold export earnings are forecast to increase by 14% to \$28 billion in 2023–24. Growth will largely be driven by 11% year-on-year growth in export volumes and a strong September quarter 2023 result (in both volume and price terms). Export earnings are then forecast to decline by 17% to \$23 billion in 2024–25, due to lower forecast export volumes and Australian dollar gold prices (Figure 10.6).

From 2025–26 onwards, Australian gold export earnings are projected to decline in real terms by 3.2% a year on average. Forecast declines will be driven by falls in real Australian gold prices. Australian export volumes are projected to grow and stabilise at around 275 tonnes a year from 2026–27 onwards, supported by growth in domestic mine production.

Australian gold mine production decreased in 2023

Australia's gold industry produced 294 tonnes of mined gold in 2023, down by 2.8% year-on-year. Production was adversely affected in the first half of the year by heavy rainfall in the Northern Territory (NT) and northern parts of Queensland (QLD) and Western Australia (WA). Over the second half of the year, production was then lower year-on-year due to lower grades or major outages due to maintenance at some mines. Production was also

Figure 10.6: Australian gold exports and mine production



Sources: ABS (2024); Department of Industry, Science and Resources (2024)

down year-on-year due to some mines having entered care and maintenance due to profitability issues.

Production at Newmont’s Cadia mine in New South Wales (NSW) fell by 22% year-on-year to 16 tonnes in 2023. Falls in production were driven by lower grade and reduced mill throughput resulting from major planned shutdown activities in the year. During the year, Cadia also commissioned and ramped up activities from its new “PC2-3” panel cave project, and received the first renewable power through its Rye Park Wind Farm Power Purchase Agreement. Production was down across Newmont’s other gold projects, including an 8.4% decrease at Boddington (23 tonnes), a 7.8% decrease at Tanami (14 tonnes) and a 17% decrease at Telfer (9.4 tonnes). Tanami production outages caused by heavy rainfall caused production to be down by 18% year-on-year.

Production at Northern Star’s KCGM operation in WA was down by 9.7% year-on-year in 2023, at 13.2 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 — which commenced mining ahead of schedule in the December quarter 2023. Lower grades and mill shutdowns in the September quarter 2023 weighed on output from the company’s Carosue Dam and Jundee operations, however strong performance otherwise lifted full year production at Carosue Dam 11% higher year-on-year.

Production at Evolution Mining’s Cowal operation in NSW increased by 18% year-on-year to 8.9 tonnes as the company commenced production of higher-grade ores from its new underground mine. Adverse weather in H1 2023 affected mining operations at the company’s Ernest Henry project in QLD, dragging full year production down by 23% to 2.0 tonnes.

BHP’s Olympic Dam operation had record gold output in 2023, delivering 6.4 tonnes of gold — 40% more than 2022. Gold output from Olympic Dam has grown as a result of additional concentrate feed from the recently acquired Prominent Hill and Carrapateena assets — together producing 3.5 tonnes of gold in concentrate under BHP’s ownership in 2023.

First gold was poured at the 6.2 tonnes per year Bellevue Gold Project in October 2023, with the plant also achieving nameplate milling capacity in the December quarter 2023.

Having recently acquired Dacian Gold, Genesis Minerals’ 2.8 tonnes per year Mount Morgans Gold Operation remained in care and maintenance throughout the quarter, after operations were suspended 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. Wiluna recently released a pre-feasibility study for restarting mining operations, detailing a plan to produce 2.1 tonnes a year over a 9.5-year mine life.

Australian gold production to be supported by major project expansions

Australian gold production is forecast to rise marginally over the first half of the forecast period, from 292 tonnes in 2023–24 to 312 tonnes in 2025–26. Within this trajectory, the impact of significant new projects and mine expansions coming online will be offset in the short-term by mine closures

and project delays — leading to production taking a short-term dip to 291 tonnes in 2024–25.

Production will continue to ramp up at 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 continues to be developed and is set to achieve first production in 2024.

Northern Star’s recently expanded Thunderbox mill ramped up to reach nameplate capacity in H2 2023, resulting in production increasing by 28% year-on-year to 5.9 tonnes. Further expansions to Northern Star’s Thunderbox mill output are expected in 2024–25, as high-grade ore feed commences and mill optimisation continues.

Production from Newmont’s Tanami and Boddington projects is expected to decline in 2024, due to lower ore grades (as part of planned mine sequencing). The company is on track to begin lifting Tanami’s output from 2026, as its Tanami Expansion 2 project reaches completion.

From 2025–26 onwards, Australian gold production is projected to step up and stabilise at around 325 tonnes as major new projects and expansions of current projects provide substantial new supply, while other projects trend towards lower grades and reserve depletion.

Northern Star Resources’ Super Pit (KCGM) gold operation is scheduled to begin long-term expansion in 2024, rising to about 20 tonnes by 2025–26. In 2023, Northern Star committed to a \$1.5 billion mill expansion at KCGM to double processing capacity by 2029. This expansion will lift the Super Pit’s output to 28 tonnes in 2028–29, up from 13 tonnes in 2022–23.

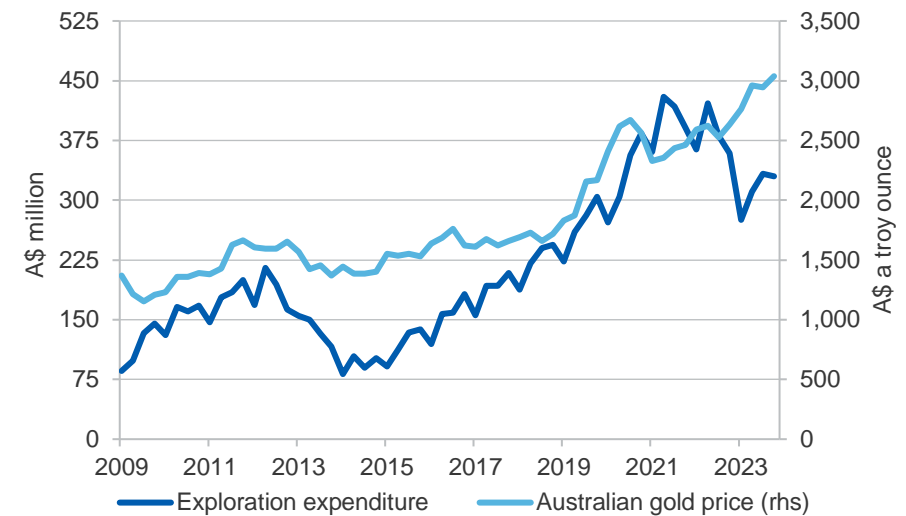
Outcomes of the definitive feasibility study at De Grey Mining’s Hemi Gold Project were announced in September 2023, which forecast production of 17 tonnes per year on average in its first 5 years of operation (expected to commence in 2026).

Weaker than expected gold prices present a downside risk to the forecasts of Australian gold output. 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 2023

Australia’s gold exploration expenditure decreased by 18% year-on-year to \$1.3 billion in 2023 (Figure 10.7). As a result, gold’s share of Australian mineral exploration expenditure fell to 29% in 2023, down from 38% 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 70% of total gold exploration expenditure.

Figure 10.7: Australian gold exploration expenditure and prices



Source: ABS (2024)

Revisions to the outlook

Compared with the December 2023 *Resources and Energy Quarterly*, Australia’s forecast gold export earnings have been revised up in 2023–24

(by 9.1%) and 2024–25 (by 10%). This largely reflects upgrades made to price forecasts.

Forecast US dollar gold prices have been revised up across the board, due to persistent strength on the demand side from investors and central banks. Combining this with a slightly weaker than expected AUD/USD, Australian dollar gold prices have been revised up over the outlook period.

Compared to the March 2023 *Resources and Energy Quarterly*, forecast Australian export earnings (nominal) are 18% higher in 2023–24, due to a 29% higher Australian dollar gold price which offset a notable downgrade to forecast export volume. Forecast export earnings are, on average, 3.9% lower from 2024–25 to 2027–28, due to downgrades made to forecast export volumes since then.

The downgrade in export volumes across all years in the outlook period is largely to a change in methodology (documented in June 2023 *Resources and Energy Quarterly*), and to a lesser extent revisions to forecast mine production. Mine production forecasts have been revised down since March 2023, due to projects entering care and maintenance, or companies delaying project commencements (with updates made to these dates in the 2023 *Resources and Energy Major Projects* report).

Table 10.1: Gold outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^f	2027 ^z	2028 ^z	2029 ^z	CAGR
Total demand	tonnes	4,448	4,415	4,230	4,390	4,475	4,585	4,704	0.9
Fabrication consumption ^b	tonnes	2,466	2,415	2,480	2,590	2,695	2,800	2,905	2.8
Mine production	tonnes	3,644	3,765	3,780	3,850	3,875	3,850	3,800	0.7
Price ^c									
– nominal	US\$/oz	1,943	2,023	2,030	1,924	1,875	1,883	1,945	0.0
– real ^d	US\$/oz	1,985	2,023	1,992	1,848	1,765	1,736	1,756	-2.0
Australia	Unit	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^f	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR
Mine production	tonnes	301	292	291	312	325	324	324	1.2
Exports									
– volume	tonnes	228	253	248	265	277	275	275	3.2
– nominal value	A\$m	24,406	27,850	23,165	22,997	22,503	22,058	22,529	-1.3
– real value ^e	A\$m	25,386	27,850	22,452	21,691	20,706	19,802	19,732	-4.1
Price									
– nominal	A\$/oz	2,721	3,028	2,909	2,701	2,530	2,493	2,546	-1.1
– real ^e	A\$/oz	2,831	3,028	2,819	2,548	2,328	2,238	2,230	-3.9

Notes: **b** includes jewellery consumption and industrial applications; **c** London Bullion Market Association PM price; **d** In 2024 US dollars; **e** In 2023–24 Australian dollars; **f** Forecast; **z** Projection.

Source: ABS (2024); Department of Industry, Science and Resources (2024); London Bullion Market Association (2024) gold price PM; S&P Market Intelligence (2024); World Gold Council (2024).

Aluminium



Australia's aluminium sector



10%
of global primary
aluminium exports
are **Australian**

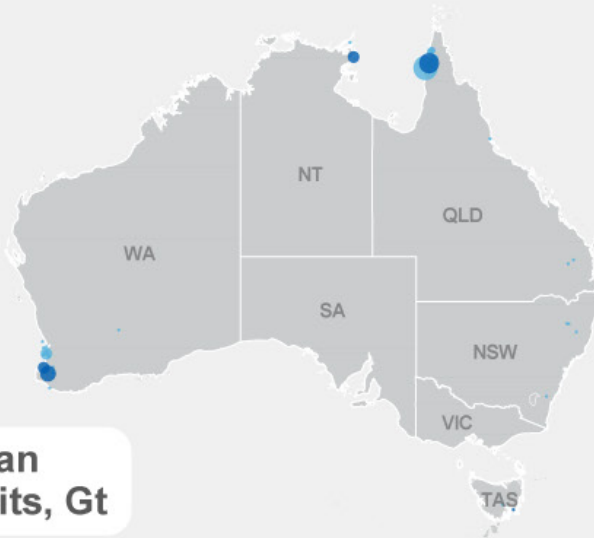


\$17 billion
primary aluminium,
alumina and bauxite
exported, 2023



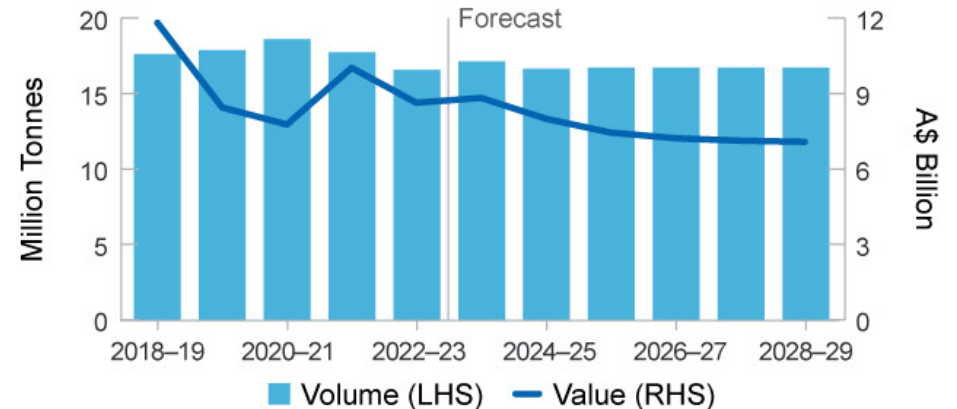
Over 98%
of Australian
bauxite is **exported**
to **China**

- Deposit
- Operating mine
- <0.01
- 0.02–0.03
- 0.04–0.09
- 0.10–0.20
- 0.21–0.44
- >0.45



Major Australian bauxite deposits, Gt

Australian alumina exports



Outlook



Prices set to rise as energy efficient technology supports aluminium demand



Australia is expected to be world's largest HPA* producer by 2025, with **49%** of global output



The Australian bauxite industry is on track to be a **\$2 billion** export industry by 2026-27

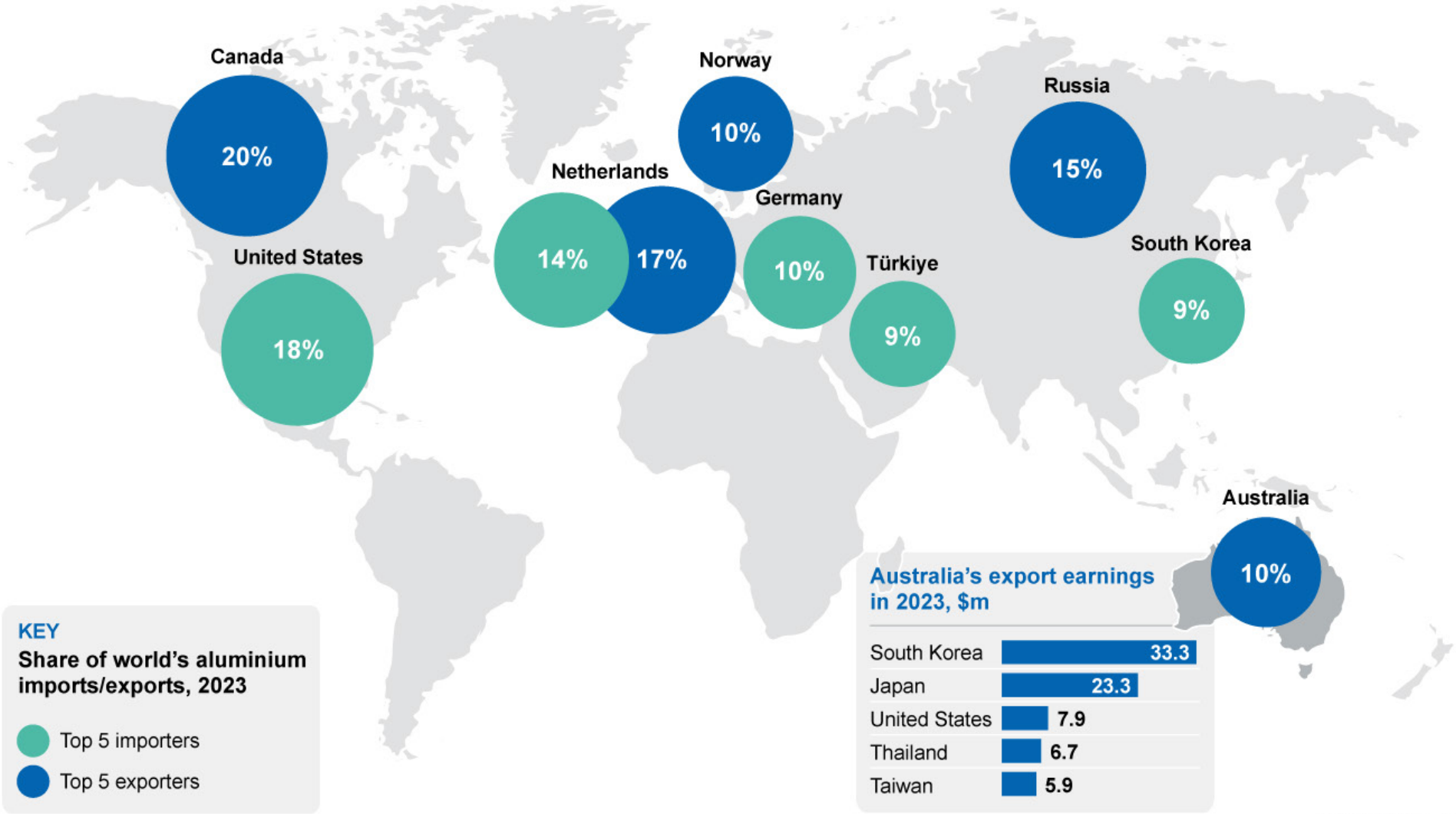


Growing **global demand** for energy efficient cars and new tech support aluminium use & exports

*High Purity Alumina

SOURCE: DISR; OCE

Aluminium TRADE MAP



SOURCE: WBMS; ABS

11.1 Summary

- Aluminium prices are forecast to remain at 2023 levels in 2024, averaging US\$2,300 a tonne. Increased Russian supply is expected to offset the impact of higher Chinese demand. Growing demand for new energy-efficient cars/technologies is expected to result in the aluminium price rising to US\$2,437 a tonne by 2029 (in real terms).
- Australia's primary aluminium output is projected to be 1.6 million tonnes (Mt) a year. Alcoa's decision to curtail its Kwinana alumina refinery in WA by the end of the June quarter 2024 is likely to bring Australian alumina output below 19 Mt a year. Mine expansion and new mines are expected to boost Australian bauxite output to 122 Mt by 2029.
- The ramp up of high purity alumina output is expected to add about \$1.5 billion a year to Australia's aluminium, alumina and bauxite (AAB) exports from 2025–26. Australian AAB exports are projected to reach \$17 billion (in real terms) by 2028–29.

11.2 World consumption

China drove higher aluminium and alumina consumption

Rising primary aluminium demand from China pushed world primary aluminium demand up 1.7% year-on-year to nearly 70 Mt higher in 2023 (Figure 11.1). Over this period, consumption in China, the world's largest primary aluminium consuming country, rose by 4.2% year-on-year. A rise in the use of aluminium in China's automotive sector (helped by the Chinese government's stimulus package) contributed to a jump in Chinese aluminium demand in 2023.

In 2023, primary aluminium consumption also grew in India (up 36% year-on-year) and South Korea (up 5.0% year-on-year). The growth in primary aluminium consumption partly reflected increased aluminium use in new, energy-efficient car models. However, European consumption was hit by sluggish construction activity, leading to lower demand in Germany (-21%) and France (-13%). Demand from global automotive makers drove a 2.8% year-on-year rise in the use of secondary aluminium in 2023 (Figure 11.1). Secondary aluminium usage rose by 5.2% in China and 3.6% in the US.

Higher global primary aluminium production helped boost global alumina consumption to 1.5% to 136 Mt in 2023 (Figure 11.2). China remained the world's largest alumina consumer, accounting for 59% of global alumina consumption, and contributed most to this increase (up 3.0% year-on-year). Outside of China, alumina consumption in Brazil and Canada rose by 23% and 5.3% year-on-year in 2023, respectively.

Strong bauxite consumption from the United Arab Emirates (UAE) helped push global bauxite usage up by 0.3% year-on-year in 2023 to 361 Mt (Figure 11.3). Over this period, the UAE consumed nearly 11 Mt of bauxite, up 46% year-on-year, as the country's alumina production rose by 45% year-on-year in 2023.

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

Demand for primary aluminium in 2024 is expected to be mainly driven by China, as strong electric vehicle manufacturing activity lifts demand. As a result, global primary aluminium consumption is forecast to increase by 2.8% in 2024, to 72 Mt (Figure 11.1).

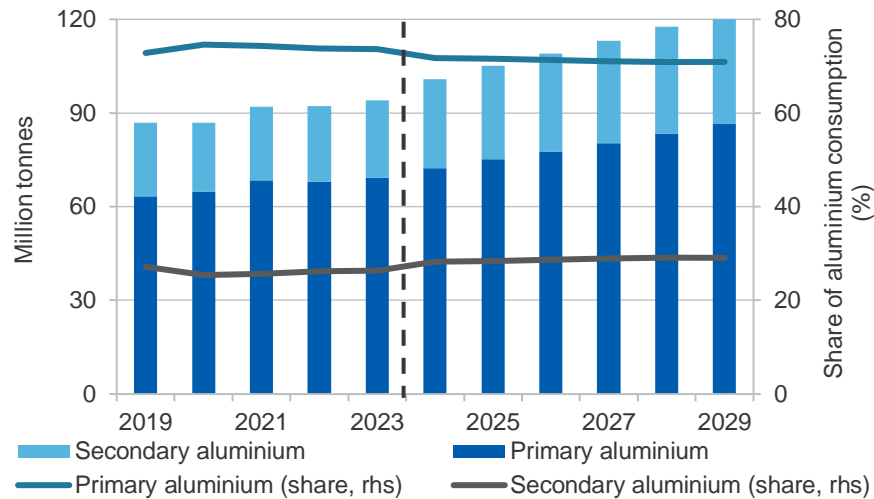
Beyond 2024, world primary aluminium consumption is projected to grow at an annual average rate of 3.7% to nearly 86 Mt by 2029 (Figure 11.1). China's green energy and electric vehicle sectors are expected to drive global primary aluminium demand over the outlook period.

World secondary aluminium demand is forecast to increase by 15% year-on-year in 2024 to 28 Mt (Figure 11.1). After 2024, world secondary aluminium demand is projected to increase at 4.5% a year over the outlook period (Figure 11.1), supported by rising primary aluminium prices and the use of low carbon aluminium.

In line with world primary aluminium production, world alumina usage is forecast to grow by 1.7% year-on-year in 2024 before growing at a slower rate through the rest of the outlook period (Figure 11.2).

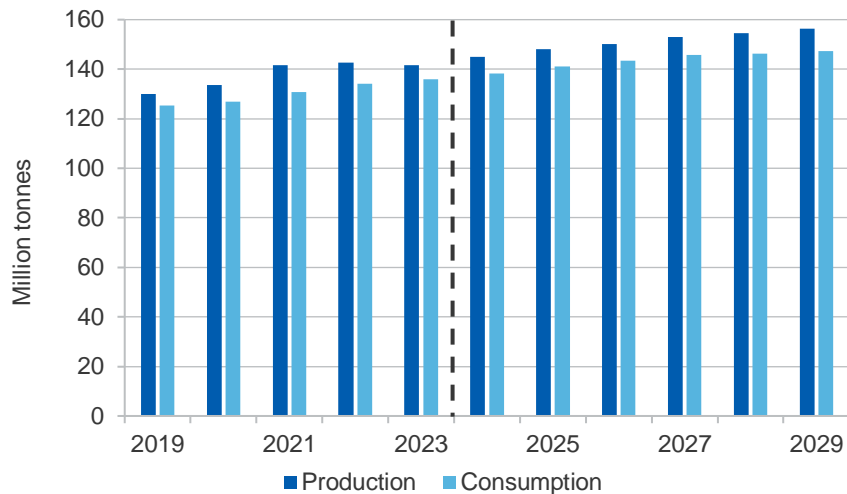
Bauxite demand is expected to rise by 0.3% in 2024, with more rapid growth projected through the rest of the outlook period (Figure 11.3)

Figure 11.1: World aluminium consumption



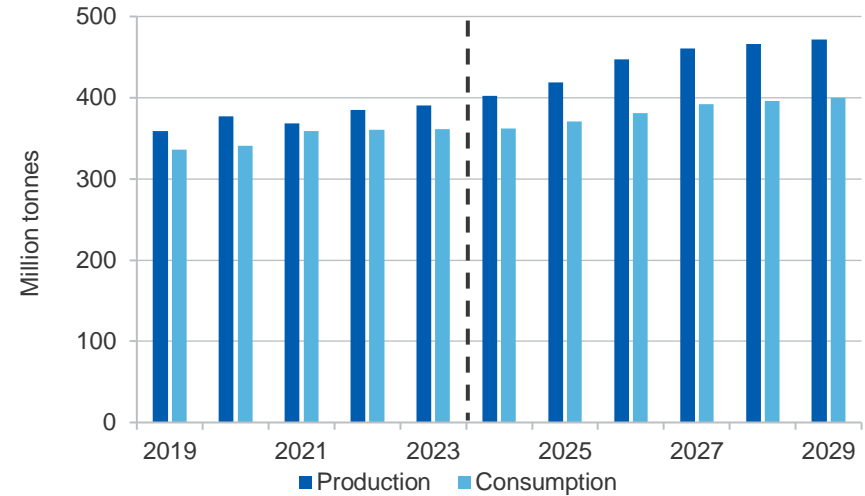
Source: World Bureau of Metals Statistics (2024); CRU (2024); Wood Mackenzie (2024); Macquarie Bank (2024); Department of Industry, Science and Resources (2024)

Figure 11.2: World alumina production and consumption



Source: World Bureau of Metals Statistics (2024); CRU (2024); Wood Mackenzie (2024); Macquarie Bank (2024); Department of Industry, Science and Resources (2024)

Figure 11.3: World bauxite production and consumption



Source: World Bureau of Metals Statistics (2024); Department of Industry, Science and Resources (2024)

New emerging economy aluminium and alumina consumers

India is expected to emerge as a major consumer of primary aluminium by the end of the outlook period, as the nation urbanises further. India's primary aluminium demand is projected to grow from 2.6 Mt in 2024 to 3.3 Mt in 2029.

By the end of the outlook period, Indonesia is expected to consume more alumina to accommodate its rising aluminium output. Indonesia's alumina demand is projected to rise from 433,000 tonnes in 2024 to 1.5 Mt in 2029.

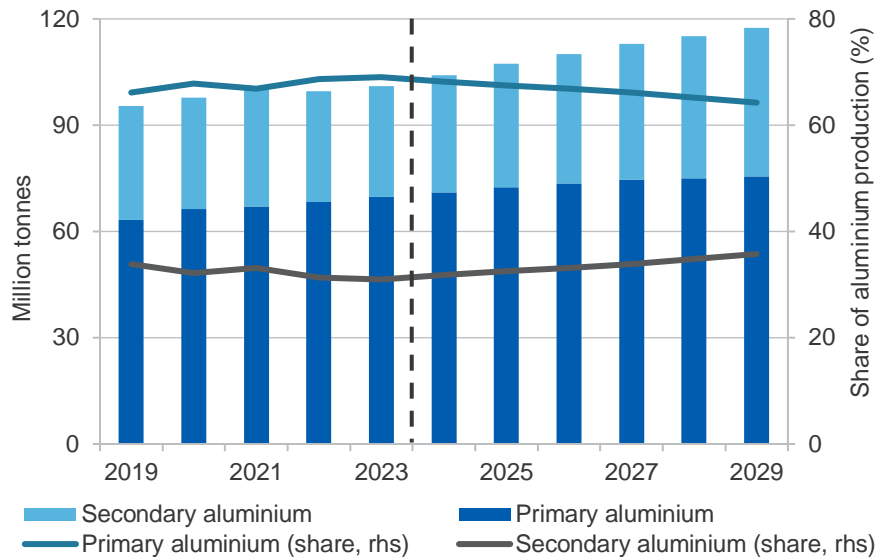
11.3 World production

Aluminium and bauxite output grew in 2023

In 2023, a 2.8% year-on-year rise in China's primary aluminium output drove a 1.6% year-on-year rise in global primary aluminium output, to nearly 70 Mt (Figure 11.4). China's primary aluminium producers raised output in response to the removal of power restrictions and improved power supply in the second half of 2023.

Amongst other major producers, primary aluminium output in the United Arab Emirates (UAE) rose by 5.9% year-on-year in 2023, driven by the ramp-up of production at Emirates Global Aluminium's Al-Taweelah smelter. Output also rose in Canada — by 8.0% year-on-year — driven by the ramp up of production at Rio Tinto's Kitimat aluminium smelter.

Figure 11.4: World aluminium production



Source: World Bureau of Metals Statistics (2024); CRU (2024); Wood Mackenzie (2024); Macquarie Bank (2024); Department of Industry, Science and Resources (2024)

In Europe, primary aluminium output fell in 2023 — including France (down by 29% year-on-year), Germany (down by 45%) and Bosnia (down by 56%). The aluminium smelting capacity that was curtailed in 2022 — due to high energy costs — remained largely offline in 2023.

World secondary aluminium production rose by 0.1% year-on-year to 31 Mt in 2023 (Figure 11.4). Over this period, Brazil's secondary aluminium production was 900,000 tonnes, up 10% year-on-year, while Italy's secondary aluminium output was 747,000 tonnes, up 4.2% year-on-year.

Lower Chinese and Australian alumina output (down by 0.3% and 3.9% year-on-year, respectively) drove a 0.8% year-on-year fall in global alumina output in 2023 to nearly 142 Mt (Figure 11.2).

In 2023, higher output in Guinea, Australia, Brazil, China and India led to a 1.3% year-on-year rise in global bauxite output to 390 Mt (Figure 11.3). In Indonesia, a ban on bauxite exports commenced in June 2023 reduced Indonesian bauxite production in 2023 by 71% to 6.4 Mt.

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

Production ramp-up in China and India is expected to boost world primary aluminium output by 1.7% year-on-year in 2024 to nearly 71 Mt (Figure 11.4). Growth in China and India is expected to be relatively robust, but weak primary aluminium demand in Europe is preventing curtailed capacity from coming back online.

After 2024, production ramp-up in China, Indonesia and the Middle East is expected to increase global primary aluminium output by 1.2% a year over the outlook period, reaching 75 Mt by 2029 (Figure 11.4). China's primary aluminium production is projected to reach 45 million tonnes by 2029, bringing it to the capacity cap introduced in 2017.

Outside of China, Indonesia's primary aluminium production is projected to rise from 336,000 tonnes in 2025 to 861,000 tonnes in 2029. Inalum's Kuala Tanjung aluminium smelter is expected to finish its expansion from 250,000 tonnes a year to about 275,000 tonnes a year by the end of 2024.

The Gulf Cooperation Council region (including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE) is expected to establish itself as a major aluminium producer over the outlook period. Saudi Arabia has made clear its aspiration to become one of the world's top ten aluminium producers. By the end of 2023, the country has invested US\$12 billion in aluminium related projects to enhance its production capabilities.

World secondary aluminium output is forecast to increase by 5.8% year-on-year in 2024 to 33 Mt, driven by higher output from China (up by 6.1% year-on-year) and the US (up by 12% year-on-year). After 2024, world secondary aluminium output is projected to rise at 4.9% a year, reaching

42 Mt by 2029 (Figure 11.4). In December 2023, Emirates Global Aluminium in the UAE began the construction of a 170,000 tonnes a year aluminium recycling plant. The construction is to be completed in 2026.

World alumina output is forecast to grow by 2.4% year-on-year in 2024 to 145 Mt, driven by rising output from new/existing refineries in China, Brazil and Indonesia (Figure 11.2). After years of delay, Indonesia's 1 Mt a year Inalum alumina refinery is expected to come online in H2 2024.

After 2024, world alumina output is projected to rise by 1.4% a year over the outlook period, reaching 156 Mt by 2029 (Figure 11.2). The gains are forecast to be driven by India and Indonesia. Hindalco's phase one 3 Mt a year Aditya alumina refinery in Odisha, India is expected to start in 2027.

In Indonesia, eight alumina refineries with a combined production capacity of 8.5 Mt are expected to start production from 2024 and onwards. This will include China Aluminium Company and the Indonesian joint-venture partners' 2 Mt a year Mempawah alumina project.

Emirates Global Aluminium in the UAE is planning to build a 1 Mt a year alumina refinery in Guinea, but a start date has not been announced yet.

World bauxite output is forecast to grow by 3.3% in 2024 to 402 Mt (Figure 11.2). Growth has been affected in the short-term by an explosion at the main fuel depots in Guinea and by Indonesia's bauxite export ban, which is having short-term effects on production. After 2024, world bauxite production is projected to increase by 3.2% a year, reaching 464 Mt by 2029 (Figure 11.2). Australia and Guinea are expected to contribute most to this rise.

Emerging aluminium and alumina producers

In the inauguration speech for his second term in 2019, President Widodo committed to pushing for Indonesia's economic transformation from an exporter of raw materials to an exporter of highly competitive products through downstream industry. In line with the President's speech, the country's primary aluminium production is projected to increase from 249,000 tonnes in 2024 to 861,000 tonnes in 2029.

India is expected to get close to overtaking Brazil as the world's third largest alumina producer, after China and Australia, by the end of the outlook period. India's alumina production is projected to rise from 7.9 Mt in 2024 to over 11 Mt in 2029.

Green aluminium, alumina and bauxite

In December 2023, the International Aluminium Institute launched a new initiative that tracks and reports the progress in greenhouse gas reduction of its member companies.

Rio Tinto commenced the construction of a new solar farm and battery storage system for its Amrun bauxite operations in Queensland in December 2023, which is expected to be operational in 2025. Combined with the existing Weipa renewable power generation network, the solar farms are anticipated to reduce diesel consumption by 10 million litres a year and lower greenhouse gas emissions by 28,000 tonnes annually.

In January 2024, the Guinean Government announced a carbon tax on mining companies is under consideration to protect the local environment.

Alcoa announced in February 2024 that it will supply global cable producer Nexans with aluminium produced from the ELYSIS process — a revolutionary process that eliminates all direct greenhouse gas emissions from the traditional smelting process.

In China, the use of green power — wind, solar, hydro, geothermal, ocean, biomass and other forms of renewable energy — has increased rapidly in recent years. In 2015, thermal power accounted for 89% of energy used by Chinese aluminium smelters, and hydroelectric power about 10%. Currently, thermal power usage accounts for around 74% of production, while hydro power usage has increased to around 19%.

In early 2024, Rio Tinto agreed to buy all electricity from the 1.1GW Upper Calliope Solar Farm and 80% of Windlab's 1.4GW Bungaban wind energy project for 25 years to provide renewable power to its Gladstone operations in Queensland. These agreements make Rio Tinto the largest industrial buyer of renewable power in Australia.

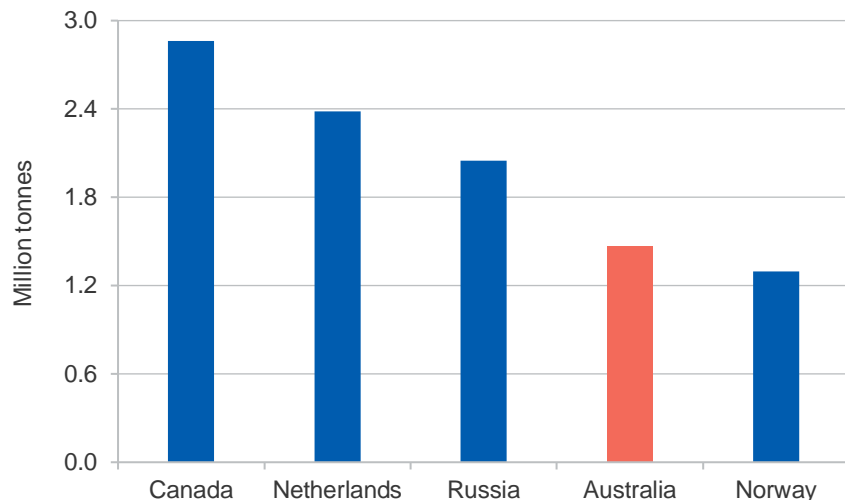
11.4 World trade

Weak aluminium, alumina and bauxite exports in 2023

Lower primary aluminium exports from Europe and West Asia led to a 3.1% fall in global primary aluminium exports in 2023. Primary aluminium exports declined from the Netherlands (- 9.9%), Sweden (-52%) and Turkiye (-33%). Falls in Europe and West Asia were offset in part by rising exports from Australia, Canada, the US, Russia and China. Russian primary aluminium exports rose by 11% in 2023 to over 2.0 Mt.

Figure 11.5 shows the top five global primary aluminium exporters in 2023. Australia ranked fourth and accounted for 10% of global primary aluminium exports. Higher secondary aluminium exports from European countries helped boost global secondary exports to 3.3 Mt in 2023, up 0.2% year-on-year. Falling energy costs in Europe increased primary aluminium output, leading European users to use less secondary aluminium as a substitute.

Figure 11.5: Top five global primary aluminium exporters, 2023



Source: World Bureau of Metal Statistics (2024); ABS (2024) International Trade in Goods and Services, 5368.0

Lower alumina exports from Australia — the world's largest alumina exporter — cut global alumina exports by 5.5% in 2023 (see the Australia section). Figure 11.6 shows the top 5 global alumina exporters in 2023. Australia ranked first, accounting for 42% of global alumina exports.

The Indonesian bauxite export ban which started in June 2023 cut global bauxite exports by 2.0% year-on-year in 2023 to 168 Mt. Figure 11.7 shows the top five global bauxite exporters in 2023. Australia ranked second and accounted for 22% of global bauxite exports.

Guinea's leading bauxite producer and exporter Societe Miniere de Boke plans to invest US\$1 billion over the next five years in export infrastructure to boost Guinean bauxite exports that reached a record of 116 Mt in 2023.

China drove higher global bauxite imports

In 2023, lower primary aluminium imports from Europe and the US led to a 4.6% fall in world primary aluminium imports to 17 Mt (Figure 11.8).

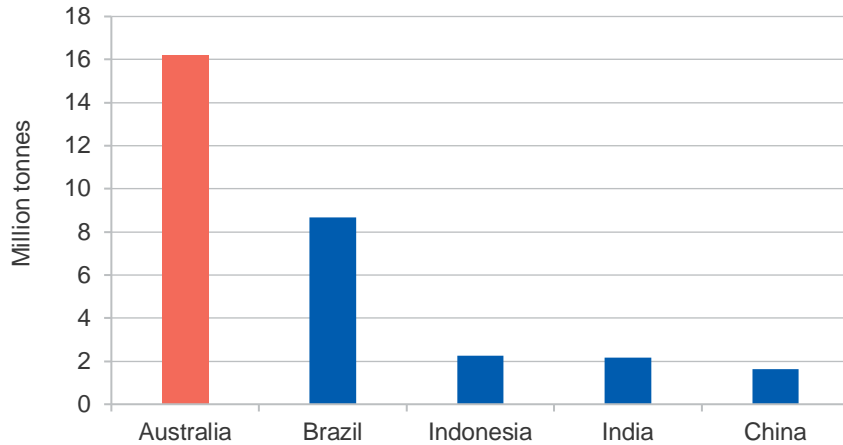
At the end of 2023, the US Government officially extended the suspension of tariffs on European Union (EU) steel and aluminium — a 25% import tariff on EU steel and a 10% tariff on EU aluminium introduced by the Trump Administration in January 2022 — until December 2025.

Higher imports by Germany and the Netherlands boosted world secondary aluminium imports, up 13% year-on-year in 2023 to 3.6 Mt (Figure 11.8). In Germany, secondary aluminium imports rose by 18% year-on-year to 535,000 tonnes in 2023. Over this period, secondary aluminium imports by the Netherlands increased by 16% year-on-year to 507,000 tonnes.

World alumina imports fell by 4.7% year-on-year in 2023 to 32 million tonnes, due to a 9.2% year-on-year fall in alumina imports from China. Imports fell due to higher Chinese alumina production (Figure 11.8).

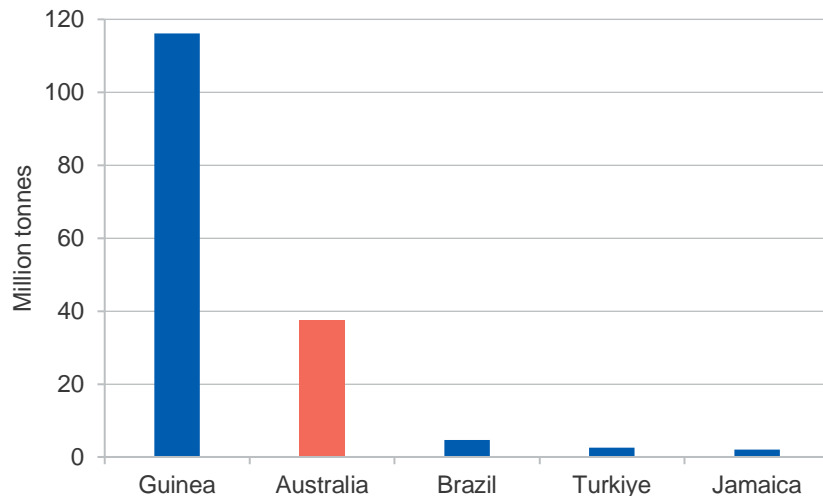
Higher bauxite imports from China — the world's largest bauxite importer — led to a 6.3% year-on-year rise in global bauxite imports to 161 Mt (Figure 11.8). China imported 142 Mt of bauxite in 2023, a 13% year-on-year rise from 2022.

Figure 11.6: Top five global alumina exporters, 2023



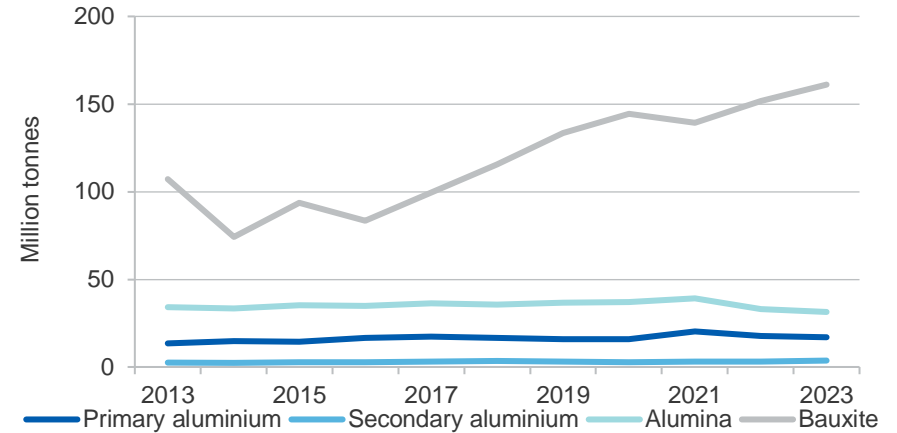
Source: World Bureau of Metal Statistics (2024); ABS (2024) International Trade in Goods and Services, 5368.0

Figure 11.7: Top five global bauxite exporters, 2023



Source: World Bureau of Metal Statistics (2024); ABS (2024) International Trade in Goods and Services, 5368.0

Figure 11.8: World aluminium, alumina and bauxite imports



Source: World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024)

European Union Carbon Border Adjustment Mechanism (EU CBAM)

On 14 July 2021, the European Commission released its draft regulation on the Carbon Border Adjustment Mechanism (CBAM). The draft regulation sets out the policy for the European Union (EU) to tax imports based on the greenhouse gases emitted to make them. The CBAM — the world's first carbon tax on imports — applies to EU imports of iron ore, steel, aluminium, cement, fertiliser, electricity and hydrogen.

After nearly two years of consultation, the EU's parliament approved the CBAM legislation on 18 April 2023. Starting in October 2023, European companies must report the emissions of their imported goods, including the indirect emissions released by the electricity generation that powers overseas factories. European importers will have to pay taxes on the emissions from 2026 and onwards.

The introduction of EU CBAM is unlikely to directly impact Australia's primary aluminium exports. The EU accounted for 0.03% (\$1.6 million) of Australia's total primary aluminium exports in 2023. Over this period, Australia exported \$5.2 billion of primary aluminium; 33% to South Korea, 23% to Japan, 8% to the US, and 7% to Taiwan.

However, the EU CBAM is likely to impact global primary aluminium trade from 2026 and onwards. Figure 11.9 shows major primary aluminium suppliers (Russia, Turkiye, the UAE, India and China) to the EU and their emission intensity. The EU CBAM is likely to have minimal impacts on Russian and Turkiyen primary aluminium exporters as Russia and Turkiye have a relatively low carbon footprint.

The EU CBAM is likely to have large impacts on Indian and Chinese primary aluminium exporters as India and China have a high carbon footprint. India does not have a carbon tax or emission trading scheme (ETS) that can be used as a partial offset for the EU CBAM. In China, the relocation of aluminium smelters to the Southern provinces, where cheap hydropower is available, is expected to bring down the emission intensity of Chinese primary aluminium producers and boost their competitiveness in exporting primary aluminium into the EU. As a result, primary aluminium exports from Russia and Turkiye to the EU are expected to remain the same or increase when the CBAM commences in 2026. In contrast, primary aluminium exports from India and China to the EU are expected to fall, unless the emission intensity is reduced in India and China.

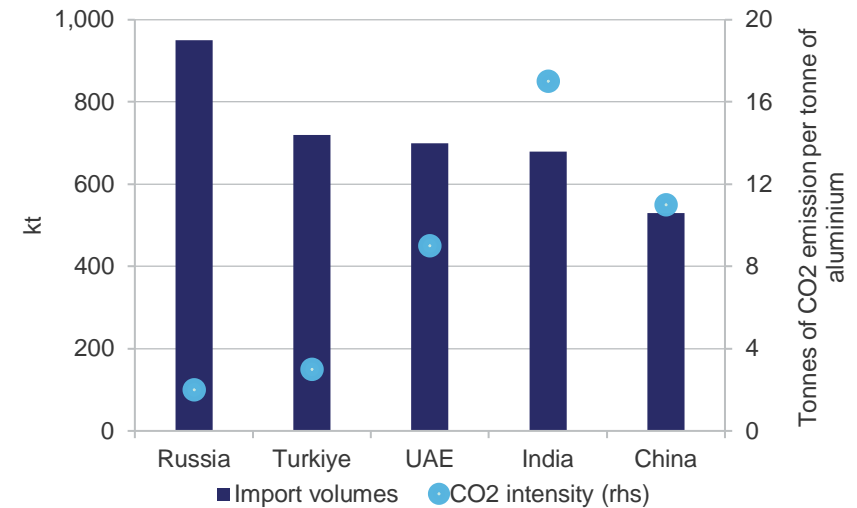
11.5 Prices

Aluminium prices fell sharply in 2023

Sluggish primary aluminium demand in Europe and the rise of Russian aluminium in the London Metal Exchange (LME)'s warehouses outweighed the impacts on aluminium prices of supply disruptions in China's Yunnan province. The LME spot price for primary aluminium fell by 19% year-on-year in 2023, averaging US\$2,299 a tonne in real terms.

LME stock changes reflect the sluggish ex-China primary aluminium demand, rising from 407,325 tonnes in January 2023 to 549,050 tonnes in December 2023. Shanghai Future Exchanges aluminium stock changes reflect the supply issues in Yunnan, falling from 226,395 tonnes in January 2023 to 99,029 tonnes in December 2023. LME off-warrant stocks reflect the rise of Russian aluminium stocks, rising from 385,752 tonnes in January 2023 to 436,113 tonnes in December 2023 (Figure 11.11).

Figure 11.9: Major primary aluminium suppliers to the EU and emission intensity



Source: ING, *How the EU's carbon border tax will affect global metals trade* (2 May 2023)

The free on board (FOB) Australian alumina price fell by 9.2% year-on-year in 2023 to US\$352 a tonne in real terms (Figure 11.10).

Prices remain unchanged in real terms in 2024

In 2024, Chinese primary aluminium demand is expected to strengthen amid stimulus policies and a push for energy efficient cars and technologies. Demand for aluminium in the Western markets is subject to the US Federal Reserve and the European Central Bank decisions on interest rates. A lower interest rate environment will boost higher aluminium demand. On the supply side, the level of Russian aluminium in LME warehouses and the possibility of an LME ban on Russian aluminium will push aluminium prices upward. The absence of new measures on Russian aluminium in the latest US sanctions on Russia announced on 23 February 2024 has put downward pressure on aluminium prices. On balance, the LME aluminium spot price is forecast to be unchanged in 2024, averaging US\$2,299 a tonne in real terms (Figures 11.10).

An improvement in global demand and Kwinana's curtailment are expected to support alumina prices. The free on board (FOB) Australian alumina price is forecast to rise by 0.7% year-on-year in 2024 to average US\$347 a tonne in nominal terms. As inflation remains high in Western economies, the real FOB Australian alumina price is forecast to fall by 1.5% year-on-year in 2024 to average US\$347 a tonne (Figure 11.10).

Aluminium market distorted as buyers shun Russian aluminium

An influx of Russian primary aluminium into LME warehouses may not have the usual impact on LME primary aluminium prices. By the end of January 2024, Russia's share of LME on-warrant stock reached 90% (Figure 11.12). As more and more consumers opt not to purchase Russian primary aluminium, a further increase of Russian aluminium LME stocks is expected. However, these stocks may disguise underlying shortages.

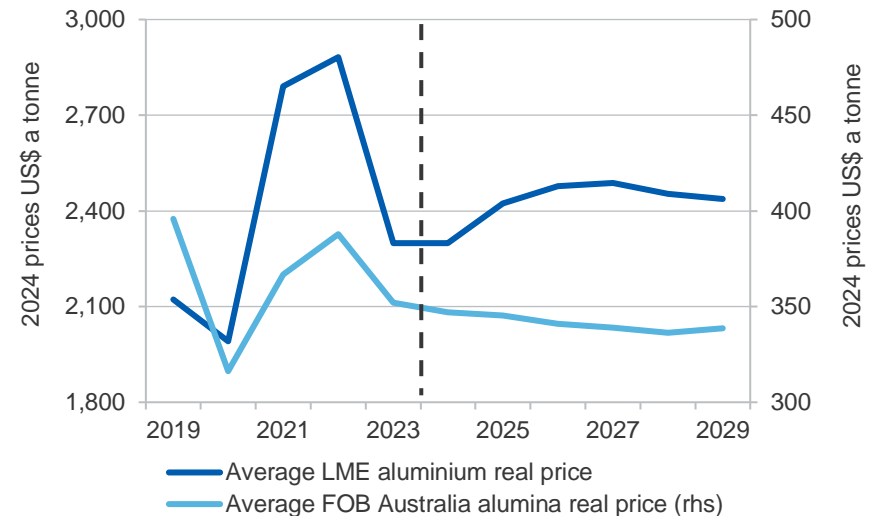
More sanctions on Russian aluminium

The prospects of more sanctions on Russian aluminium from Western countries are likely to cause some bifurcation of base metal markets and could raise the volatility of aluminium prices. Effective from 15 December 2023, the UK Government prohibited its citizens from acquiring, importing, supplying and delivering Russian origin metal, including aluminium. If any person or company buys LME warranted Russian primary aluminium, they can only hold and sell that metal, not take physical delivery or re-warrant in the LME system.

On 18 December 2023, the European Council imposed a new sanction package targeting imports of Russian aluminium wire, foil, tube and pipe. This new sanction has no direct impacts, as the LME only trades primary aluminium (unformed products). Nonetheless, European Aluminium has called for the sanctions to be extended to Russian primary aluminium.

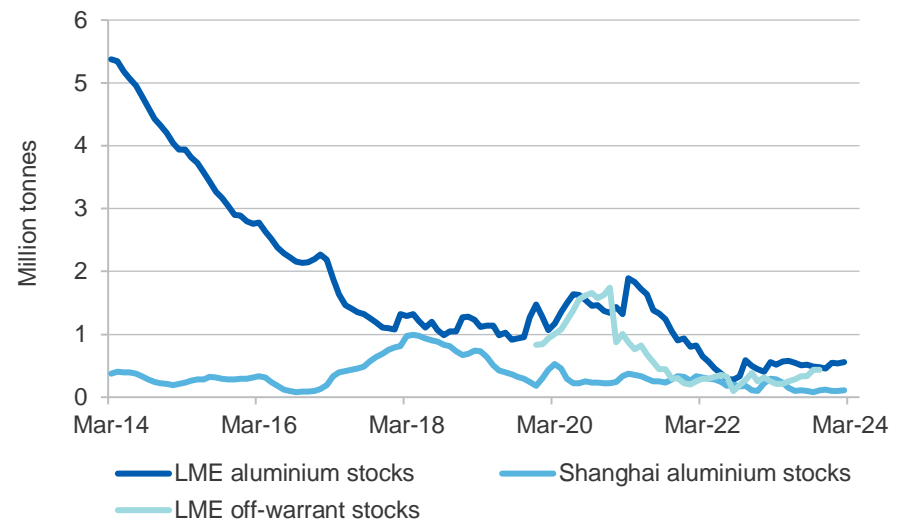
Western sanctions on Russian primary aluminium risk a build up of aluminium inventories in the short term. China has limited need for Russian aluminium shunned by Western nations. Indian and other nations accepting Russian exports are unlikely to take all Russian aluminium exports currently being exported to Western nations.

Figure 11.10: Primary aluminium and alumina prices



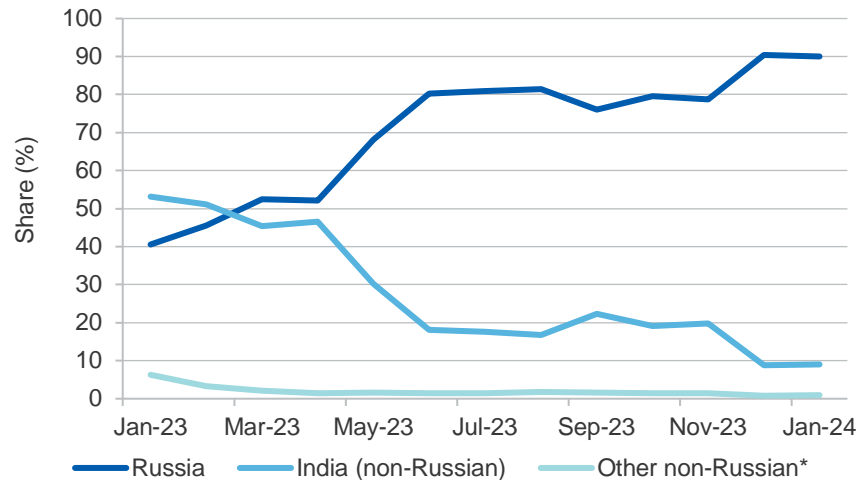
Source: LME (2024); Department of Industry, Science and Resources (2024)

Figure 11.11: Exchange aluminium stocks



Source: London Metal Exchange (2024); Bloomberg (2024)

Figure 11.12: LME on-warrant primary aluminium stocks



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 (2024)

Higher aluminium prices over the outlook period

After 2024, the LME aluminium price is projected to rise to average US\$2,437 a tonne in real terms in 2029 (Figure 11.10). Growing demand for new, energy-efficient cars and technologies will boost aluminium usage. This is projected to see the FOB Australian alumina price average US\$339 a tonne in real terms in 2029 (Figure 11.10).

11.6 Australia's exports and production

Record bauxite exports in the December quarter 2023

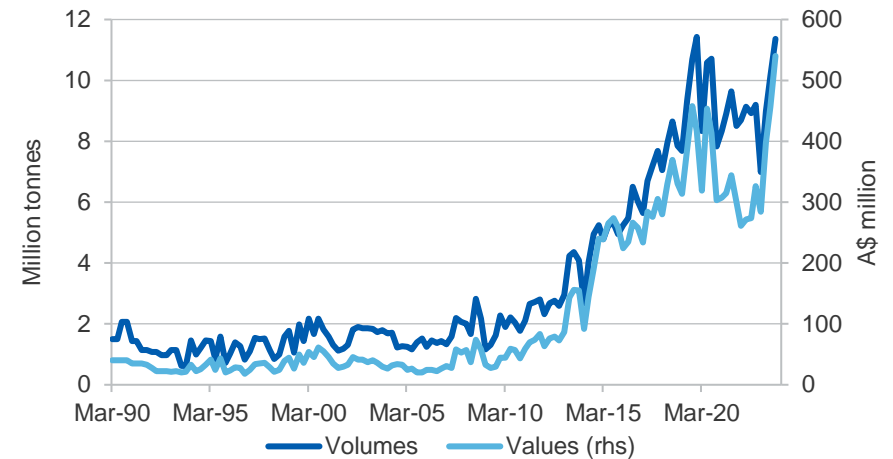
A 16% year-on-year fall in the LME aluminium price in 2023 and a 5.3% year-on-year fall in the Australian FOB alumina price in 2023 reduced Australian aluminium, alumina and bauxite export values by 8.4% year-on-year in 2023 to \$16.6 billion in real terms.

Australian alumina export volumes fell by 5.7% year-on-year to 16 million tonnes in 2023. Australian alumina export values fell by 12% year-on-year

over the same period to \$8.5 billion in real terms.

The Indonesian ban on bauxite exports boosted Australian bauxite export volumes and values by 4.3% (to 37 Mt) and 48% (to nearly \$1.7 billion) year-on-year in 2023, respectively. In the December quarter 2023, Australia had record export earnings — more than \$0.5 billion (Figure 11.13) — of which 98% to China.

Figure 11.13: Australia's bauxite exports, quarterly



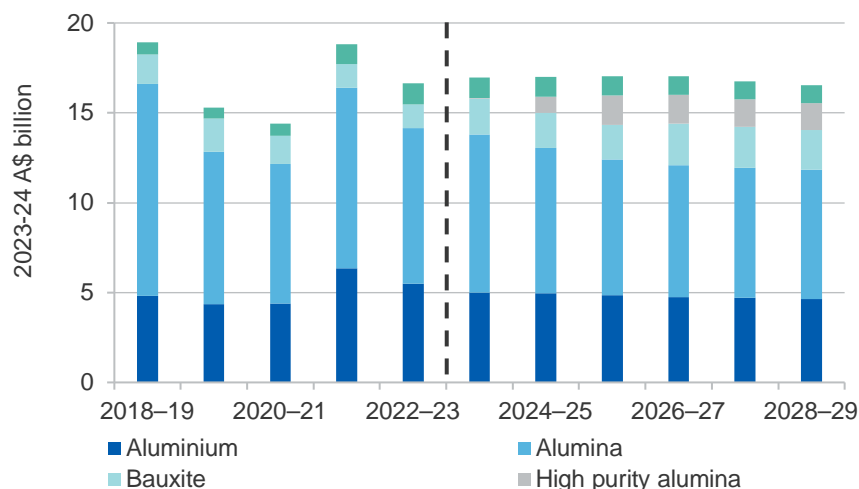
Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024).

A strong earnings year for Australia's AAB exports in 2023–24

An expected rise in bauxite exports in 2024 is likely to boost Australia's aluminium, alumina and bauxite (AAB) export earnings to \$17 billion in real terms in 2023–24 (Figure 11.14).

Disruptions to bauxite exports from Guinea are expected. In Guinea, bauxite mines are dependent upon diesel for their operations. Damage to a major oil depot in Guinea from an explosion in December 2023 is likely to take more than two years to repair. As the world's 2nd largest bauxite exporter, Australia is in the box seat to fill the loss of bauxite from Guinea. In China's Guangxi province, alumina refineries are encouraged to use imported bauxite with preferential support from the local government.

Figure 11.14: Australian aluminium/alumina/bauxite exports



Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

After 2023–24, Australia’s AAB exports are projected to be about \$17 billion a year in real terms over the outlook period (Figure 11.14). The Australian bauxite industry is expected to earn \$2 billion in exports by 2026–27. It is estimated that high purity alumina (HPA) will add about \$1.5 billion to Australia’s AAB exports from 2025–26 and onwards.

Australia’s primary aluminium and bauxite production rose in 2023

An improved operating performance from Rio Tinto’s aluminium smelters led to a 3.0% year-on-year rise in Australian primary aluminium output in 2023 to 1.56 Mt. Over this period, production at Boyne Island aluminium smelter in Queensland rose by 10% year-on-year to 496,000 tonnes.

Planned maintenance at Worsley alumina refinery and approval delays at Alcoa’s refineries in Western Australia reduced Australian alumina output by 3.9% year-on-year to 18.8 Mt in 2023.

A production ramp-up at Metro Mining’s Bauxite Hill mine lifted Australian bauxite output, up by 3.3% year-on-year in 2023 to nearly 104 Mt.

Higher bauxite output over the outlook period

No expansions or major disruptions are expected at existing aluminium smelters in Australia over the outlook period. Australia’s primary aluminium output is projected to be around 1.6 Mt a year.

In mid-December 2023, Alcoa received an approval from the Western Australia Government to continue mining bauxite in WA.

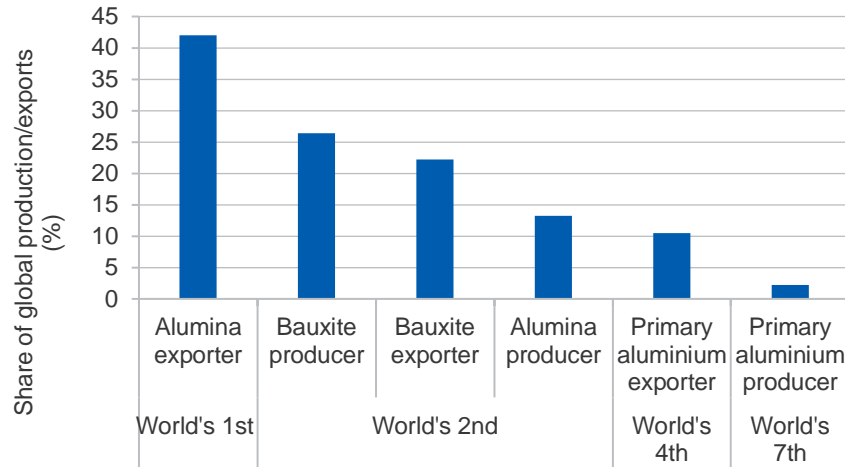
Rio Tinto’s Gove bauxite mine in WA is expected to continue until 2030. Mine expansion and new mine are expected to boost Australian bauxite output to 122 Mt by 2029. These include the expansion of Metro Mining’s Bauxite Hills mine in Queensland from 3.5 million tonnes a year to 7 million tonnes a year (expected to be commissioned in 2024) and the commissioning of Glencore Bauxite Resources’ and Mitsubishi’s 8.0 million tonnes a year Aurukun bauxite project in Queensland.

Alumina output to fall from 2024–25

In January 2024, Alcoa announced its decision to fully curtail its 2.2 Mt a year Kwinana alumina refinery in WA by the end of the June quarter of 2024 amid rising costs, ageing plant and grade challenges. This curtailment is likely to reduce Australian alumina output from 19.4 Mt in 2023–24 to 18.6 Mt a year from 2024–25 and beyond. Despite the production curtailment at Alcoa’s Kwinana alumina refinery, Australia remains the world’s second largest producer of alumina and the world’s largest exporter of alumina.

In early January 2024, the Australian Government announced the inclusion of aluminium on the Strategic Materials List. The list contains minerals that are important to the global transition to net zero, for which Australia has potential for resources, and in demand. Australia is one of few countries in the world that has an integrated aluminium value chain - bauxite mining, alumina refining, aluminium smelting and downstream manufacturing. It is a key global producer and exporter of primary aluminium, alumina and bauxite (Figure 11.15).

Figure 11.15: Australian world ranking, 2023



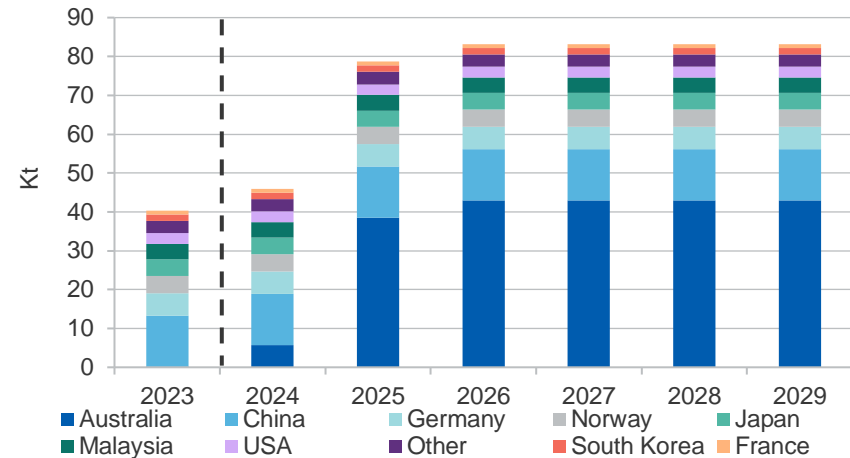
Source: World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024)

Australia: likely the world's largest high purity alumina producer in 2025

The addition of HPA to Australia's critical minerals list in 2022 reflects its growing economic and strategic importance. HPA is used in the aerospace and automotive sectors, and is an important component of high-performance electronics and optics. HPA is also a key input for ensuring the stability of lithium-ion batteries. As the world's second-largest producer and the world's largest exporter of smelting grade alumina, Australia is well placed to build capacity in HPA. Australia is expected to overtake China as the world's largest HPA producer by 2025, with 49% of world output (Figure 11.16).

Alpha HPA is expected to release a definitive feasibility study for its \$300 million Stage 2 First Project in the March quarter 2024. This comes after Stage 1 of the project reached commercial production in late 2022. Queensland Pacific Metals' \$82 million Lava Blue HPA Project is expected to start commercial production in 2025. The pre-feasibility study of Lake Hope's \$65 million HPA Project in Western Australia is expected to be completed in late 2024.

Figure 11.16: World's high purity alumina production



Source: Altech Chemicals (2020), *White paper: The global high purity alumina market*; CRU (2020), *High purity aluminium: A steady developing industry promoted by high-tech*; Department of Industry, Science and Resources (2024)

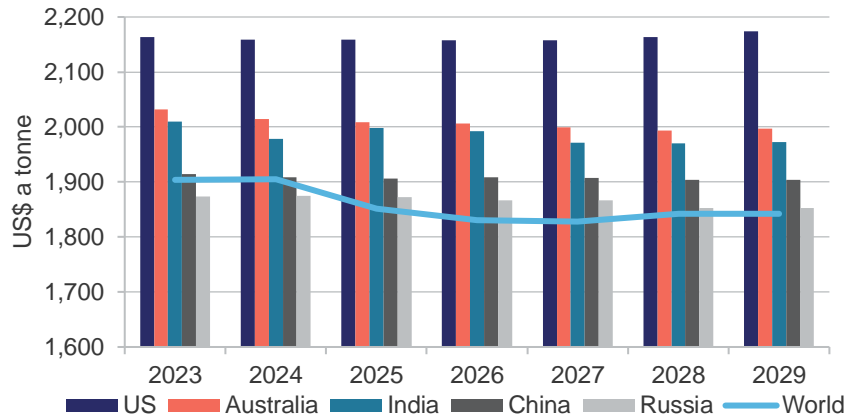
Australian alumina and bauxite producers have comparatively low costs

Figure 11.17 shows the operating cash costs of aluminium smelters in select major primary aluminium producing nations. Australian smelters' operating costs are above the world average of US\$1,905 a tonne in 2024, and those in India, China and Russia.

Figure 11.18 shows the operating cash costs of alumina refineries in selected major alumina producing nations. Australian refiners' operating costs are below the world average of US\$297 a tonne in 2024, and those in Russia, China and Brazil.

Figure 11.19 shows the operating cash costs of bauxite mines in selected major bauxite producing nations, Australia, Guinea, China, Indonesia and Brazil. Australian miners' operating costs are below the world average of US\$20 a tonne in 2024, and those in China, Guinea, Brazil and Indonesia.

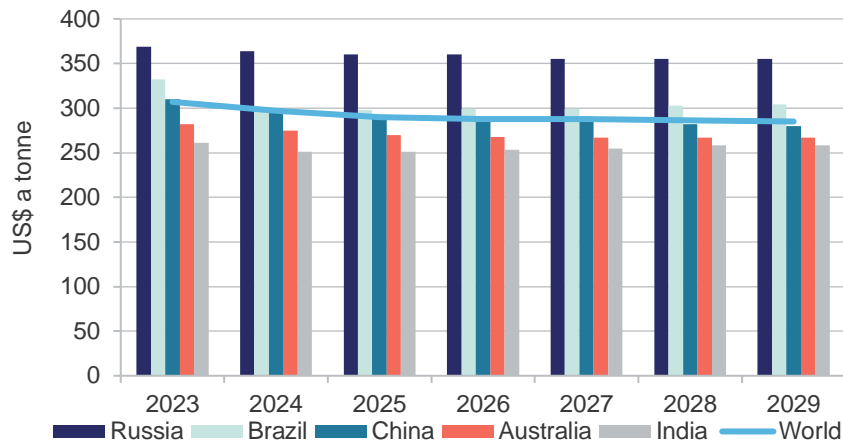
Figure 11.17: Aluminium smelter total operating cash costs



Notes: Total operating cash costs include average delivered alumina cost, carbon and other raw materials, consumables, labour, repair and maintenance materials, services and other cost, and total energy.

Source: Wood Mackenzie (2024)

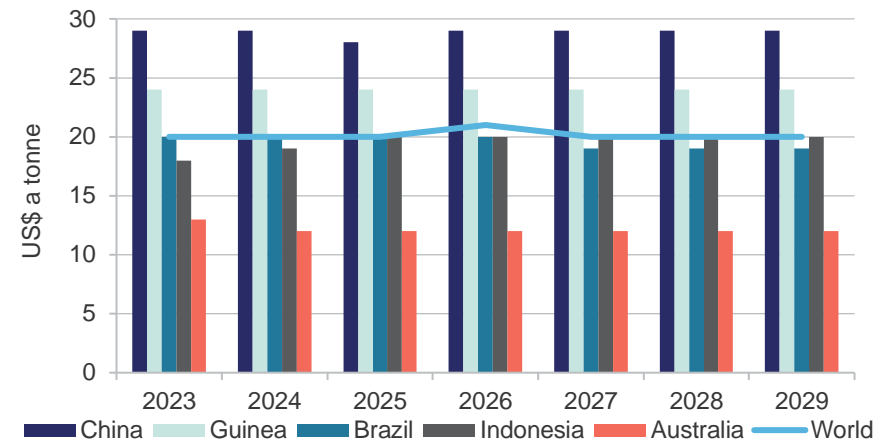
Figure 11.18: Alumina refinery total operating cash costs



Notes: Total operating cash costs include bauxite, freight, caustic/lime/limestone/ash, total energy, labour, and other costs.

Source: Wood Mackenzie (2024)

Figure 11.19: Bauxite mine total operating cash costs



Notes: Total operating cash costs include diesel, residual fuel, labour, consumables, other materials, services, bauxite levy, royalties and taxes.

Source: Wood Mackenzie (2024)

Revisions to the outlook

The forecast for Australia’s AAB export earnings in 2023–24 has been revised up from the December 2023 *Resources and Energy Quarterly (REQ)* — by \$478 million. The revision reflects a stronger than expected rise in bauxite exports in the December quarter 2023. Compared with the March 2022 REQ, forecast Australian earnings in 2027–28 (in nominal terms) has been revised down by 2.6% to \$18.9 billion. This reflects the impacts of Kwinana’s alumina production curtailment on alumina export volumes.

Table 11.1: Aluminium, alumina and bauxite outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
Primary aluminium									
Production	kt	69,759	70,963	72,409	73,521	74,705	75,060	75,487	1.3
Consumption	kt	69,184	72,326	75,156	77,738	80,272	83,355	86,526	3.8
Prices aluminium^c									
- nominal	US\$/t	2,249	2,299	2,470	2,580	2,644	2,663	2,700	3.1
- real ^d	US\$/t	2,299	2,299	2,424	2,478	2,488	2,454	2,437	1.0
Prices alumina spot									
- nominal	US\$/t	344	347	352	355	360	365	375	1.4
- real ^d	US\$/t	352	347	345	341	339	336	339	-0.6
Australia	Unit	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^r
Production									
Primary aluminium	kt	1,532	1,571	1,561	1,561	1,561	1,561	1,561	0.3
Alumina	kt	18,971	19,445	18,484	18,564	18,564	18,564	18,564	-0.4
Bauxite	Mt	98.5	107.8	106.4	106.4	122.4	122.4	122.4	3.7
Consumption									
Primary aluminium	kt	151	150	126	126	126	126	126	-3.0
Exports									
Primary aluminium	kt	1,440	1,462	1,483	1,483	1,483	1,483	1,483	0.5
- nominal value	A\$m	5,281	4,985	5,108	5,129	5,168	5,248	5,309	0.1
- real value ^e	A\$m	5,494	4,985	4,951	4,837	4,756	4,711	4,650	-2.7
Alumina	kt	16,566	17,165	16,636	16,708	16,708	16,708	16,708	0.1
- nominal value	A\$m	8,308	8,826	8,370	8,023	7,977	8,064	8,215	-0.2
- real value ^e	A\$m	8,642	8,826	8,112	7,567	7,340	7,239	7,195	-3.0
Bauxite	kt	34,113	43,237	43,492	43,492	50,212	50,212	50,212	6.7
- nominal value	A\$m	1,284	1,987	1,987	2,023	2,517	2,517	2,517	11.9
- real value ^e	A\$m	1,335	1,987	1,926	1,908	2,316	2,260	2,205	8.7
Total value									
- nominal value	A\$m	16,005	16,967	17,535	18,061	18,511	18,678	18,890	2.8
- real value ^e	A\$m	16,649	16,967	16,996	17,035	17,033	16,768	16,544	-0.1

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 2024 calendar year US dollars; **e** In 2023–24 financial year Australian dollars; **f** Forecast; **r** Average annual growth between 2023 and 2029 or 2022–23 and 2028–29; **z** Projection; Source: ABS (2024) International Trade in Goods and Services, 5368.0; Bloomberg (2024); London Metal Exchange (2024); Department of Industry, Science and Resources (2024); World Bureau of Metal Statistics (2024)

Copper



Australia's copper sector



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

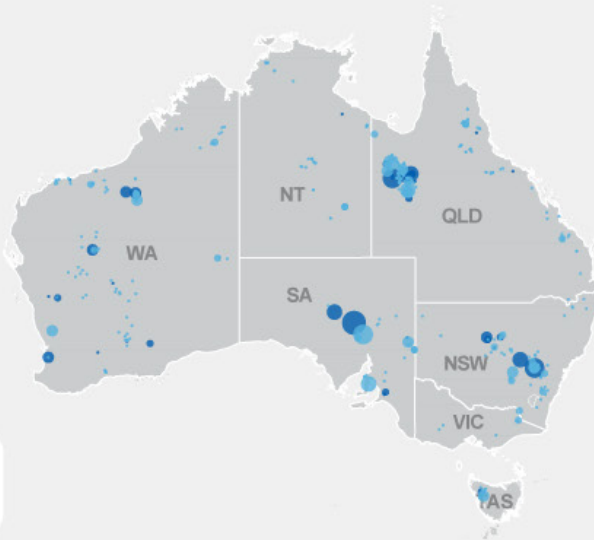


**4th largest
exporter** and **8th
largest producer**
globally, 2022



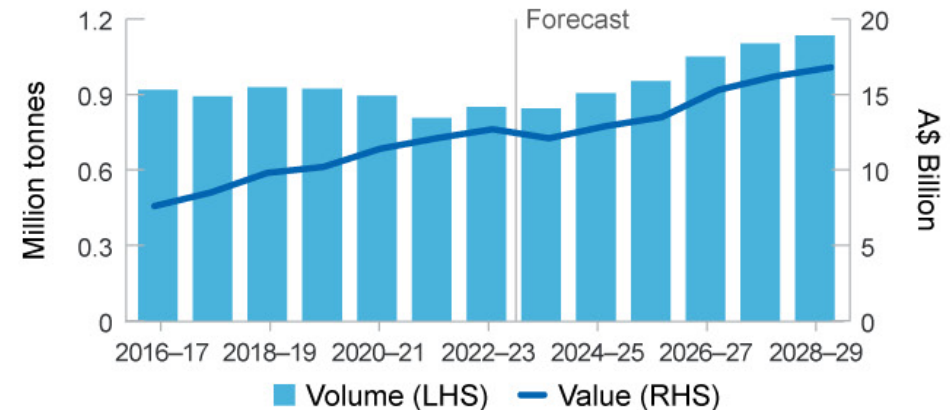
**200k tonnes
produced** per year
at Australia's largest
mine, Olympic Mine

- Deposit
- Operating mine
- <0.01
- 0.02
- 0.03–0.8
- 0.9–2.1
- 2.2–6.8
- >6.9



**Major copper
deposits, Mt**

Australian copper exports



Outlook



Prices **trending down**
through 2023-24 but will
pick up from H2 2024
and grow over outlook



Export earnings stable
at **\$12.1 billion** and will
grow ~5% annually
over the outlook period



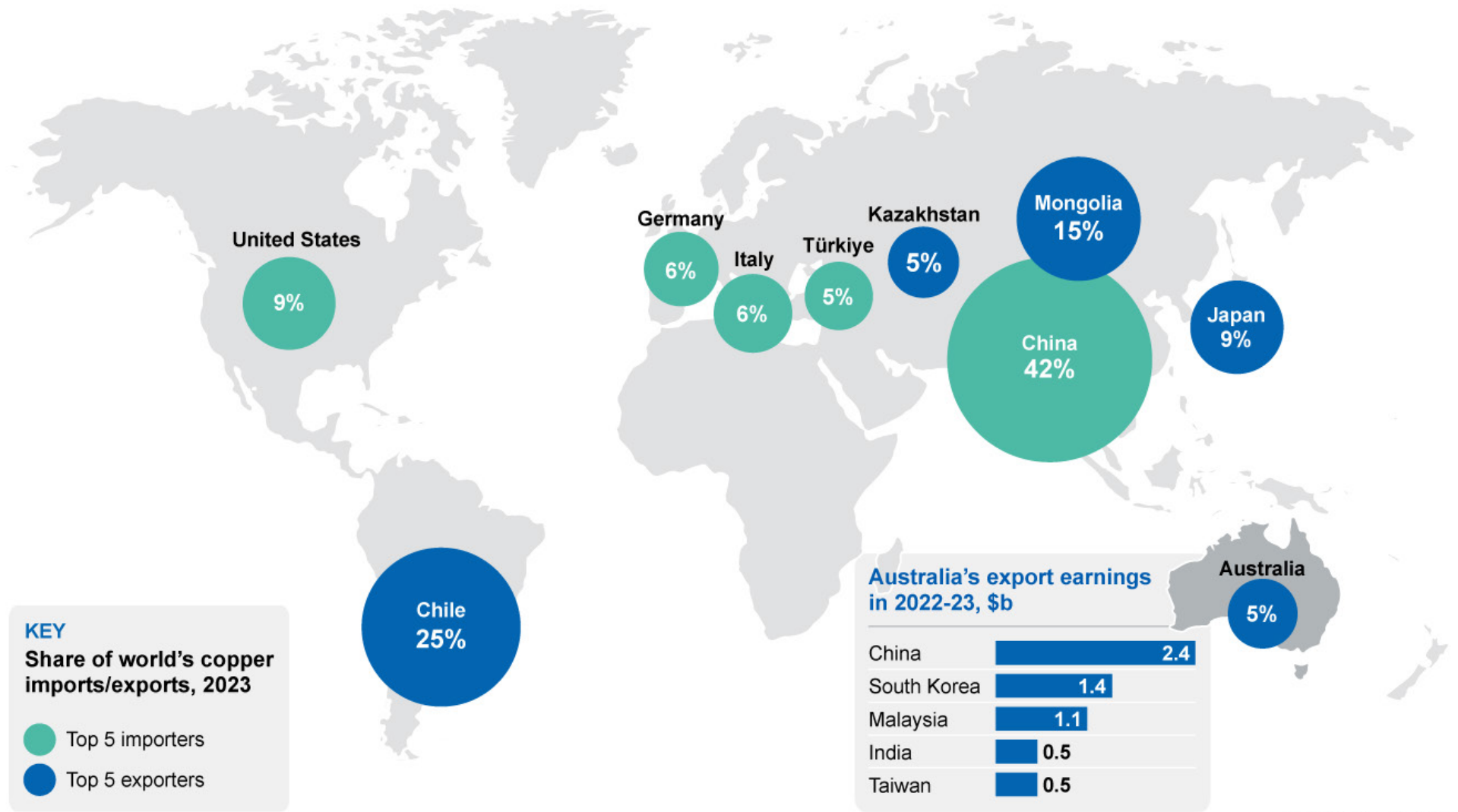
Exports to increase as
supply disruptions ease,
and growing production
over the study period



Exploration
expenditure **continues**
to trend higher toward
end of 2023

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

- Despite significant growth in copper consumption in China, copper prices trended down throughout 2023 and into 2024. The fall in copper prices was driven by weakness in construction and manufacturing in advanced economies including US, EU, and Japan. The benchmark LME copper price is estimated to average about US\$8,340 a tonne in 2024 but is expected to rally and reach US\$9,200 a tonne in 2029 (real terms).
- Global mined and refined copper production are expected to grow by 2.4% and 2.0% in 2024, respectively. This growth will be driven by a combination of starts of new greenfield projects, a rise in production capacity, and increasing automation of certain production processes.
- Australian copper export earnings are forecast to reach \$12.1 billion in 2023–24. Higher export volumes and rising prices are expected to see real export earnings reach \$16.8 billion in 2028–29.

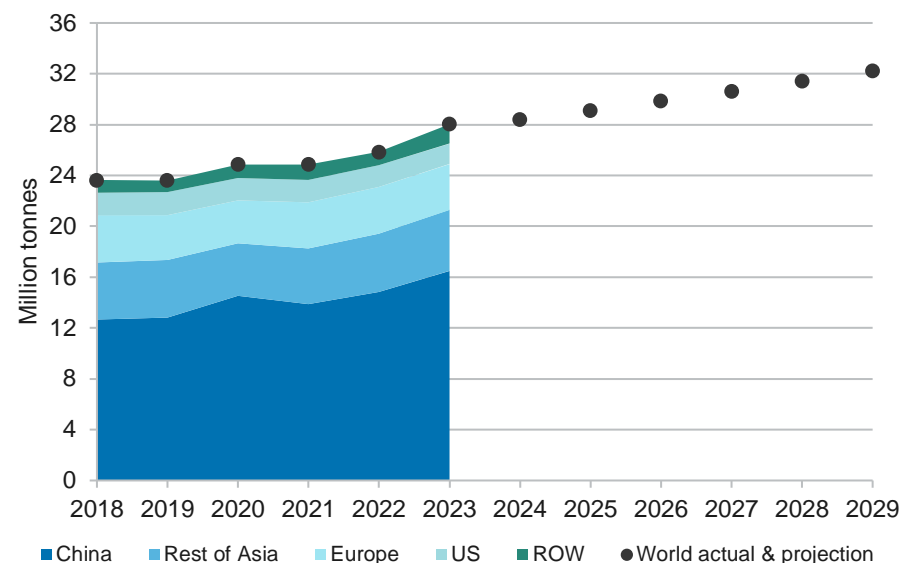
12.2 World consumption

Robust growth in world copper demand in 2023, driven by China

World refined copper consumption grew 8.5% in 2023, to reach just over 28 million tonnes (Mt) (Figure 12.1). This continued a solid, post-COVID recovery of 4.1% growth in annual global demand since 2021. China was the major contributor to growth in demand in 2023, rising by 11% over the period. This helped to offset falls in refined copper consumption in the US, and the EU by 6.4% and 2.4%, respectively.

Global copper consumption is forecast to grow by 1.3% in 2024 to reach 28.4 Mt. Key end use sectors such as property construction (in China and Europe) and manufacturing (in Europe) are expected to remain weak in the near term. However, resilient conditions in other parts of the global economy (especially the US), as well as a broader trend of infrastructure investment globally, are expected to drive solid growth in demand in 2024. Beyond 2024, global consumption is expected to rise by 2.2% per annum over the outlook period to reach about 32 Mt in 2029. Clean energy applications (such as electric vehicles and low emissions power generation) and grid infrastructure will drive growth.

Figure 12.1: Refined copper actual consumption & projection



Source: World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024)

New energy applications driving China's copper demand

Despite the ongoing downturn in the real estate sector, China's copper usage was strong in 2023. Strong manufacturing activity and infrastructure spending helped boost copper demand. This included a 46% rise in EVs production in 2023, an increasingly important global end user of copper.

China's refined copper consumption is projected to grow 1.9% during the outlook period. A key driver of growth in copper consumption is expected to be the transportation and clean energy manufacturing. This will include continued growth in domestic purchases of EVs — with the Chinese Government last year announcing an extension of the tax-exemption on purchased EVs until 2027 — as well as the ongoing export of these vehicles to international markets.

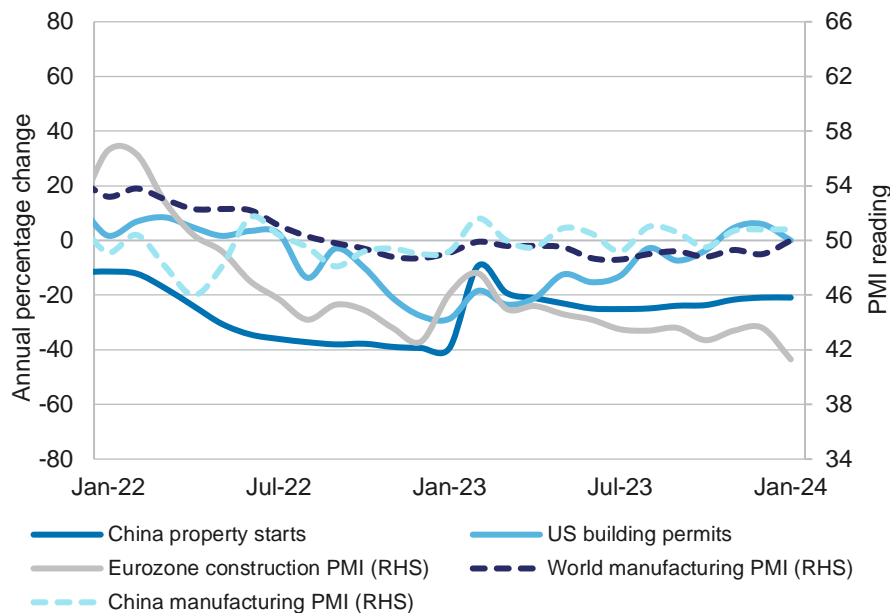
Low emissions power generation and transmission is also expected to be a major growth engine for China's copper demand in coming years. As

part of the Chinese Government’s ‘dual carbon’ targets announced in 2020, the country set a target of 1,200 GW of renewable power capacity by 2030). However, recent trends suggest the country could meet this target by 2025, demonstrating the significant investment the country is continuing to make in copper-intensive energy infrastructure.

Slower outlook for global (ex. China) in manufacturing, and construction

Most advanced economies outside of China experienced weakening manufacturing and construction activity through much of 2023, impacting ex-China world demand. Leading indicators in early 2024 suggest a slight improving for select economies such as the US and South Korea. This has helped to see a return to positive territory for JP Morgan’s Global Manufacturing PMI in February, with a reading of 50.3 (Figure 12.2).

Figure 12.2: Leading global indicators for copper



Source: Bloomberg (2024)

However, a more moderate outlook for economies such as Europe and Japan are expected to contain ex-China growth in copper demand to relatively modest levels. Industrial production continued to fall in both the Eurozone and Japan in early 2024, while US output lifted according to the PMI report in February 2024. The Eurozone Manufacturing PMI rose in February 2024 but remained in contractionary territory.

Global construction activity — which accounted for about 26% of world copper demand in 2022 — has helped to mitigate ongoing weakness in ex-China manufacturing. By sector, infrastructure construction has helped resource demand, while tighter financial conditions have dented 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. The outlook for the Asia region remains mixed, with a strong outlook for India and Philippines offsetting weaker expectations for China.

Challenges still remain with European manufacturing and construction

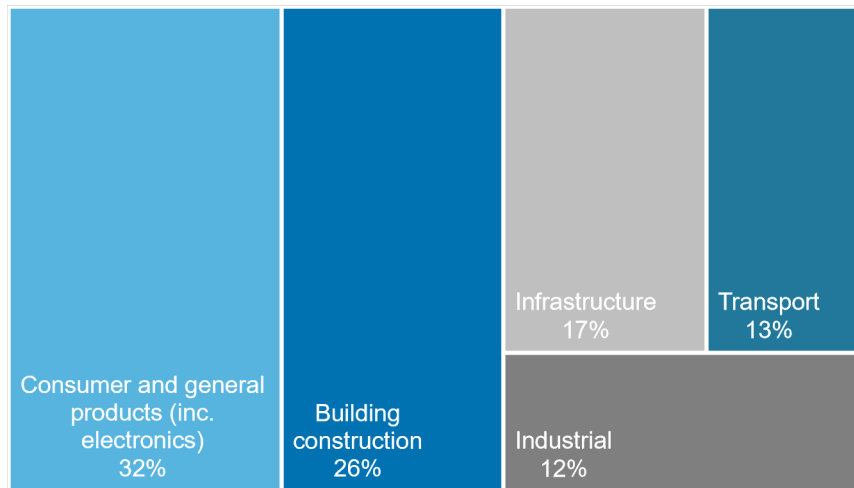
European copper consumption in December 2023 was 2.4% lower year-on-year. This reflected weakness in the manufacturing and construction sectors. Although the manufacturing PMI improved in February 2024, the index remained in sub-50.0 (contractionary) territory.

The European construction sector faces further near-term challenges. Monetary policy is restrictive, housing construction expected to reduce more, prices for construction materials remain high and with labour shortages in some EU countries. The Eurozone construction PMI total activity index showed rose (to 42.9) in February 2024 but remained in contractionary territory where it has been for more than twenty months.

US manufacturing shows improvement, and a healthy long-term outlook

The US manufacturing PMI posted 52 in February 2024, up from 50.7 in January. The improvement came from higher new orders, and stronger output expectations in the year ahead; employment rose for the first time since September 2023.

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 (2024)

Business confidence jumped to a 21-month high in January 2024. Rising input costs, supply disruptions, and transaction delays continue to be the major concerns for producers. Due to higher input costs, the output prices are expected to rise as firms seek to pass on higher costs to customers. As the domestic demand grows, the country's goods producers recorded a marginal drop in output in January 2024.

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.

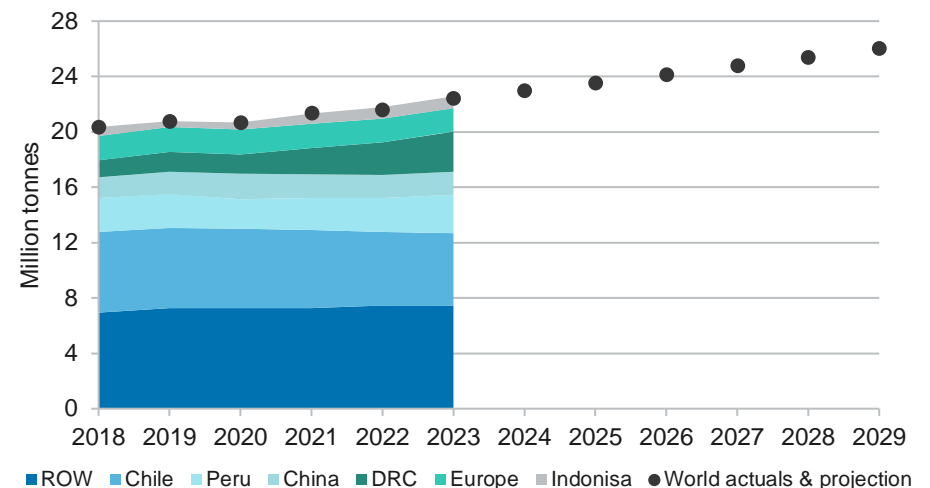
12.3 World production

Stable growth in global mine supply, despite ongoing operational risks

Global mined copper output grew by 3.8% to reach 22.4 Mt in 2023.

Amongst major producers, Peru, and the Democratic Republic of Congo (DRC) saw significant production growth in 2023, up by 13% and 22%, respectively, while Chile — the world's largest producer — saw copper output fall by 1.5%, due to a combination of operational issues (discussed in detail below), project holdups and continued social unrest.

Figure 12.4: Major copper mine actual production & projection



Source: World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024)

Chilean copper production in 2023 was impacted by a number of issues, including adverse weather, equipment and technical issues, community action, and lower grades from many existing operations. Codelco (Chile's largest copper miner) reported an 8.3% fall in production in 2023, to total 1.424 Mt over the period. The company continued to be impacted by its high debt levels (delaying a number of its sustaining and expansion projects) as well as poorer weather, and lower grades at its existing operations.

The fall in Codelco's copper output in 2023 was partially offset by higher output from other major Chilean copper mines (such as Escondida and Collahuasi). BHP's joint venture, Escondida recorded a growth in total production in 2023 of 4.5% to reach 88,500 tonnes. While the Glencore-Anglo-American JV, Collahuasi, grew by 0.4% to reach 60,300 tonnes.

Peruvian mine output grew by 13% in 2023 to reach 2,755,000 tonnes. This included higher output from Quellaveco, the nation's newest major copper mine, expected to produce 300,000 tonnes of copper equivalent per year on average over the period.

Among other major producers, Panama's mined copper output fell by 5.5% in 2023, following closure of its biggest mine, Cobre Panama, due to community opposition.

Mined copper to grow 2.4% in 2024, and 2.6% annually to 2029

Global mine output is forecast to grow by 2.4% in 2024 to reach about 23 Mt, and by 2.6% to 26.1 Mt by 2029 (Figure 12.4). Growth over the outlook period is slightly slower compared to the last 5 years, mainly due to declining ore grades, geopolitical instability, environmental challenges, weather, and logistical issues. Over the rest of outlook period, global mined copper output will rise by 2.6% per annum through 2029. The major contributors to this growth will be Chile and the DRC.

The DRC is expected to add around 450,000 tonnes in new annual capacity over the outlook period. Growth in DRC production reflects significant Chinese investment made in many of the country's copper projects in recent years, including the Tenke Fungurume expansion, Kamoto's Katanga mine, the Kansanshi S3 expansion and critically, the 650,000 tonnes per annum Kamo-Kakula project (joint owned by Zijin Mining Group, Ivanhoe mines, the DRC, and Crystal River Global).

Chile is expected to add around 500,000 tonnes of mined capacity over the outlook period, including 300,000 tonnes from 2024 with the ramp up of Quebrada Blanca. Codelco's Chuquibambilla underground mine is also expected to continue to ramp up over the next few years, to reach a peak of 300,000 tonnes annual production by 2029. Escondida — the world's

largest copper mine — is expected to maintain output near current levels of close to 1 Mt a year.

One of Peru's largest existing mines, Antamina, received environmental approval for an expansion in H2 2023. This will see construction begin in 2024 and project aimed at extending mine life (from 2028 to 2036).

Mine production capacity in China is also expected to increase from 1.9 Mt in 2023 to a peak of 2.2 Mt in 2027, coming from operations including Qulong and Yulong.

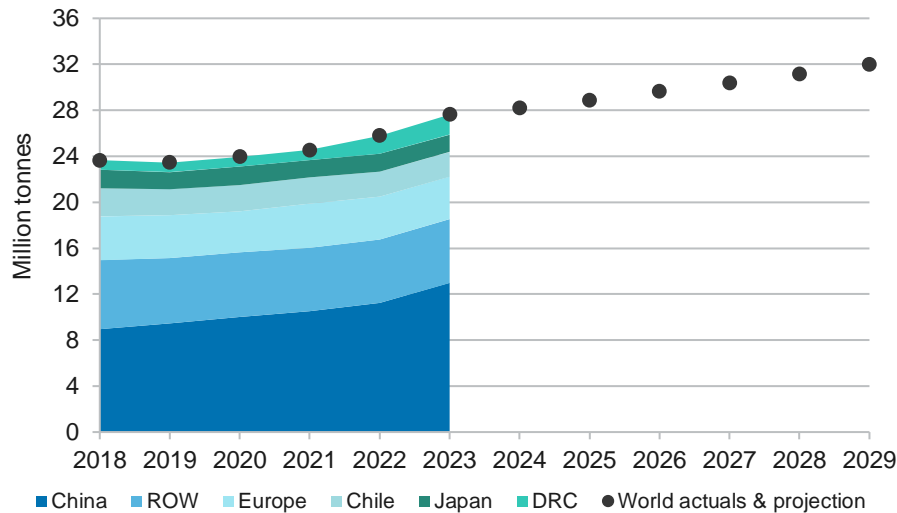
Rising AI applications in the exploration and production of mined copper

Last year saw the increasing use of Artificial Intelligence (AI) in copper extraction and refining processes, as producers seek to meet the robust demand projected for copper in coming decades. At the world's largest mine Escondida, BHP continues to explore ways to improve copper recovery, including a partnership announced with Microsoft in May last year that aims to use AI to optimise the mine's initial processing circuit. In early 2024, Kobold Metals announced the discovery of an expansive copper deposit in Zambia using AI. The deposit has been compared to the significant Kamo-Kakula project in the DRC, with Kobold hopeful it can begin operations toward the end of the 2020s.

China and DRC lead global refined copper production in 2023

Refined copper output grew by 7.1% in 2023, to reach about 27.6 Mt (Figure 12.5). This included significant growth in the DRC and China — the world's largest producer with almost 50% of the world's refined output. These gains helped to offset falls amongst other major producers such as Europe and Chile. Domestic refiners in China boosted output sharply in 2023, growing by about 18% year-on-year. The rise was concurrent with a significant fall in China's imports of refined copper over the same period and driven by stronger refining charges. Rising domestic output in part reflected considerable growth in China's apparent demand for copper in 2023, a consequence of the large investment made in the country's energy infrastructure (particularly renewable energy) and domestic electric vehicle production (see [World Consumption section](#)).

Figure 12.5: Refined copper actual production & projection



Source: World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024)

Sizable, refined output expansion from China, Indonesia, and India

World refined copper production is forecast to grow by around 2.5% annually over the outlook period to 2029. The major contributors to this new capacity are expected to be China, Indonesia, and India.

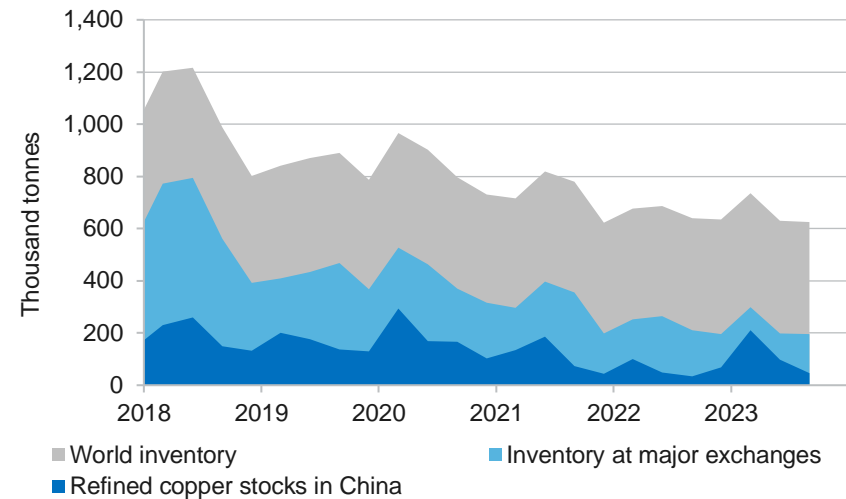
The Guangxi Nanko refinery project in China is expected to add more than 1 Mt of refining capacity in the next few years, equivalent to close to 10% of the country’s total production in 2022. This will include phase 2 of the project with an initial annual capacity of 275,000 tonnes, expected to start in early 2024. Three further projects, all owned by Tongling Nonferrous Metals (Chifeng Jintong, Jinguan Tongling phase 2 and the Tongling new refinery) are expected to add further refining capacity in the next few years. From 2025 onward, the Chifeng Jintong and expansion of Jinguan will add initial capacity of 400,000 and 280,000 tonnes respectively. Similarly, the Tongling Nonferrous project is expected to contribute with an initial capacity of 300,000 tonnes per year from 2026 onward.

Indonesian refined copper output is expected to significantly increase in the next few 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 the second half of 2024.

India is also expected to see strong growth in refined copper production over the next few years. This includes Adani Group’s Gujarat refinery, expected to be operational in early 2024. According to ICSG, phase 1 of Adani scheduled to start production in H1 2024, with an initial capacity of 500,000 tonnes per year, and an eventual annual nameplate capacity of 1 Mt. In addition, phase 2 of Adani group is the additional expansion will come to operation in 2026-28 with an initial capacity of 500,000 tonnes per year.

Despite the strong rise in Chinese copper output, copper inventories in China (and elsewhere) remain at historic lows, and this represents an ongoing upside risk to prices over the outlook period (Figure 12.6).

Figure 12.6: Global copper inventories



Source: Bloomberg (2024)

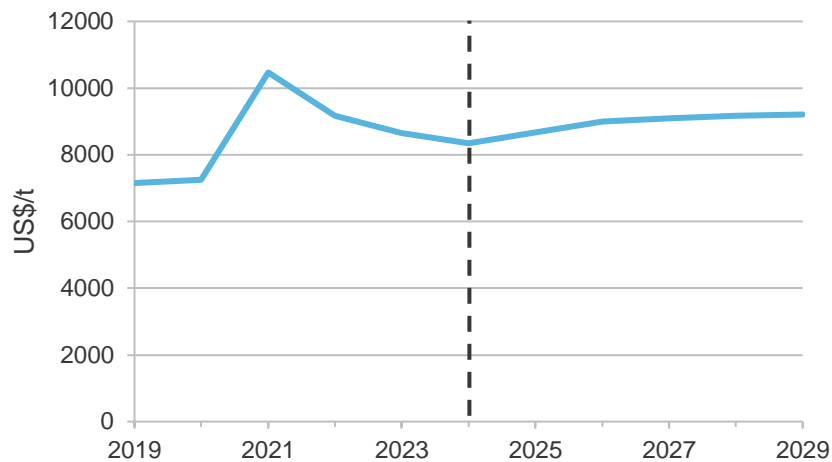
12.4 Prices

Global copper prices expecting to rise over the outlook period

After reaching post-COVID highs of more than US\$9,300 a tonne in January 2023, copper prices have continued to decline during the last 12 months, averaging about US\$8,340 a tonne by February 2024. The fall in prices came despite solid growth in China's refined copper demand in 2023 and was a consequence of the weak outlook for construction and manufacturing in other key markets such as US, EU, and ex-China Asia.

In 2024, the average copper price is forecast to remain relatively similar to 2023 levels (US\$8,400 a tonne). Rising consumption of copper from end uses such as grid infrastructure and clean energy power generation are expected to offset moderating demand from sectors such as residential construction and manufacturing. Beyond 2024, the copper price is expected to rise by around 1% annually over the outlook period, to reach US\$9,200 (real terms) a tonne in 2029 (Figure 12.7). Higher prices will be driven by stronger consumption in copper-intensive sectors such as construction, power sector, appliances and EVs.

Figure 12.7: Copper price



Source: LME (2024) Official cash copper price (refined)

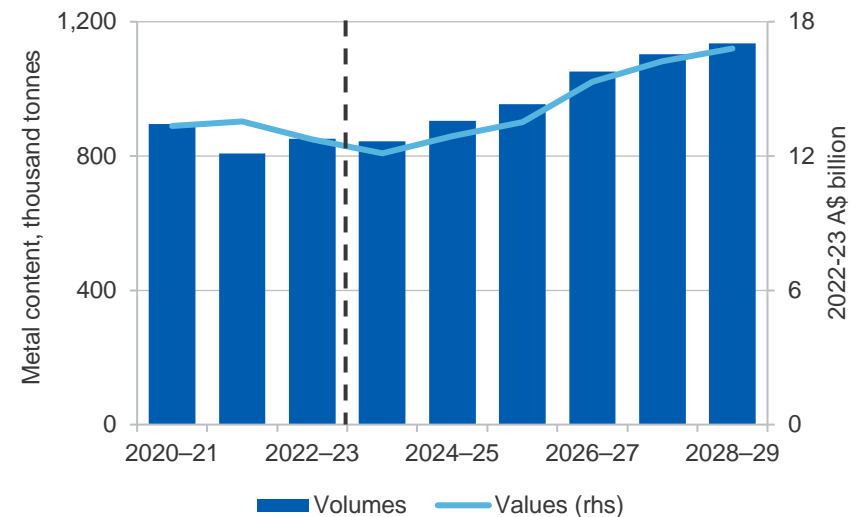
However, historically low levels of global inventories pose an upside risk for the copper prices over the outlook period. Stronger demand in coming quarters could be expected to draw inventories down further, putting upward pressure on prices. Larger-than-expected expansions of clean energy manufacturing, construction, and the ongoing moving toward EVs in economies such as China and the US, also present upside risks to copper prices over the outlook.

12.5 Australia

Higher volume, healthy export earning over the outlook period

Export volumes are forecast to reach 845,000 tonnes in 2023–24, little changed from 2022–23 (Figure 12.8). However, due to a lower copper price, export earnings for 2023–24 are forecast to be around \$12.1 billion, a 1.2% contraction compared to 2022–23. Over the outlook period, exports earnings (in real terms) are projected to grow 4.7% annually, to reach around \$16.8 billion by 2028–29.

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 (2024)

Mine production continues to grow over the outlook period

Australian mine production is projected to grow by 6.2% per annum over the outlook period, to reach 1,160,000 tonnes in 2028–29. Over the same period, Australian refined output is expected to grow by around 0.7% annually. The projected growth in both mined and refined production will come from a range of new projects and expansions of existing operations.

Hillgrove Resources' Kanmantoo copper mine project in South Australia started production in February 2024. Kanmantoo is a significant greenfield project and is expected to add around 43,500 tonnes of copper per year to Australian mine production. Hillgrove Resources is also expected to develop further projects through its strong pipeline of exploration opportunities over the outlook period.

BHP's acquisition of OZ Minerals in May 2023 has seen the consolidation of Olympic Dam, Carrapateena and Prominent Hill as a new single-operated asset known as Copper South Australia. The amalgamation is expected to significantly increase refined copper output from the company's South Australian operations over the outlook period. BHP's OZ Minerals acquisition also included the West Musgrave project. This project contains a large scale of copper and nickel sulphide—although the lower price for nickel might be a downside risk for operation of the project as the final investment decision is pending from the company yet. However, the project is expected to add an annual production capacity of 41,000 tonnes from 2025 onward over the outlook period.

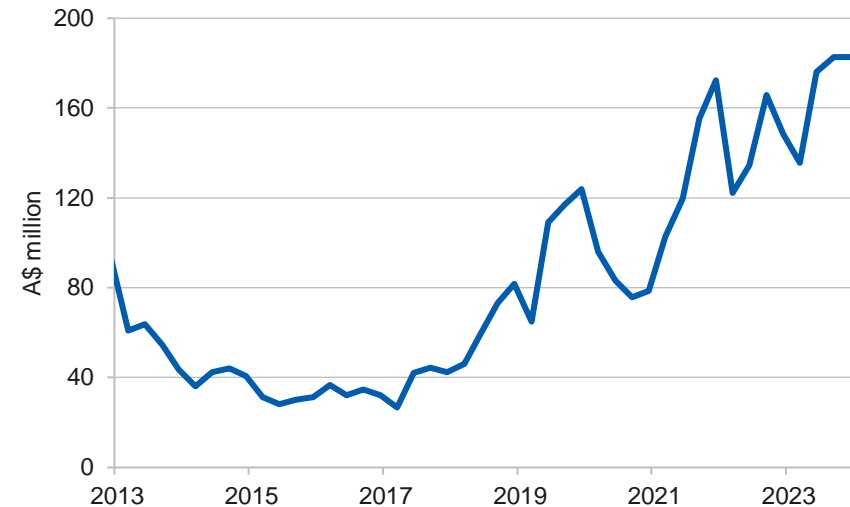
The rise in Australian mined production will come despite the closure of Glencore's Mount Isa copper mines and concentrator in H2 2025, announced in October 2023 by the company. However, Glencore's copper smelter in Mount Isa and refinery in Townsville are expected to continue operating to 2030, subject to approval of additional capital investment.

Copper exploration very strong through 2023

Copper exploration expenditure on average rose to \$169 million in 2023. This was around 19% higher compared to the last year, and continues a general upward trend seen since 2017 (Figure 12.9).

In February 2024, BHP announced the identification of some high grades of copper at its Oak Dam deposit in South Australia. This discovery is significant for future Australian copper production.

Figure 12.9: Australian copper exploration



Source: ABS (2024) Mineral and Petroleum Exploration, Australia. 8412.0

Revisions to the outlook

Since December 2023 *Resources and Energy Quarterly*, the forecast for Australia's copper export earnings in 2023–24 has been revised down by 0.6 billion due to moderate revision of the price of copper export ores and concentrates. Compared to the March 2023 *Resources and Energy Quarterly*, export earnings in 2027–28 have been revised up by approximately \$1.2 billion at \$16.2 billion (in real terms), due to an upward revision of the forecast price of copper ore and concentrates.

Table 12.1: Copper outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
Production									
– mine	kt	22,364	22,946	23,542	24,145	24,760	25,392	26,039	2.6
– refined	kt	27,626	28,179	28,897	29,636	30,393	31,169	31,966	2.5
Consumption	kt	28,034	28,409	28,974	29,446	30,067	30,980	31,856	2.2
Closing stocks	kt	656	426	349	539	865	1054	1164	10.0
– weeks of consumption		1.2	0.8	0.6	1.0	1.5	1.8	1.9	7.7
Prices LME									
– nominal	US\$/t	8,469	8,340	8,827	9,359	9,665	9,945	10,207	3.2
	USc/lb	384	378	400	425	438	451	463	3.2
– real ^b	US\$/t	8,655	8,340	8,663	8,991	9,098	9,166	9,211	1.0
	USc/lb	393	378	393	408	413	416	418	1.0
Australia	Unit	2022-23	2023–24 ^s	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^r
Mine output	kt	808	813	821	888	1,031	1,114	1,160	6.2
Refined output	kt	454	462	470	454	460	469	472	0.65
Exports									
– ores and concs ^c	kt	1,511	1,421	1,505	1,757	2,116	2,287	2,396	8.0
– refined	kt	415	434	470	454	460	469	472	2.2
– total metallic content	kt	852	845	906	954	1,052	1,104	1,135	4.9
Export value									
– nominal	A\$m	12,262	12,120	13,288	14,322	16,635	18,079	19,184	7.7
– real ^d	A\$m	12,755	12,120	12,879	13,509	15,307	16,231	16,802	4.7

Notes: **b** In 2024 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; **r** Average annual growth between 2023 and 2029 or 2022–23 and 2028–29; **z** Projection.

Source: ABS (2024) International Trade, 5465.0; LME (2024) spot price; World Bureau of Metal Statistics (2024); Department of Industry, Science and Resources (2024).

Nickel



Australia's nickel sector



18%
of global **resources**,
second largest
global reserve

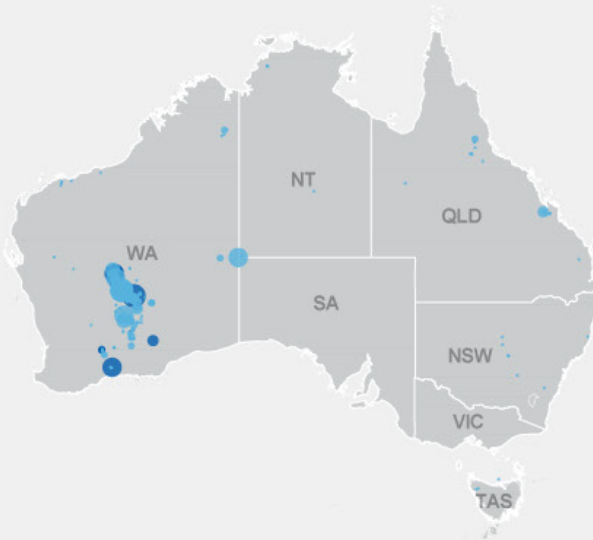


6th largest
nickel **mine and**
refined producer
globally



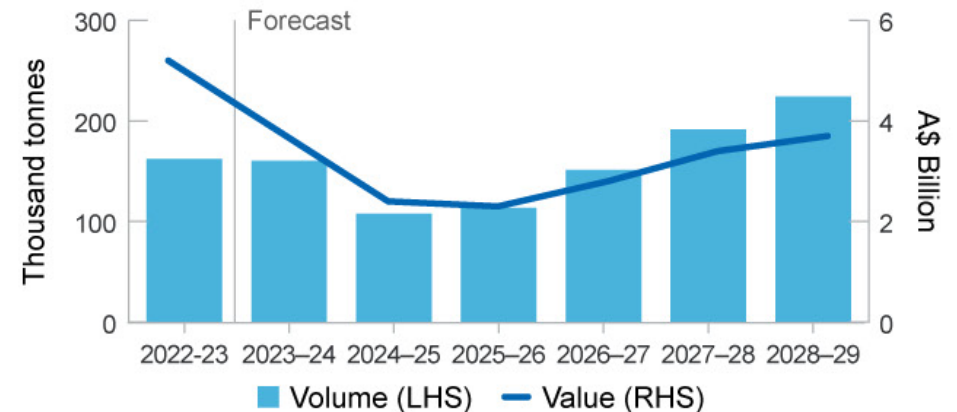
20%
of global demand
represented by **EV**
batteries, other **low**
emissions tech

- Deposit
- Operating mine
- <0.05
- 0.06–0.21
- 0.22–0.58
- 0.59–0.83
- 0.84–1.69
- >1.70



Major nickel deposits, Mt

Australian nickel exports



Outlook



Chinese demand
continues driving global
consumption, estimated
13% growth in 2023



Export earnings to fall
to **\$3.8 billion** in
2023-24, following
sustained price falls.



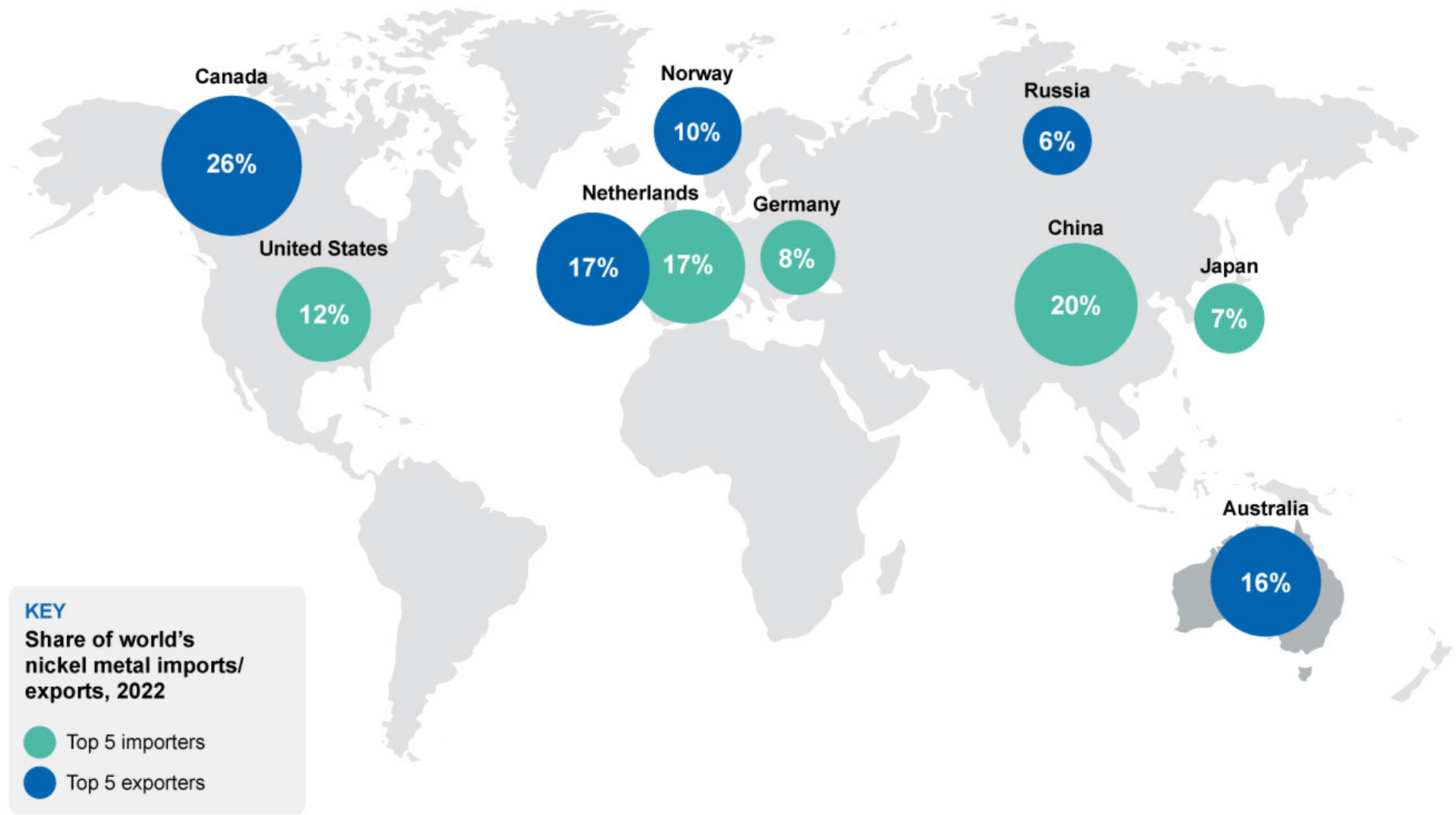
Oversupply in the
global nickel market
expected to persist in
the next few years.



Exploration
expenditure over the
past 12 months
highest since 2008

SOURCE: GA; DISR; OCE

Nickel TRADE MAP



SOURCE: WBMS; ABS; DISR; GA

13.1 Summary

- Strong supply growth in recent years — predominantly from Indonesia and China — has created a global nickel surplus that is expected to persist over the next few years. This surplus has put sustained downward pressure on the nickel price over the past year, leading to a fall of 40% in the 12 months to February 2024.
- Despite the near-term oversupply, continued growth in global demand — particularly from new low emission technologies — is expected to see a tightening global balance for nickel in the latter half of the outlook period.
- Current weaker prices and reduced production are expected to see Australian nickel export earnings fall to \$3.6 billion in 2023–24 and \$2.5 billion in 2024–25. However, improved prices toward the end of the outlook period will see Australian exports reach around \$4.4 billion in 2028–29 (in real terms).

13.2 World consumption

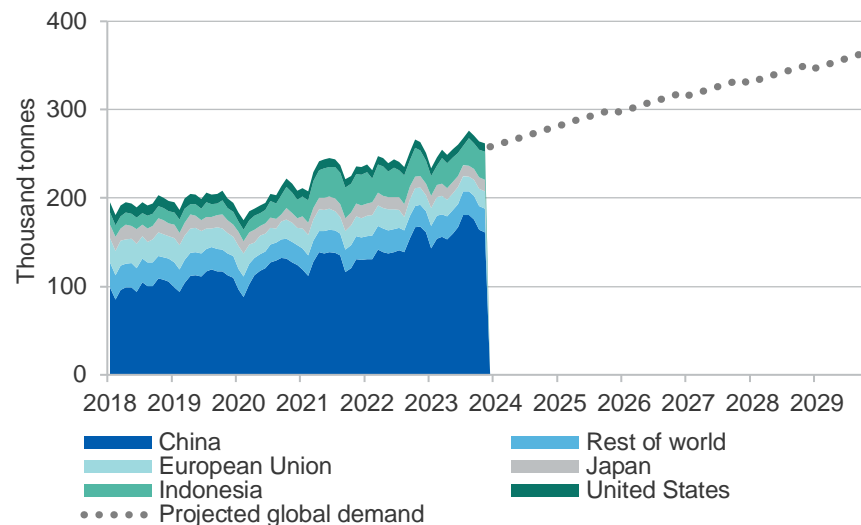
World nickel demand strong in 2023, with rising clean energy applications

Global nickel demand grew by 6.1% in 2023, maintaining the robust recovery seen since 2020 (with growth averaging over 10% a year in 2021 and 2022). The rise in global demand last year was primarily led by China (up 13%), which offset falls in other major markets such as Europe, Japan and the US (down 4%, 8% and 2.4%, respectively).

Global stainless-steel output — accounting for two-thirds of nickel demand in 2023 — is estimated to have increased by around 3.5%. This included 13% growth in Chinese production, with increased infrastructure spending helping to counter a softening outlook for other key sectors such as manufacturing and residential construction. This pattern was also seen in global markets outside of China, with infrastructure-led construction helping to offset a widespread moderation in manufacturing activity.

Demand for nickel from EV battery production continued to rise in 2023, growing by 8.5% year-on-year. The rapid expansion of EV vehicle production has seen this sector increase its share of total nickel demand from around 5% in 2018 to 15% in 2023. At the same time, nickel's

Figure 13.1: World nickel demand



Source: International Nickel Study Group (2024); Department of Industry, Science and Resources (2024)

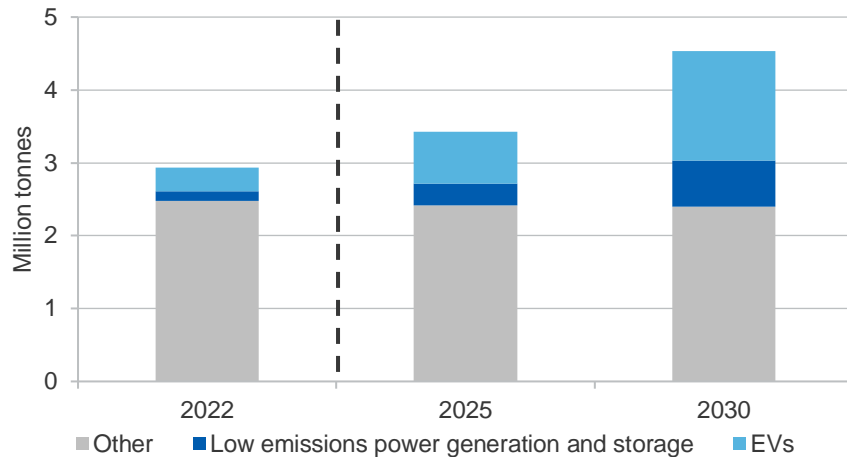
applications in other clean energy technologies (such as wind and other low emissions power generation, and stationary storage) are estimated to have accounted for around 4% of total commodity demand in 2023.

Outlook for global demand to 2029 bright, despite emergent challenges

World nickel demand is projected to grow by 5.8% annually over the outlook period (Figure 13.1). Clean energy technologies are expected to be the primary driver of growth, accounting for nearly 50% of total nickel demand by the end of the outlook period. This will include nickel's use in EVs and low emission power generation technologies — such as wind, hydro and geothermal — as well as growing application in stationary storage. Demand from traditional uses of nickel (such as stainless steel in consumer goods and construction) is expected to be steady (Figure 13.2).

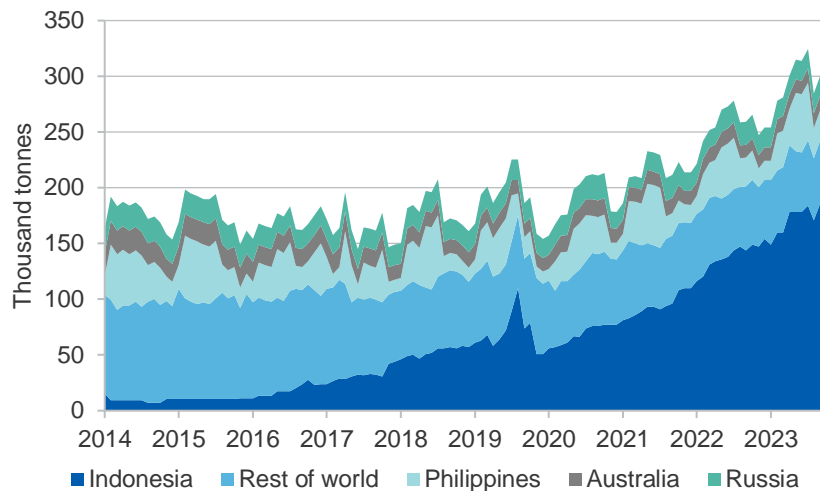
Lithium iron phosphate (LFP) batteries have recently emerged as an alternative to nickel-based chemistries in lithium-ion batteries. The market share for this chemistry type has risen from 10% of total battery demand in 2018 to 30% in 2023. Higher market adoption of non-nickel-based

Figure 13.2: IEA projections of world nickel demand by end use



Note: IEA projections under a State Policies scenario; low emissions power generation includes wind and solar PV.
 Source: International Energy Agency (2024); Department of Industry, Science and Resources (2024)

Figure 13.3 World mined nickel production



Source: International Nickel Study Group (2024); Department of Industry, Science and Resources (2024)

lithium-ion batteries is expected to continue over the outlook period, with LFP batteries expected to rise to about 40% of total battery demand by 2029. More nascent technologies, such sodium-ion batteries (see *Lithium chapter*) and other stationary storage technologies are also expected to gain small market shares over the outlook period. However, robust growth in aggregate demand for batteries will ensure comparably strong growth in nickel demand from this sector over the outlook period.

In addition to EV battery applications, nickel is expected to play an important ongoing role in low emissions power generation. The IEA projects nickel's use in power-generative technologies to rise from 4% in 2023 to about 12% of total nickel demand by 2030 — almost 5 times current aggregate demand. Demand is expected to be prevalent in technologies such as wind, hydropower, geothermal, where nickel alloys resistant to erosion, corrosion and heat are seen as essential components.

Beyond the outlook period, secondary (i.e. recycled) nickel is expected to become a more prevalent supply source for the mineral, carrying potential risks to the level of growth in primary demand from the mid-2030s.

13.3 World production

Growth in Indonesian supply fundamentally altering global nickel market

World mined nickel production grew by 15% in 2023, underpinned by a continued expansion of Indonesian supply. Indonesia is estimated to have added more than 450,000 tonnes of new nickel output in 2023, the equivalent of 14% of total global supply in the previous calendar year.

The rapid rise in Indonesian nickel in recent years reflects substantial investment in new processing capacity, primarily by Chinese interests — firstly to make stainless steel and (more recently) battery grade matte. In 2020, Indonesia's government implemented a ban on nickel ore exports (after announcing and partially implementing this policy over the previous decade) with the aim of promoting value add through domestic refining of its mined nickel. This policy has coincided with rapid investment in integrated facilities capable of mining and processing in a single operation.

This policy has seen Indonesian supply grow from 10% of world mine output in 2016, to 55% in 2023 (Figure 13.3).

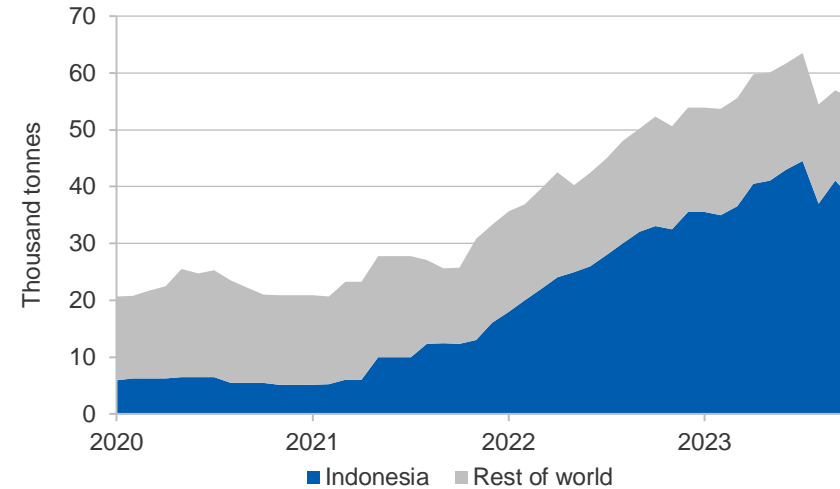
Over the outlook period, annual world mine output is forecast to rise 2.8%. Growth will continue to be driven by increased Indonesian supply through the continued ramp up of existing industrial parks such as Weda Bay and Morowali, and prospective projects such as the IGP Pomalaa project.

Indonesia is expected to continue working to address environmental and sustainability challenges associated with its nickel industry over the outlook period. Responsible ESG practices are expected to become an increasing feature (and preference) in global EV supply chains, a consequence of policies such as the US' Inflation Reduction Act. However, the availability of high-grade nickel reserves in Indonesia poses a risk to global production in the medium term, with the nation's key peak nickel mining association flagging risks of a potential depletion in high grade reserves before 2030 without stricter controls being implemented.

World refined nickel output rose by 9.4% in 2023, with Indonesia (21% gain) and China (12% gain) accounting for the vast majority of growth. The 2020 ban on the export of nickel ores by the Indonesian Government has led to considerable Chinese investment — more than US\$30 billion by some estimates — in Indonesian processing capacity. This has led to a dramatic rise in the production of intermediate and refined products in Indonesia in recent years (Figures 13.4 and 13.5), with over 80% of Indonesian battery-grade nickel production expected to come from majority Chinese-owned producers in 2024.

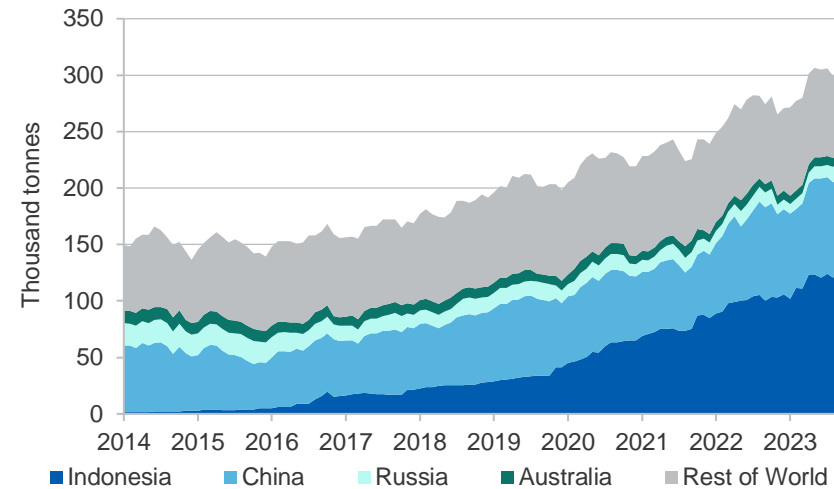
The rise in intermediate production has been aided by technological innovation commercialised by Chinese firm Tsingshan in 2021, which made possible the processing of lower-quality, laterite nickel pig iron (NPI) into grade 1 'battery grade' nickel products (via the production of matte). While this development has prompted considerable growth in the production of nickel matte in Indonesia in the last few years, the markedly higher emissions associated with this process (around 6 times the intensity of sulphide-based production according to the IEA) is considered by some

Figure 13.4 World intermediate nickel production



Source: International Nickel Study Group (2024); Department of Industry, Science and Resources (2024)

Figure 13.5 World refined nickel production



Source: International Nickel Study Group (2024); Department of Industry, Science and Resources (2024)

market participants as limiting upside potential of this product over the outlook period.

However, Indonesia’s nickel industry is expected to see continued ramp up of projects utilising an alternative hydrometallurgical technology (through the use of High Pressure Acid Leaching, or HPAL) to produce intermediate products such as Mixed Hydroxide Precipitate (MHP). While this emerging process tends to have lower emissions intensity than the matte-via-NPI route, it does present its own environmental issues for Indonesia, such as the significant waste and storage issues created by the process. Despite these challenges, higher production and exports of these materials is expected to be a key trend over the outlook period.

World refined nickel production is forecast to grow 4.4% annually over the outlook period. Indonesia and China are expected to be the major contributors to this growth, with each expected to increase annual capacity by approximately 500,000 tonnes by 2029. This would see these two countries account for around 75% of global refined nickel supply by 2029.

13.4 Prices

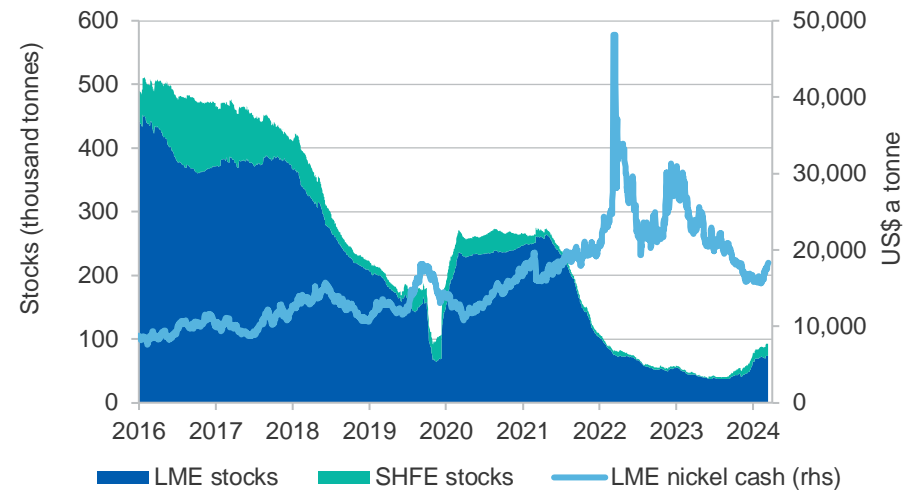
Sustained fall in nickel prices though to early 2024

After reaching a peak of just over US\$30,000 a tonne at the end of January last year, nickel prices have seen persistent downward pressure in the intervening period. In the last 12 months, the LME nickel price has fallen 40% to average around US\$16,400 a tonne in February 2024. This compares with an average real nickel price (in 2023 US dollars) for the period 2013 to 2022 of US\$17,800/tonne.

Structural oversupply in global nickel markets has continued to act as the primary driver of falling prices, with substantial growth in both mined supply (from Indonesia) and refined products (from both Indonesia and China) in recent years (see [World Production section](#)).

Moderating (cyclical) global demand has further contributed to recent price weakness. Global manufacturing new orders marked 22 months of decline in December 2023, with recent lead indicators such as PMI remaining subdued as of early 2024. The current outlook for global construction also

Figure 13.6 Nickel spot price and stock at exchanges



Source: Bloomberg (2024); LME (2024); Department of Industry, Science and Resources (2024)

remains mixed, with infrastructure continuing to bolster broader weakness in residential and commercial construction in key regions such as Europe and China (see *Steel chapter*).

Global EV sales — a primary driver of recent growth in world demand — appears to be slowing from the impressive rates of growth seen in recent years, with total sales growth moderating to 30% in 2023 (from 60% growth in 2022). While growth in this industry is expected to remain strong in coming years, its maturation (and the more moderate rates of growth this would be expected to bring) now appears to be weighing on prices.

Excess global supply to keep prices below US\$19,000 for next few years

With solid growth in mined and refined supply projected to continue over the outlook period, and slowing demand from key sectors in the near term, the resulting oversupply is forecast to contain nickel prices in 2024. The LME nickel price is expected to average US\$17,000 a tonne in 2024, and is forecast to average below US\$18,000 a tonne through to 2026 (in real

terms). However, continued growth in clean energy applications should see a more balanced market in the latter half of the outlook period, when prices are projected to recover to around US\$19,000 a tonne by 2029.

Class 1 inventories likely to build on global surplus

Healthy growth in mined and refined nickel supply is expected to maintain a global oversupply to 2026, which should help to replenish the historically low inventory levels seen at major exchanges such as LME and Shanghai Futures Exchange. Notably, LME inventories are currently more than 70% below their previous 10-year average. This provides a modest upside risk to prices in the near term: a pick-up in demand coinciding with further supply disruptions would limit builds in inventories currently priced in.

13.5 Australia

Falling prices impacting Australian production in the near-term

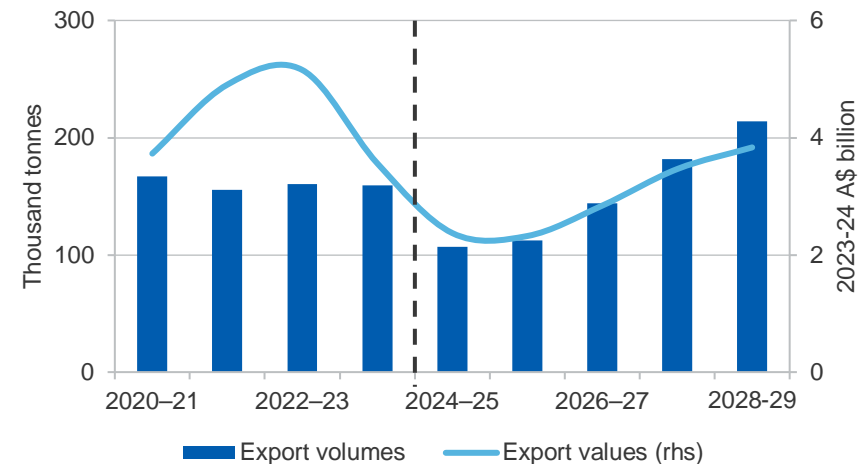
Lower nickel prices are forecast to see a reduction in Australia's total mined and refined nickel production through to 2025–26. Recent price falls have seen mine closures and reduced output announced by several Australian producers, as well as delays in planned projects. This includes the closure of BHP's Kambalda nickel concentrator, with the company update in mid-February indicating it was continuing to study a potential for a period of care and maintenance for its Nickel West operations.

Australia's mined output is expected to fall by 16% in 2024–25 to reach 129,000 tonnes, while refined output is projected to remain flat.

Australian production to grow in latter half of the outlook period

Higher prices projected from 2026 are expected to support higher production volumes, with a number of projects set to come online in coming years. By the end of the outlook period, Australian mined nickel production is projected to grow to 230,000 tonnes in 2028–29, with new output from a number of large and mid-tier producers. This will include a number of new projects aiming to produce intermediate products (such as Mixed Hydroxide Precipitate) and nickel sulphate (an emerging alternative for feeding into the production of cathode materials for lithium-ion

Figure 13.7 Nickel export volumes and values



Source: ABS (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources estimates (2024)

batteries). Australia's refined production is projected to grow to 113,000 tonnes over the same period.

Export earnings to be impacted by falling nickel prices and production cuts

Weaker prices and reduced export volumes are expected to impact Australia's nickel export earnings over the next few years. Export earnings in 2023–24 are expected to fall to \$3.6 billion from an estimated \$5.2 billion in 2022–23 (in real terms). Australia's export earnings from nickel are expected to fall further to \$2.4 billion in 2024–25 (in real terms) as lower prices and reduced export volumes persist. Recovering prices in the latter part of the outlook period are expected to drive improved nickel exports from Australia, with total export value projected to reach around \$3.9 billion (in real terms) in 2028–29.

2023 exploration expenditure the highest since 2008

Nickel and cobalt exploration expenditure in Australia for 2023 was around \$325 million. This was 2.9% higher than the previous year, and 55% higher than the comparable period in 2018 (nominal terms).

Revisions to the outlook

Forecast export earnings for 2023–24 (in nominal terms) have been revised down from the December 2023 *Resources and Energy Quarterly* — from \$3.9 billion to \$3.6 billion in this edition. This reflects lower-than-anticipated prices in recent months and reduced Australian production and export of nickel products. Export earnings in 2024–25 have also been revised down, from \$4.3 billion to \$2.5 billion, given those same drivers.

Compared with the March 2023 *Resources and Energy Quarterly*, forecast Australian earnings in 2027–28 (in nominal terms) have also been revised down from \$4.9 billion to \$3.5 billion.

Table 13.1: Nickel outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^z	CAGR ^r
Production									
–mine	kt	3,684	3,861	4,040	4,180	4,260	4,300	4,280	2.5
–refined	kt	3,346	3,607	3,780	3,935	4,060	4,190	4,300	4.3
Consumption	kt	3,104	3,494	3,566	3,770	3,960	4,150	4,400	6.0
Global balance	kt	243	113	214	166	100	40	-100	
Closing stocks	kt	935	1 049	1 263	1 428	1 528	1 568	1 468	7.8
–weeks of consumption		16	16	18	20	20	20	17	1.7
Prices LME									
–nominal	US\$/t	21,477	16,954	17,650	18,375	19,575	20,550	21,400	-0.1
	USc/lb	974	769	801	833	888	932	971	-0.1
–real ^b	US\$/t	21,950	16,954	17,321	17,652	18,426	18,940	19,312	-2.1
	USc/lb	996	769	786	801	836	859	876	-2.1
Australia	Unit	2022–23	2023–24^f	2024–25^f	2025–26^z	2026–27^z	2027–28^z	2028–29^z	CAGR^r
Production									
– mine ^c	kt	153	141	106	122	162	200	230	7.0
– refined	kt	97	94	68	71	84	100	113	2.7
– intermediate	kt	38	40	28	28	30	38	57	7.1
Export volume	kt	161	159	107	112	144	182	214	4.9
Export value									
– nominal value	A\$m	4,956	3,563	2,448	2,462	3,087	3,859	4,377	-2.0
– real value ^d	A\$m	5,155	3,563	2,373	2,322	2,841	3,464	3,834	-4.8

Notes: **b** In 2024 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; **r** Average annual growth between 2023 and 2029 or 2022–23 and 2028–29; **z** Projection.

Source: ABS (2024) International Trade, 5465.0; LME (2024) spot price; World Bureau of Metal Statistics (2024) World Metal Statistics; Department of Industry, Science and Resources (2024).

Zinc



Australia's Zinc sector



About 1/3
ores & concentrate
production **refined**
domestically

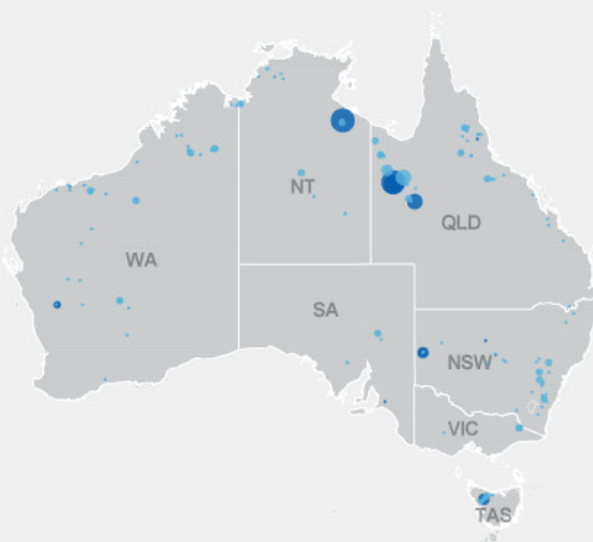


31%
of the world's known
zinc resources



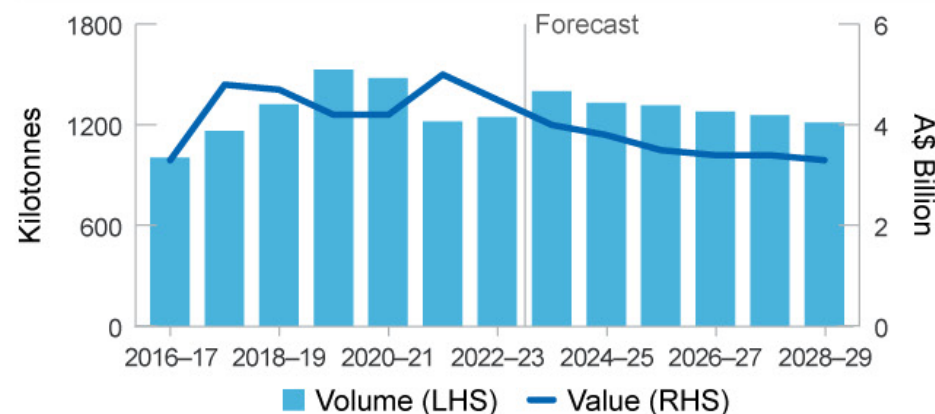
3rd largest
zinc producer
globally in 2022

- Deposit
- Operating mine
- <0.01
- 0.02–0.03
- 0.04–0.09
- 0.10–0.20
- 0.21–0.44
- >0.45



**Major zinc
deposits, Mt**

Australian zinc exports



Outlook



Prices remain low
due to weakness in
global manufacturing
and construction



**Future earnings to
fall** as price remains
subdued



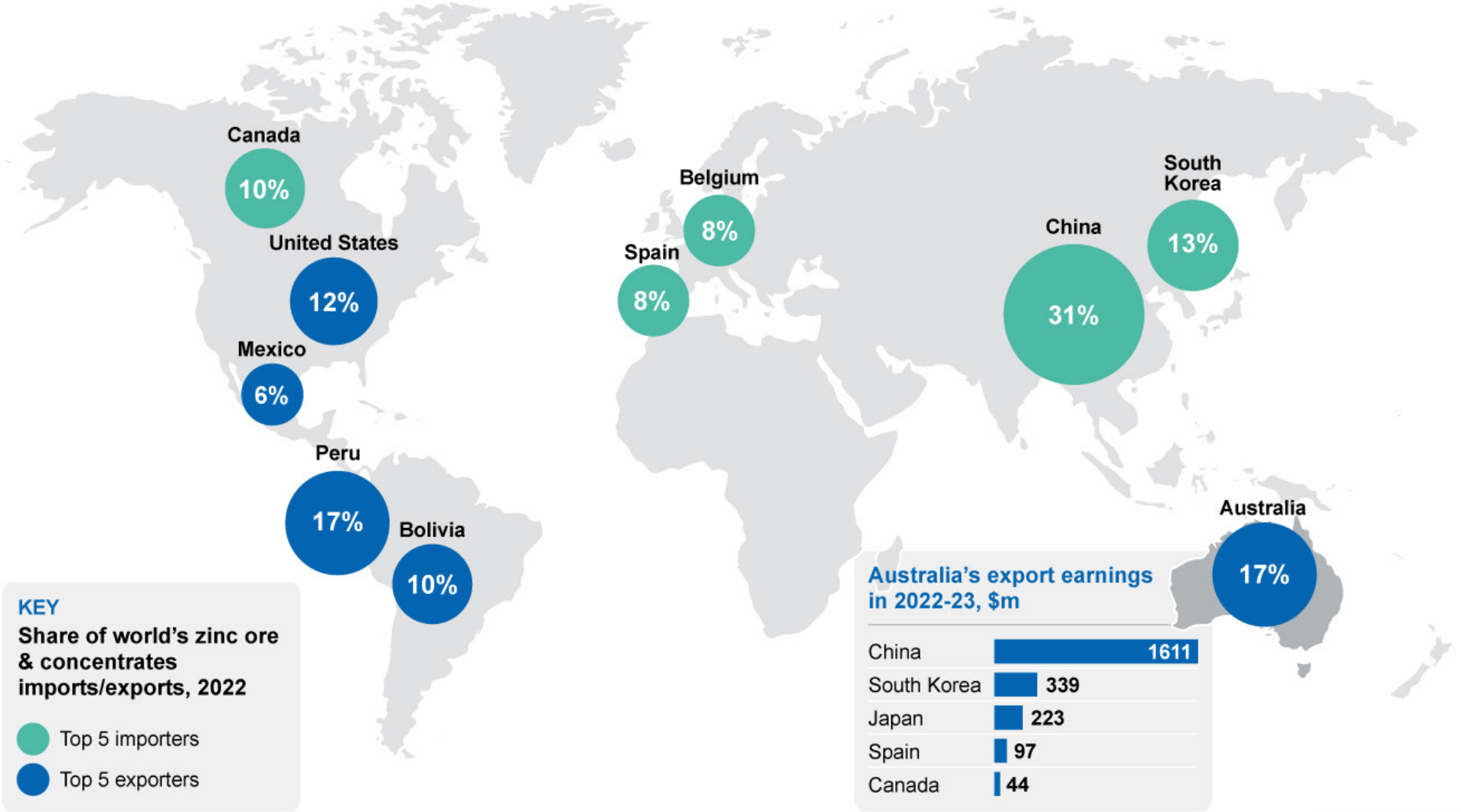
Australian production
outlook expected to
moderate as production
from older mines tapers



Exploration
expenditure **rises**
despite **weak prices**

SOURCE: GA; DISR; OCE

Zinc TRADE MAP



SOURCE: ILZSG; ABS

14.1 Summary

- The outlook for zinc demand remains subdued due to slowing global growth and ongoing weakness in China's property market. The zinc price is forecast to rise gradually (in real terms) over the outlook period, from around US\$2,400 a tonne to around US\$2,700 a tonne by 2029.
- Australia's zinc production is forecast to grow steadily over the next two years, due to the Century mine expansion and higher Golden Grove mine output. However, output is expected to gradually ease from 2026 as production tapers off in some of Australia's older zinc mines.
- Australia's zinc exports are forecast to decline from \$4.0 billion in 2023–24 to \$3.3 billion in 2028–29 in real terms, with lower volumes partially offset by moderate increases in prices.

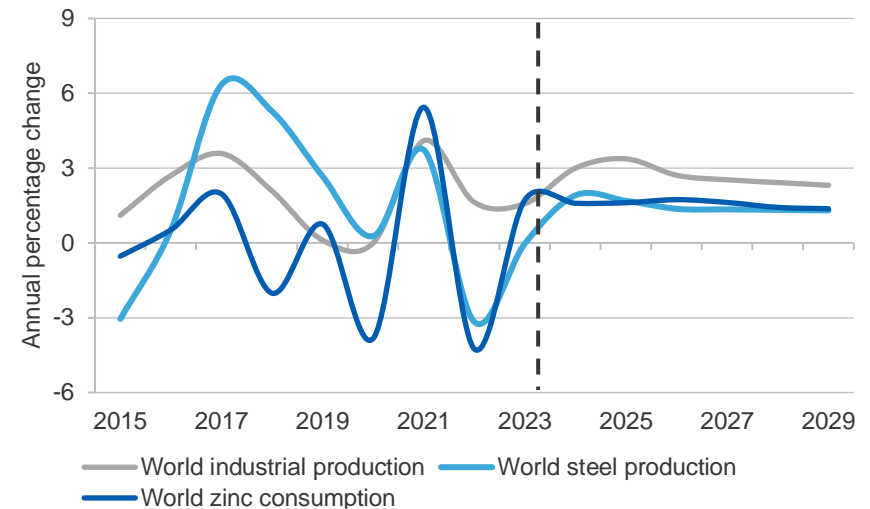
14.2 World consumption

Global zinc consumption showing tentative signs of recovery

Zinc consumption is heavily affected by the global industrial production cycle, reflecting its primary role in galvanising steel (Figure 14.1) and its heavy use in the manufacturing, construction and automotive sectors. World refined zinc consumption rose by an estimated 5.9% year-on-year in the December quarter 2023. Over the same period, consumption rose in China (12%), ex-China Asia (5.3%) and the European Union (3.1%), though was offset by a large fall in the US (24%).

China is the world's largest consumer of zinc, and demand in the December quarter 2023 was supported by strong growth in infrastructure investment growth and rapid growth in manufacturing output. However, China's property sector downturn has yet to stabilise. China is prioritising the delivery of its existing construction pipeline, after concerns that liquidity-constrained developers had been forced to abandon projects already started. This has seen a turnaround in property completions, with floor space of completed residential buildings up by 16% in December (year-on-year), compared with a fall of 14% a year earlier.

Figure 14.1: Zinc consumption vs industrial and steel production



Source: International Lead Zinc Study Group (2024); CPB Netherlands Bureau for Economic Policy Analysis (2024); World Steel Association (2024); Department of Industry, Science and Resources (2024).

Despite this, new home sales, floor space under construction and fixed asset investment in real estate, were all down noticeably in year-on-year terms in December 2023. Structural factors, such as the peak in China's population and slowdown in urbanisation rates, are adding to the challenges faced by the sector.

China's passenger vehicle production rose steadily over 2023 to reach just over 25 million vehicles for the year, 5.1% higher than 2022. China is emerging as a leading manufacturer of electrical vehicles, overtaking Japan as the world's largest exporter of passenger motor vehicles in 2023.

Other major passenger vehicle producers posted production gains in 2023, shaking off the problems with chip shortages that affected production in earlier years. In 2023, Japanese passenger vehicle output rose by 12.2%, while production in Germany rose by 18.1%.

Despite substantial falls in US zinc consumption in recent months, indicators of related construction activity have been positive. US construction spending rose by 11.6% in the December quarter 2023 in nominal terms, driven by a large rise in non-residential construction spending, up 24% year-on-year. Residential construction also contributed to the growth, up 2.9% year on year — a turnaround from the 5.3% year-on-year fall in the September quarter. The rise in non-residential construction spending was driven by manufacturing (up 71% year-on-year) and computer/electronics (up 134% year-on-year). US motor vehicle assemblies — the majority of which are commercial vehicles — rose 6.6% year-on-year in January 2024.

The EU's construction production (volume) index remained relatively flat in the December quarter 2023, rising just 0.2% year-on-year. Despite healthy growth in a number of countries, including Italy and Spain, ongoing weakness in Germany and France continues to weigh on the EU's construction sector.

[Demand outlook for zinc remains subdued](#)

World zinc consumption is forecast to grow by 1.6% a year on average over the outlook period to 2029 (Table 14.1). This rate of growth is much slower than the 2009 to 2019 period when zinc consumption grew by an average of 2.4% per year. This reflects slowing global economic growth, largely driven by the expected ongoing structural slowing in China's growth as it matures. The IMF projects China's 2024 growth at 4.6%, easing to 3.5% in 2028 (see *Macroeconomic Outlook* chapter).

Over the outlook period to 2029, China's residential construction activity will likely stabilise at a lower level, reducing steel — and therefore zinc — demand. Stronger growth in infrastructure and manufacturing investment, along with steel-intensive manufactured exports (including automobiles and whitegoods) helped support Chinese zinc demand in 2023. Infrastructure investment is also expected to continue to support demand for zinc over the outlook period to 2029, as the Chinese Government seeks to support economic growth.

The global energy transition will likely have mixed effects on zinc demand, increasing usage for some sectors but potentially seeing zinc usage reduced for other applications. Construction and deployment of renewable energy infrastructure is expected to support the demand for zinc due to the complementary role it plays with steel as an input to wind turbines, solar panels and transmission towers. However, growing electric vehicle adoption could also weaken demand for zinc as automakers preference lighter materials to steel (in particular, aluminium) to improve battery range and performance.

[14.3 World production](#)

[Mine closures and project delays disrupted supply in 2023](#)

Sharp falls in zinc prices over the past two years have seen unprecedented disruptions to global zinc mine supply, as owners chose to place mines on care and maintenance to cut losses. World mine production fell by around 1.4% year-on-year in 2023. Mine production fell 0.5% year-on-year in China, which accounts for a third of global production. Production also fell in the EU (10%) and US (1.7%). 2023 saw the closure of both the Tara mine in Ireland — the largest zinc mine in Europe — and the Aljustrel mine in Portugal. There were also slippages in the start-up of several mine operations including the Buenavista (Mexico), Ozeroye (Russia) and Vares (Bosnia) projects.

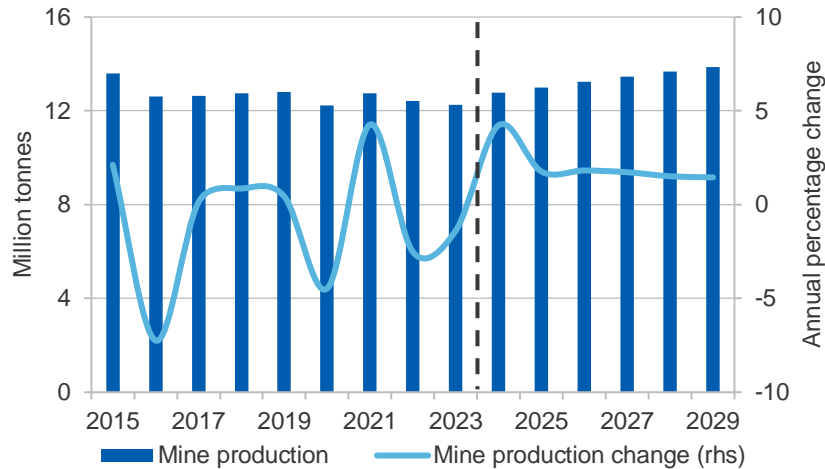
Global refined zinc production rose by 3.8% in 2023. Output in China — the world's largest zinc refiner — rose by 7.7% in 2023. A surge in refining capacity in China resulted in a rapid decline in the spot treatment price for zinc ore imported to China. The price fell to US\$85 a tonne in February 2024 from an average of US\$181 a tonne in 2023 — when the closure of some European zinc smelters (due to high energy prices) resulted in a crunch in global zinc refining capacity.

[Global production to rise steadily over the outlook period](#)

Over the outlook period, global zinc mine output is forecast to achieve average annual growth of 2.1% (Figure 14.2). The fall in mine production and rise in refining production over the past year has eliminated much of

the surplus in the concentrate market evident in 2023. Refined production is expected to rise by 1.4% a year on average. Most of the new capacity is expected to be in China.

Figure 14.2: World zinc mine production, metallic content



Source: International Lead Zinc Study Group (2024); Department of Industry, Science and Resources (2024).

14.4 Prices

Prices weaken on growing concerns over the demand outlook

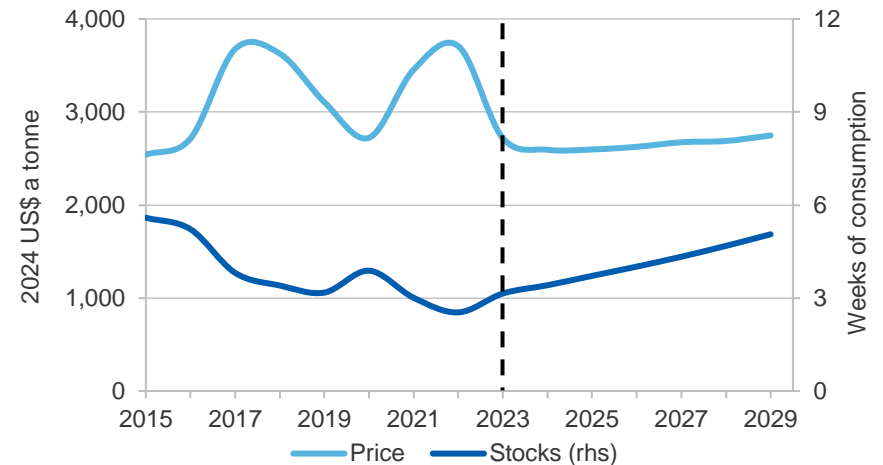
The London Metal Exchange (LME) spot zinc price declined slightly quarter-on-quarter in the March quarter 2024 to around US\$2,400 a tonne. This continued the weakening trend in zinc prices experienced over the past year and leaves prices well below the US\$3,100 a tonne achieved in the March quarter 2023, when worries over shortages of zinc refining capacity kept prices high. The price falls in 2023 were triggered by the reopening of some European zinc smelters and were sustained by relatively soft demand throughout 2023.

Zinc inventories fluctuated markedly over the course of 2023. Weak demand over 2023 saw LME zinc stocks increase to around 148 thousand tonnes by the end of August. However, consumption strengthened over

the September quarter 2023 and LME zinc stocks were drawn down to 68 thousand tonnes in mid-November before rising steadily in recent months to around 275 thousand tonnes in March 2024. Zinc stocks are forecast to increase gradually to around the long run average over the outlook period.

The LME (spot) zinc price is forecast to stay relatively low through 2024, due to the soft demand outlook. This will put mine margins under pressure and raise the prospect of further price-induced mine closures. The price should average about US\$2,600 a tonne in 2024, before picking up slightly in 2025 and 2026 as global industrial production and construction pick up (Figure 14.3).

Figure 14.3: Zinc prices and stocks



Source: LME (2024); International Lead Zinc Study Group (2024); Department of Industry, Science and Resources (2024).

14.5 Australia's exports and production

Export earnings to fall unless new resources can be developed

Australia's export earnings for both zinc concentrates and refined zinc (combined) fell by 24% year-on-year to \$1.0 billion in the December quarter 2023. The fall was largely driven by declining prices over the period, with prices received for exports of ore and refined zinc down 23%

and 16%, respectively. Falls in export volumes also contributed to a decline in export revenue in the December quarter 2023. Zinc ore exports fell by 7% year-on-year, while export volumes of refined zinc metal fell by 1.0% year-on-year.

Australian mine production fell by 11% year-on-year in the December quarter 2023, following the closure of several small mines earlier in the year due to the impact of falling zinc prices on profit margins. These included the Jaguar mine operated by Aeris Resources, the Mount Garnet and King Vol zinc mines owned by Aurora Metals — which entered into administration in mid-2023 — and the Hera mine, owned by Aurelia metals.

Australian production was disrupted in early 2024 when concentrate shipments to China were suspended after flooding prevented the movement of material from mines in Queensland. The rail line serving Cannington, Dugald River and Mt Isa re-opened in late-February.

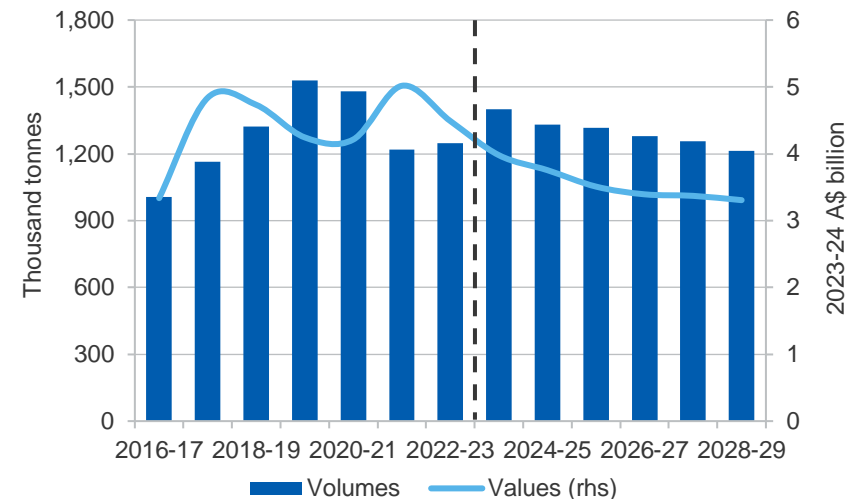
Australian mine output is expected to decline by an average 0.3% per year over the outlook period to 2029. Over the next two years an expansion of the Century mine, as well as increases in production from the Golden Grove mine (following the completion of ventilation upgrades) will maintain output levels. However, from 2026–27 Australia's mined zinc output is projected to taper off, due to lower output likely at several operations.

From \$3.9 billion in 2023–24, Australia's export earnings (in real terms) for concentrates and refined zinc (combined) are forecast to fall to \$3.3 billion in 2027–28 (Figure 14.4). However, the forecast is subject to some uncertainty. There are upside risks to the forecast, due to the potential for mine expansions, the reopening of mines under care and maintenance, and the development of new mines. For example, while there have been reports that the New Century mine may run out of ore by 2027, the company has stated that, based on indicated and inferred resources, there is an opportunity to extend operations beyond 2030. Similarly, MMG's Rosebery mine in Tasmania has stated it is undertaking an accelerated exploration program and investigating options for expanding tailings storage, in a bid to support future operations.

Exploration expenditure rises sharply in the December quarter

Exploration expenditure for silver, lead and zinc rose by 32% year-on-year in the December quarter 2023. The strong result defied the weaker prices the sector has been experiencing since the middle of 2023. Exploration expenditure slumped in 2020 — due to the COVID pandemic — but recovered as zinc prices rose over 2021 and 2022. However, exploration expenditure can be expected to begin moderating if zinc prices remain at lower levels throughout 2024.

Figure 14.4: Australia's zinc exports, metallic content



Source: ABS (2024) *International Trade in Goods and Services*, 5368.0; Department of Industry, Science and Resources (2024).

Revisions to the outlook

Compared to the December 2023 *Resources and Energy Quarterly*, forecast export earnings for 2023–24 and 2024–25 remain largely unchanged. Compared to the March 2023 *Resources and Energy Quarterly*, export earnings for 2027–28 have been revised down by around \$600 million in nominal terms, due to a moderation in forecast production volumes — as output tapers off in some of Australia's older mines.

Table 14.1: Zinc outlook

World	Unit	2023	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2028 ^z	CAGR ^f
Production									
– mine	kt	12,256	12,774	12,999	13,235	13,464	13,668	13,867	2.1
– refined ^a	kt	13,863	13,960	14,195	14,443	14,683	14,899	15,111	1.4
Consumption	kt	13,659	13,876	14,099	14,344	14,576	14,783	14,986	1.6
Closing stocks	kt	824	908	1,004	1,104	1,211	1,327	1,453	9.9
– weeks of consumption		3.1	3.4	3.7	4.0	4.3	4.7	5.0	
Price									
– nominal	US\$/t	2,658	2,593	2,646	2,733	2,841	2,917	3,045	2.3
	USc/lb	121	118	120	124	129	132	138	2.3
– real ^b	US\$/t	2,716	2,593	2,597	2,626	2,675	2,688	2,748	0.2
	USc/lb	123	118	118	119	121	122	125	0.2
Australia	Unit	2022–23	2023–24 ^f	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^f
Mine output	kt	1,154	1,188	1,252	1,237	1,199	1,177	1,134	-0.3
Refined output	kt	424	482	520	525	525	525	525	3.6
Export volume									
– ore and concentrate ^c	kt	1,886	2,103	1,885	1,839	1,755	1,707	1,609	-2.6
– refined	kt	388	455	487	492	492	492	492	4.0
– total metallic content	kt	1,247	1,401	1,332	1,316	1,279	1,257	1,213	-0.5
Export value									
– nominal	A\$m	4,315	3,978	3,873	3,720	3,687	3,754	3,774	-2.2
– real ^d	A\$m	4,489	3,978	3,754	3,509	3,393	3,370	3,306	-5.0

Notes: **a** Includes secondary refined zinc; **b** In 2024 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 (2024) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Science and Resources (2024); International Lead Zinc Study Group (2024); Wood Mackenzie (2024); LME (2024).

Lithium



Australia's lithium sector



98%
of spodumene
exported to China,
2022-23

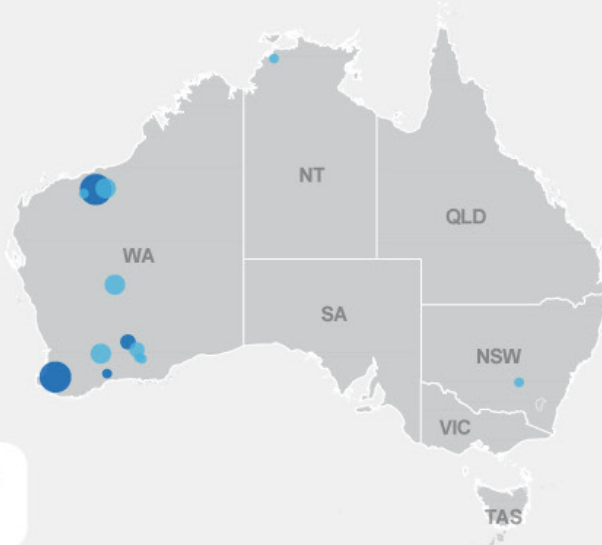


45%
of global lithium
extraction in 2023,
with **2nd** highest
reserves globally



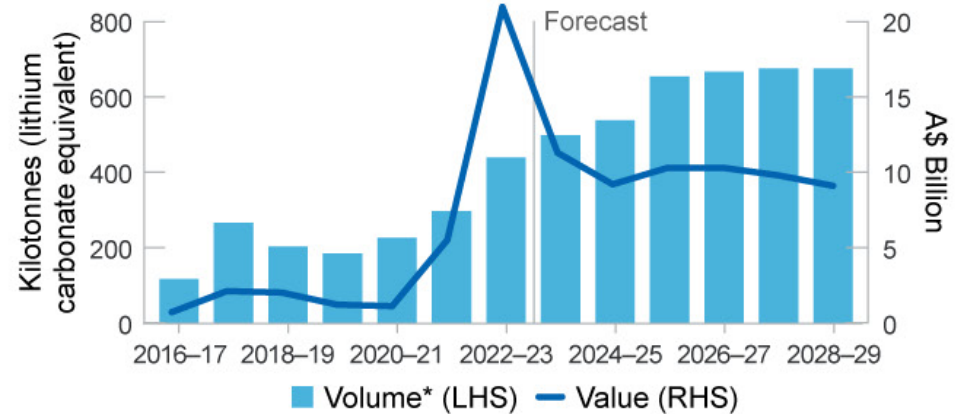
15%
of total global
lithium hydroxide
could be produced
in Australia by 2029

- Deposit
- Producing mine
- 0-100
- 100-500
- 500-1500
- >1500



Major lithium deposits, Kt

Australian lithium exports



Outlook



Prices are **expected to increase** over the next three years and then **edge back**



Evolving battery chemistries makes it **difficult to forecast global demand**



Australian mine production to **keep growing** due to a strong project pipeline



Argentina and Zimbabwe are expected to emerge as **major producers**

SOURCE: ABS; GA; Wood Mackenzie; WA DMIRS; DISR; OCE

*Volume in this chart reflects lithium content export in products including spodumene concentrates and lithium hydroxide

15.1 Summary

- Australia's lithium export earnings are projected to fall more than half over the forecast period — from \$21 billion in 2022-23 to \$9 billion in 2028-29 (in real terms). This is driven by a revised lower price forecast, though prices are highly difficult to predict given the rapid pace of supply and demand growth. Lower prices are expected to be partially offset by the impact of a projected 70% increase in Australia's lithium mine production over the period.
- Global lithium demand is projected to more than double between 2023 to 2029, driven by the rising adoption of electric vehicles. However, evolving battery technologies could reduce lithium usage in batteries.
- Global lithium supply is projected to broadly keep pace with rising demand, with sizeable project pipelines among large producers (such as Australia and China) as well as among new and emerging producers (such as Argentina and Zimbabwe).

15.2 World demand

Lithium industry growth underpinned by advances in battery technologies

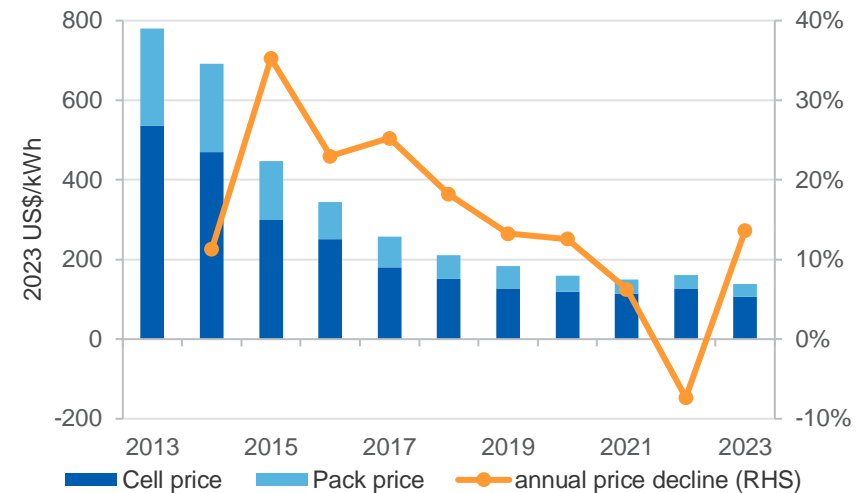
World lithium consumption is estimated to have been 1.0 million tonnes (mt) lithium carbonate equivalent (LCE) in 2023, a 28% increase from 2022, continuing a trend of rapid growth in recent years. Demand growth is primarily driven by rising adoption of electric vehicles (EVs), with demand from EVs rising to exceed half of global lithium demand in 2022. This rise in adoption can largely be attributed to improvements to battery energy density and reductions in battery cost.

Technological innovation has seen improvements to battery energy density — the amount of energy carried by a battery for a given weight — which has created new applications and markets for batteries in recent decades. In a 2021 paper *Re-examining rates of lithium-ion battery technology improvement and cost decline*, Ziegler and Trancik estimate that between 1991 and 2018, the highest energy density achievable for lithium-ion batteries in each year rose from 80 Wh/kg to over 250 Wh/kg. In the 2000s, more energy dense lithium-ion batteries made it possible to

build smartphones that consume substantially more power than traditional mobile phones. EVs became viable from the late 2010s as improved energy density added to vehicle range.

The cost decline of lithium-ion batteries has been rapid, improving the cost-competitiveness of the technology. Surveys by Bloomberg New Energy Finance find that the weighted-average cost of lithium-ion batteries fell from US\$345/kWh in 2016 to US\$139/kWh in 2023 in real 2023 USD terms (Figure 15.1). This fall can be attributed to improved manufacturing techniques and benefits from scale as the battery industry expands.

Figure 15.1: Volume-weighted average lithium-ion battery price



Notes: Survey includes passenger cars, buses, commercial vehicles, and stationary storage. Battery costs rose in 2022 due to high lithium price, with lithium hydroxide price reaching US\$79 thousand a tonne in November 2022.

Source: Bloomberg New Energy Finance (2023)

The share of value captured by lithium in the battery value chain has been rising in the last decade. As manufacturing cost falls, materials are making up a rising proportion of the cost of a battery. The International Energy Agency estimates that material cost makes up just over 20% of the cost of a battery in 2021, compared to less than 5% in 2015.

China EV adoption surges, but other markets have fallen short

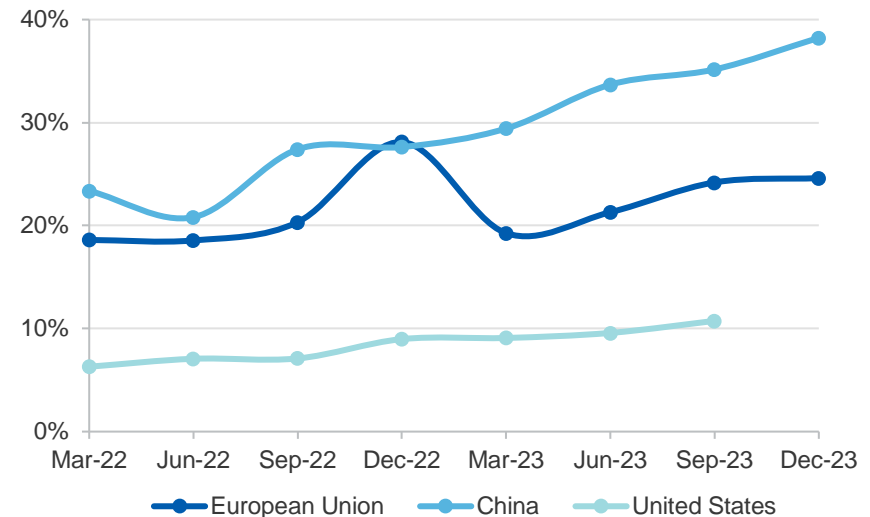
Wood Mackenzie estimates that EV penetration in the global passenger vehicle market rose from 4.5% in 2020 to 18% in 2023. Estimates by the University of Exeter's Economics of Energy Innovation System Transition programme suggests that in the EU and China the ownership cost of EVs is now lower than for small and medium ICE vehicles. Cost parity is expected to be reached in other markets by 2025.

EV sales in China surged during 2023: penetration in China's passenger vehicle market rose by 9.5 percentage points over the year to reach 35% (Figure 15.2). In China, buying a licence for a new internal combustion engine (ICE) vehicle is sometimes not straight forward. Policy differs from city to city: in Shanghai, licence plates for ICE vehicles are sold in monthly auctions — since 2014, fewer than 20% of bidders in each auction were able to buy a licence — while licence plates for electric vehicles are available at no cost.

In the EU and the US, growth in EV sales were slower than expected over 2023, with the high initial price tag (compounded by rising interest rates), lack of charging infrastructure, and concerns over vehicle range, proving to be significant barriers to adoption. The EU has some of the highest EV penetration rates after China, with sales supported by consumer preference for smaller cars and relatively high taxes on petrol. However, growth in EV sales slowed in Europe's passenger vehicle market, rising by only 0.8 percentage points to 22% in 2023.

In the US, EV adoption lags other markets globally, with EV penetration in the light duty vehicle market (including light commercial vehicles and passenger vehicles) rising to 9.3% in the first 9 months in 2023 when compared with the same period in 2022. EV sales appear to have fallen short of vehicle manufacturers' expectations, with data from Cox Automotive showing an increase in EV inventories to 114 days of supply in November 2023. This was up from 53 days of supply a year prior. A US tariff of 27.5% inhibits US consumers purchasing Chinese EVs, which are amongst the most cost-competitive EVs globally.

Figure 15.2: EV penetration rate in selected vehicle markets



Notes: Data presented for the EU and China are for the passenger vehicle market, while data presented for the US is for the light duty vehicle market. EVs include both battery electric vehicles (BEV) and plug-in hybrid electric vehicle (PHEV).

Source: European Automobile Manufacturers Association (2024), China Association of Automobile Manufacturers (2024), Alliance for Automotive Innovation (2023)

Box 15.1: China's battery and electric vehicle industries lead global rivals

The shift from nickel manganese cobalt (NMC) batteries to lithium iron phosphate (LFP) batteries is strengthening the competitive position of Chinese EV and battery manufacturers. While NMC batteries have more energy density than LFP batteries, improvements to energy density for newer LFP batteries, as well as their lower cost, are lifting the attractiveness of LFP, especially in mid-range EVs.

LFP batteries' key advantage over NMC batteries are their substantially lower material costs; the names of these batteries are derived from their respective cathode materials, and iron and phosphate are available at a much lower cost than nickel, manganese and cobalt. Furthermore, LFP batteries can be manufactured using lithium carbonate, while NMC batteries use the more expensive, and less shelf-stable, lithium hydroxide.

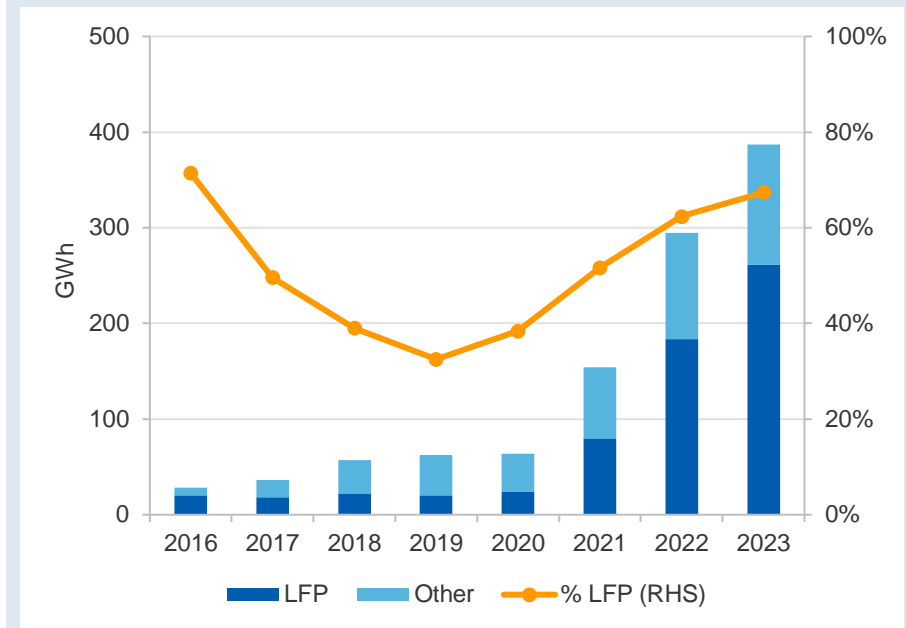
Between 2018 and 2023, lithium carbonate was typically about 20-30% cheaper than lithium hydroxide, on a lithium metal-content basis. Beyond the cost of materials, LFP batteries are safer and have longer cycle-life, while cobalt mining has been associated with human rights abuses in the Democratic Republic of Congo.

In China, LFP's share of batteries installed in EVs rose for the fifth year in a row in 2023, reaching a commanding share of close to 70% of batteries installed in EVs (Figure 15.3). This includes many export models: Tesla's non-US standard versions of the Model 3 and the Model Y — with a range of 513 km and 455 km, respectively — use LFP batteries sourced from Chinese suppliers BYD and CATL, and are typically assembled at its Shanghai Gigafactory. The intellectual property and technical expertise of manufacturing commercial LFP batteries are largely held by Chinese companies. Wood Mackenzie estimates that more than 99% of global LFP battery cathode production was located in China in 2023.

China has leveraged its large domestic EV market and dominance in the battery supply chain into a strong position in EV manufacturing, with Chinese manufacturer BYD overtaking Tesla as the world's largest EV manufacturer in the December quarter 2023. A 2023 report by UBS found that BYD have a 25% cost advantage over North American and European companies, with technical expertise in battery manufacturing leveraged into advantages in EV design through, for example, battery cell-to-body design and integrated power electronics modules. The report forecast that Chinese EV makers could hold a third of the global EV market by 2030.

China overtook Japan to become the largest vehicle exporter in 2023, with 4.9 million vehicles exported compared to 4.4 million exported from Japan. In value terms, almost half of China's vehicle exports were for EVs in 2023 (US\$38 billion of US\$79 billion), and the export value of EVs rose by 70% from 2022, according to data published by the General Administration of Customs of the People's Republic of China. The EU is a major market for China's EVs, taking about 37% of value of China's EV exports in 2023.

Figure 15.3: Batteries installed in EVs in China



Notes: Based on materials released by the China Automotive Power Battery Innovation Alliance and the Chinese government. Prior to 2022, compiled by Mitsui & Co. Global Strategic Studies Institute. 2023 data compiled by DISR.

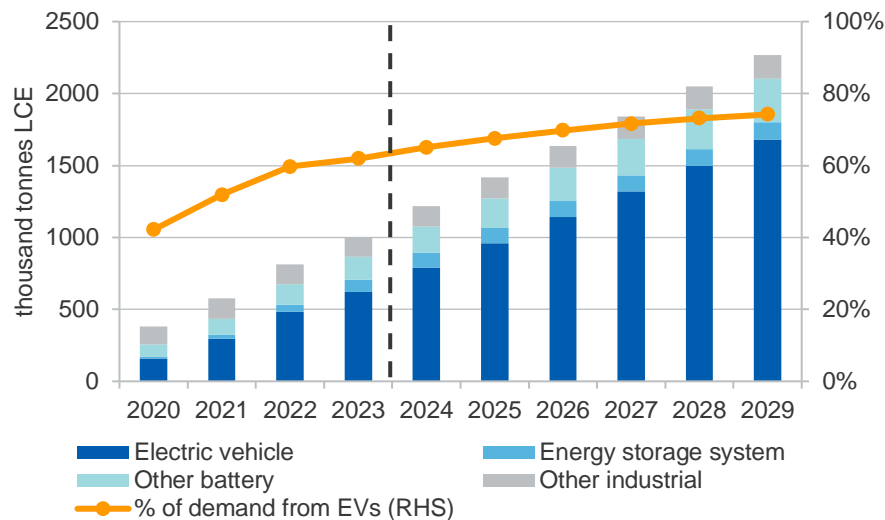
Source: Mitsui & Co. Global Strategic Studies Institute (2023), Department of Industry, Science and Resources (2024)

Much of China's EV exports to the EU are for cars from Western companies with factories in China, such as Tesla's aforementioned Shanghai Gigafactory. The Centre for Strategic and International Studies found that Tesla and joint ventures between European and Chinese companies accounted for more than half of China's EV exports to the EU in the first half of 2023. Joint ventures between European and Chinese companies — for example, between Mercedes-Benz and Geely — have become common, with European companies seeking to tap into Chinese supply chains and technical expertise.

Electric vehicle adoption to drive rise in global lithium demand

In LCE terms, global lithium consumption is forecast to rise by 16% per year to 2.3 mt in 2029 (Figure 15.4). Demand from EVs is expected to drive the bulk of this demand, with the share of demand from EVs rising over the outlook. This forecast is presented with a substantial risk to the downside: EV adoption faces challenges ranging from rising trade barriers and supply chain concerns — as a result of ongoing geo-strategic competition — and lithium is in competition with other materials, since new battery chemistries could use less or no lithium.

Figure 15.4: World lithium consumption, by demand source



Notes: Projections are based on DISR assessment, informed by Wood Mackenzie research. Source: Department of Industry, Science and Resources (2024), Wood Mackenzie (2024)

Both the US and the EU are shifting towards establishing higher trade barriers against rising Chinese EVs exports (see Box 15.1), which could raise the cost of EVs for consumers and slow adoption. In February 2024, US President Biden claimed that ‘China’s policy could flood our market with its vehicles’ and announced an investigation to study whether data collection by Chinese EVs posed national security risks. In October 2023,

the European Commission initiated an anti-subsidy investigation into EU imports of battery electric vehicles from China. The investigation may last up to 9 months, after which the Commission may impose countervailing tariffs.

The US could tighten rules relating to the eligibility for EV tax credits under the Inflation Reduction Act, with new proposed guidelines on Foreign Entities of Concern (FEOC) released in early December 2023. Under the proposed guidelines, to be eligible for the US EV tax credit, EV batteries and battery components must not be sourced from a FEOC from 2024, and critical minerals used within those batteries must not be sourced from a FEOC from 2025. An entity is considered an FEOC if 25% or more of its board seats, voting rights or equity interests, are held by or subject to the jurisdiction or direction of the governments of China, North Korea, Russia or Iran. These proposed changes are likely to further bifurcate global lithium and batteries trade.

Evolving battery chemistry could reduce lithium usage in batteries

Lithium manganese iron phosphate (LMFP) batteries (a type of LFP battery) could see substantial uptake in EVs over the outlook period. LMFP batteries replace some of the iron in the cathode of an LFP battery with manganese, and could deliver 20% higher energy density over current LFP batteries with the same lithium content. The existing investment pipeline suggests LMFP cathode production could rise from 15 thousand tonnes (kt) in 2023 to 200 kt by 2025. 200 kt would be about 20% of LFP cathode production in 2023, according to a 2023 report by the Mitsui & Co. Global Strategic Studies Institute. This pipeline could expand if LMFP batteries prove to be commercially successful, reducing lithium demand over the outlook period.

Sodium-ion batteries use no lithium and are cheaper than lithium-ion batteries. Current versions of sodium-ion batteries have low levels of energy density compared to lithium-ion batteries, as well as lower cycle life. JAC Group, a Volkswagen backed Chinese company, began delivery of the Yiwei 3, one of the first commercial sodium-ion powered cars, in January 2024. The vehicle has a range of 230 km, and a higher

performance variant with a range of 300 km is expected to be launched later this year.

The history of battery technology suggests the performance of sodium-ion batteries may improve, alongside other battery technologies. This would allow sodium-ion batteries to follow a similar commercialisation pathway to LFP batteries: targeting consumers who prefer a lower cost product with acceptable performance over higher cost and higher performance options (see Box 15.1).

The current investment pipeline for sodium-ion batteries production facilities shows a relatively low level of investment, and production capacity is therefore expected to remain small in the short term. However, there is substantial overlap in manufacturing processes between lithium-ion and sodium-ion batteries, and manufacturers may thus leverage existing supply chains to deploy sodium-ion battery production capacity.

15.3 World production

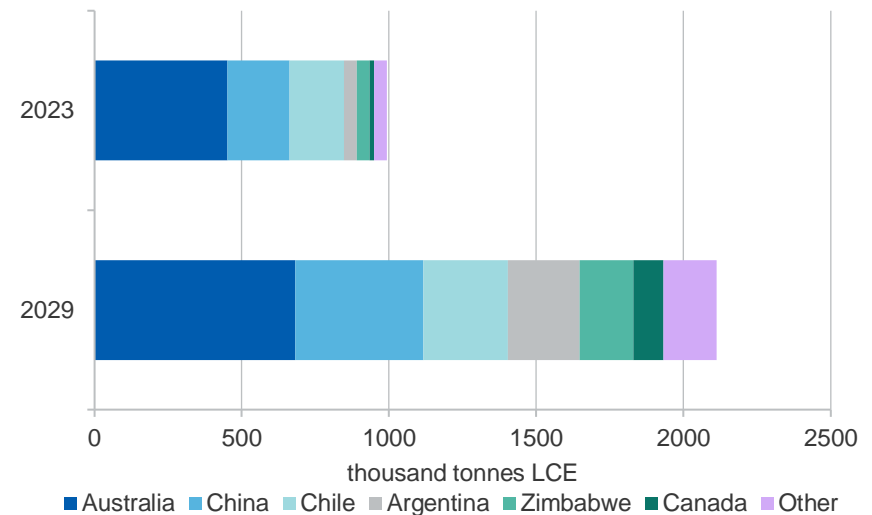
Australia's share of global lithium extraction to fall as supply diversifies

Lithium extraction is primarily divided into extracting and evaporating brines (a groundwater rich in dissolved lithium, extracted from underground lakes), and hard rock mining of either spodumene or lepidolite. Lithium lepidolites have higher costs than spodumene due to their lower lithium content. From a refined product perspective, brines are generally cheaper compared to hard rock mining. Evaporating brines produces lithium chemicals (largely lithium carbonate) which require no further refining depending on the use case, while ores/concentrates from hard rock mining must be processed at refineries to create lithium hydroxide or lithium carbonate.

World lithium output in 2023 is estimated at 993 kt LCE, a 44% increase from 2022. The largest increase came from Australia (see [Australia](#) section), but Zimbabwe and China also saw strong increases, and production rose from a range of smaller producers. As a result, Australia's share of global lithium extraction fell from 48% in 2022 to 46% in 2023.

Global lithium extraction is projected to rise by 13% per year to 2.1 mt LCE by 2029 (Figure 15.5). Australia is projected to add more lithium extraction capacity than any other country between 2023 and 2029, but a strong rise in production is also projected from other countries including China, Zimbabwe and Argentina. As a result, Australia's share of global lithium extraction is projected to fall to 32% by 2029.

Figure 15.5: Global lithium extraction, 2023 vs 2029



Notes: Includes lithium extracted from brines or mines. Projections are based on DISR assessment, informed by Wood Mackenzie research.

Source: Department of Industry, Science and Resources (2024), Wood Mackenzie (2024)

Argentina's share of global lithium extraction is projected to rise from 4.3% to 11% between 2023 and 2029. Argentina holds 12% of global lithium reserves and generally has access to lower cost brine resources compared to Australia's hard rock resources. Early lithium extraction investments favoured Australia over Argentina, due to Australia's relatively favourable investment climate. In 2021, the Argentine government's "Investment Promotion Regime for Exports" relaxed capital controls to allow foreign investors to withdraw up to 60% of export earnings from

Argentina, for purposes such as paying interest and dividends abroad. This change triggered a wave of foreign investment into its lithium sector. The Argentine Association of Mining Companies estimate that investment in the sector reached US\$1.5 billion in 2022.

Zimbabwe's share of global lithium extraction rose from 0.7% to 4.5% between 2022 and 2023. Over 2021 and 2022, Chinese companies invested about US\$1 billion in hard rock lithium projects in Zimbabwe, according to CRU Group. In 2022, Zimbabwe's government banned the practice of direct ore shipment, requiring ores to be processed into lithium spodumene concentrates domestically before export. The commissioning of some of those processing plants saw Zimbabwe's lithium extraction rise sharply over 2023. Zimbabwe's share of global lithium extraction is projected to rise to 8.6% by 2029.

China's share of global lithium extraction is projected to remain at 21% between 2023 and 2029. China has access to a mixture of brine, spodumene and lepidolite resources, and much of the increase in Chinese production over 2023 was from high cost lepidolite mining. Chinese lepidolite production is projected to stagnate during the outlook period. However, the relatively high cost of lepidolite production makes these projects amongst the most vulnerable to falls in lithium prices, and there is substantial risk that these lepidolite operations may close, especially if other low-cost sources of lithium increase, or global lithium demand fails to rise as quickly as forecast.

Production from Chile is also projected to rise over the outlook period, but at a slower rate than other producers. Chile's President announced plans to nationalise the nation's lithium industry in April 2023, which will likely lead to a slowdown in investment in the sector. Chile's share of global lithium extraction is forecast to fall from 19% in 2023 to 14% in 2029.

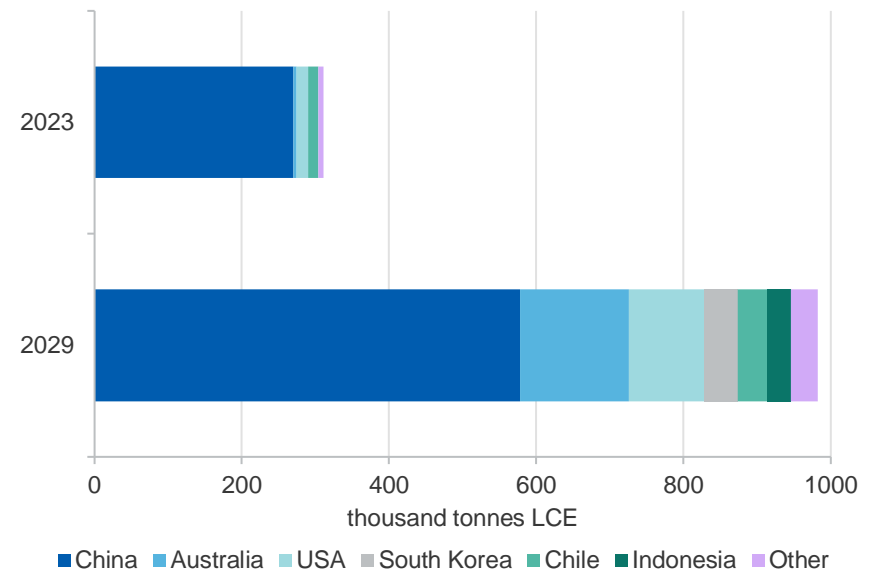
Global supply of lithium hydroxide to diversify over the outlook period

Lithium ores and concentrates are processed into refined lithium chemicals including lithium hydroxide (required for NMC batteries and can be used for LFP batteries) and lithium carbonate (largely used in LFP

batteries). While brines produce lithium chemicals without requiring further processing, it is common for carbonates produced by brines to be further processed (at dedicated refineries) into hydroxide for use in NMC batteries. The chemicals are used in the production of active materials that are part of the battery's cathode.

The global supply of refined lithium products is highly concentrated, with China the dominant producer of refined lithium chemicals. In 2023, China's share of global production was 87% for lithium hydroxide and 66% for lithium carbonate (Figures 15.6-7). Other major refined lithium chemical producers include Argentina and Chile, which extract lithium from brine.

Figure 15.6: Global lithium hydroxide production, 2023 vs 2029



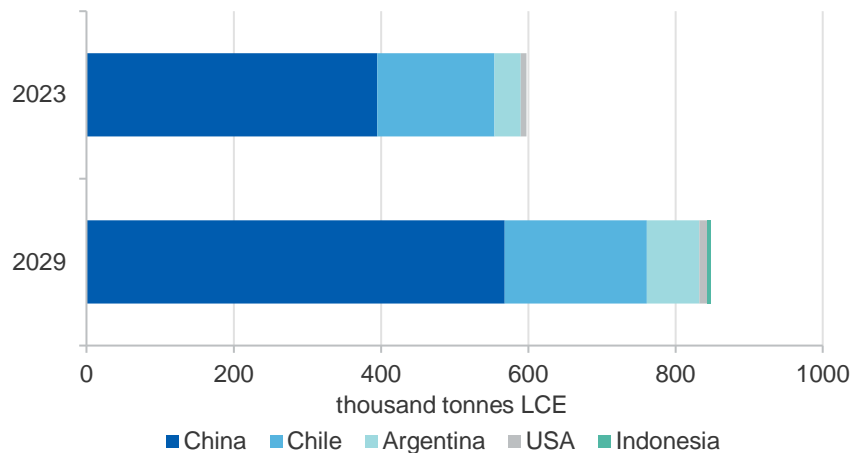
Note: Includes supply from refineries and from brines, and therefore partially overlap with supply shown under lithium extraction. Projections are based on DISR assessment, informed by Wood Mackenzie research.

Source: Department of Industry, Science and Resources (2024), Wood Mackenzie (2024)

China's share of global production for lithium hydroxide is projected to fall to 59% by 2029, due to investments in lithium refinery capacity outside of China, particularly in Australia and the US. Australia is projected to rise to 15% of global lithium hydroxide production (see [Australia](#) section), while US is projected to rise to 10%. A faster than expected adoption of LFP batteries — at the expense of NMC batteries — could put pressure on lithium hydroxide producers. The highest cost producers are lithium carbonate to hydroxide conversion facilities in China and the US, and these will likely be the most vulnerable if lithium hydroxide prices fall more than expected.

There is no currently substantial investment in refineries producing lithium carbonate outside of China. As a result, China's share of global lithium carbonate production is expected to rise slightly to 67% by 2029. Excluding carbonates produced by brines, all refinery production of lithium carbonate is located in China in 2023, and more than 99% of refinery production of lithium carbonate is projected to be in China by 2029.

Figure 15.7: Global lithium carbonate production, 2023 vs 2029



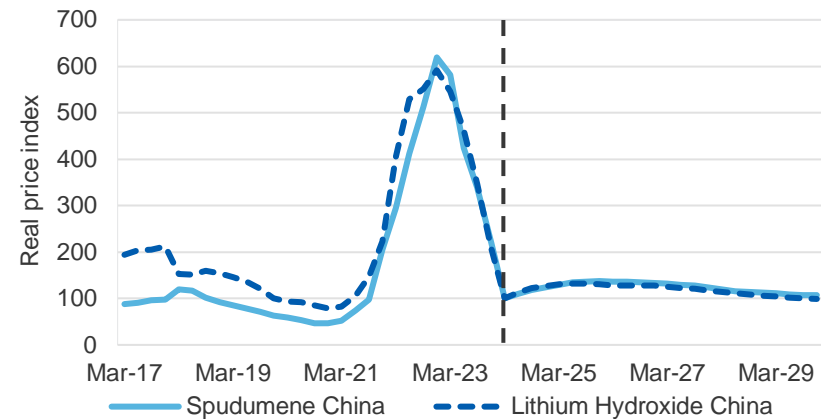
Note: Includes supply from refineries and from brines, and therefore partially overlap with supply shown under lithium extraction. Projections are based on DISR assessment, informed by Wood Mackenzie research.
Source: Department of Industry, Science and Resources (2024), Wood Mackenzie (2024)

15.4 Prices

Lithium prices to stabilise as high-cost producers exit the market

Rapid adoption of EVs drove a record rally in lithium prices over 2021 and 2022 (Figure 15.8). Lithium spodumene and hydroxide prices peaked in November 2022, with spodumene price averaging US\$6,108 a tonne and the lithium hydroxide price averaging \$75,393 a tonne. Compared to November 2020, prices for spodumene rose more than 15 times from an average of US\$392 a tonne, while prices for hydroxide rose more than 8 times from an average of US\$9,045 a tonne.

Figure 15.8: China lithium price index, quarterly



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). Index is normalized to March 2024 quarter as 100.

Source: Bloomberg (2024); Department of Industry, Science and Resources (2024)

In 2023, a wave of investment in lithium production spurred on by the high prices of 2022 resulted in a sharp rise in global lithium supply. Lithium demand was weaker than expected over the year, due to a slower than expected EV adoption in the US and EU. This closed the market deficit which drove the record prices in 2022. Prices fell over 2023 and have largely returned to levels similar to those prior to the rally in 2021. In February 2024, the spodumene price fell to an average of US\$1,000 a tonne, while the lithium hydroxide price fell to average US\$13,350 a tonne.

The lithium spodumene price is forecast to rise (in real terms) to about US\$1,360 a tonne by 2026, before falling to about US\$1,090 a tonne by 2029. The fall in prices over 2023 has driven a reduction in production (particularly by some high-cost producers). This is likely to support a modest recovery in the lithium prices over 2024 and 2025. From 2026, alternate battery chemistries could place some price pressure on lithium-ion EV batteries, resulting in a fall in lithium prices for the rest of the outlook period.

Similarly, lithium hydroxide price is forecast to rise (in real terms) to about US\$18,330 a tonne by 2026, before falling to about US\$13,890 a tonne by 2029. Rising LFP battery adoption is projected to continue to put lithium hydroxide prices under pressure (see Box 15.1). The carbonate discount over hydroxide slid through 2023 to average 13% over 2H 2023, comparing to 21% over the same period in 2022.

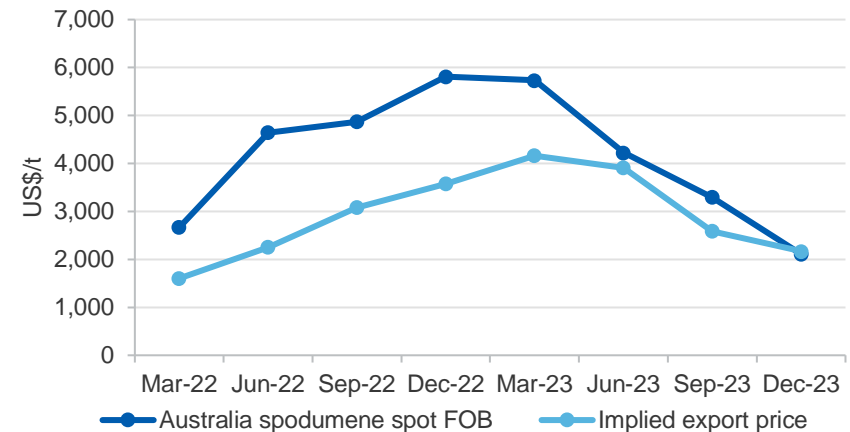
The forecasts have a high degree of uncertainty, as new producers enter the market around the world and uneven trends in EV demand growth. Lithium prices could respond to unexpected developments in the pace of EV adoption and in other emerging uses, changes in battery technology and government policy, over the outlook period.

15.5 Australia

Australian lithium mine production grew strongly in 2023

Australian lithium spodumene export earnings fell 25% year-on-year in the December quarter of 2023, driven by falling prices. The implied export price of Australian spodumene (at an equivalent to spodumene with 6% lithium content basis) fell 39% year-on-year (Figure 15.9), less than what falls in the spot price would suggest. This is due to substantial parts of Australian lithium exports trading under offtake agreements at prices which are typically priced with a lag of several months from the spot price. In LCE terms, export volumes rose by 18% year-on-year, offsetting some of the price impact. 98% of spodumene exported from Australia over the December quarter 2023 was to China.

Figure 15.9: Australian spodumene prices



Notes: The Australian export implied price is derived from export volumes and values published by the ABS, adjusting export volumes to be equivalent to spodumene with 6% lithium content.

Source: S&P Global (2024); ABS (2024); Department of Industry, Science and Resources (2024)

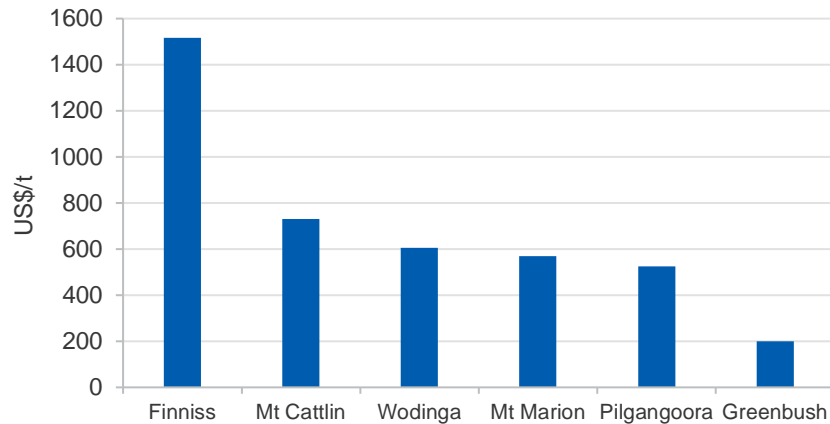
In the December quarter 2023, Australian lithium mine production is estimated to have risen 27% year-on-year to reach 119 kt LCE (1 kt of lithium spodumene with 6% lithium content is equivalent to 0.148 kt in LCE terms). The bulk of this increase in production came from mines operated by Mineral Resources, with the Wodgina mine ramping up its output over 2023, following its opening in mid-2022. Mineral Resources have also acquired the Bald Hill mine. The mine was placed on care and maintenance in 2019 when Alita Resources went into receivership. The mine re-opened following the acquisition on 1 November 2023, with a reported annual capacity of 150 kt of spodumene concentrate with 5.5% lithium content. At other lithium mines in Australia, year-on-year changes in production for the quarter were largely due to changes in ore grade.

Australian mine production to rise despite cut back at some mines

Lithium spodumene prices remain higher than the cash cost — a measure of marginal cost of production — at most major Australian lithium mines (Figure 15.10). Cash costs can indicate whether a mine is likely to reduce

production or close, but other considerations will factor into potential closures, such as floor prices in offtake agreements, a company's ability to service its loans and other liabilities, and costs associated with laying off a workforce. High prices over 2022 and 2023 left most lithium miners with a high level of cash reserves, reducing the risk of any forced mine closures.

Figure 15.10: Reported cash cost of production over H2 2023



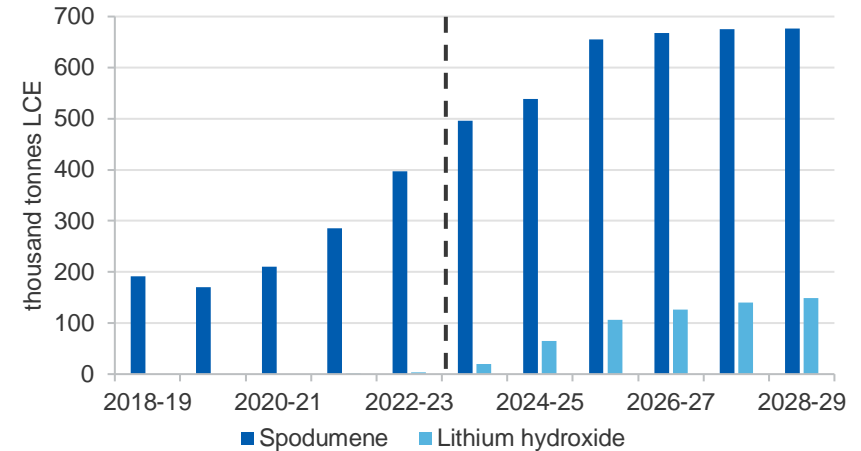
Notes: Cash costs is adjusted to spodumene with lithium content of 6% equivalent, using company reported cash cost and spodumene lithium content for H2 2023, and converted to US dollars with an exchange rate of 0.66.
Source: Company reports

Australian miners will be supported by the new proposed guidance on foreign entity of concern from the US (see [World Demand](#) section), which will exclude mines with some Chinese ownership from supplying lithium for US EVs. Most Australian lithium mines will be eligible for export to US markets under the proposed new rules.

Between 2023–24 and 2026–27, mine production is expected to rise by about 10% per annum (Figure 15.11). Greenbushes, Australia's largest lithium mine and one of the lowest cost sources of lithium globally, reported that production will be reduced over the first half of 2024, due to lower demand from Joint Venture partners. However, IGO announced that

the Joint Venture remains committed to the completion of the CGP3 processing plant. This plant is expected to increase the mine's capacity by a third from 2025 and will drive the bulk of Australia's increase in lithium mine production over the outlook period.

Figure 15.11: Aust. lithium mine and hydroxide production



Source: Department of Industry, Science and Resources (2024)

Other mines in Australia are also expected to lift production. Forward guidance from Mineral Resources suggests that Wodgina and Bald Hill will continue to ramp up production. Liontown's Kathleen Valley mine reported that construction of the mine was 74% complete at end 3023. A previously anticipated A\$760 million loan to Liontown could no longer be finalised due to lithium price falls. As a result, plans to expand Kathleen Valley from 300 kt to 400 kt of spodumene concentrate with 6.0% lithium content have been delayed. Westfarmers reported that Mt Holland had been successfully commissioned at the start of 2024, and is expected to produce 100 kt of lithium spodumene (with 5.5% lithium content) in H1 2024.

Offsetting some of this increase is the suspension of Core Lithium's Finnis mine and production cutbacks at Mt Cattlin. The Finnis mine, located in Northern Territory and the only lithium mine outside of Western

Australia, suspended production at the start of 2024 after operating for less than three months. Core Lithium’s reports to the ASX show the mine has a cash cost more than twice of other lithium mines operating in Australia over H2 2023. Mt Cattlin has the second highest cash cost in Australia over the same period and has reported plans to reduce production to cut costs.

Total Australian production is projected to be largely stable between 2026–27 and 2028–29. Identified ore reserves at Mt Cattlin suggest the mine could only operate until 2028, while the Greenbush Tailing Retreatment Project is also expected to end in 2028, as the project reaches end of life. These reductions will offset supply from new projects.

Australian lithium refineries ramp up more slowly than expected

Export of lithium hydroxide from Australia rose above 1 kt in LCE terms for the first time in the December quarter 2023 (1 kt of pure lithium hydroxide is equivalent to 0.88 kt in LCE terms). IGO reported that production at the Kwinana lithium refinery rose to 1.2 kt over H2 2023, a level below IGO’s expectations with the refinery suffering from extended downtime over the period. A review of bottlenecks and processes at the refinery is underway.

Construction of trains 1 and 2 of the Kemerton lithium refinery were completed in 2022, with an expected capacity of 50 kt of lithium hydroxide a year. However, Albemarle reported that commissioning of these trains is ongoing. Mineral Resources’ FY23 report noted that the commissioning of Train 1 is progressing — with the facility producing battery-grade lithium hydroxide at an unspecified volume — while train 2 has not yet begun production. Mineral Resources sold their 15% stake in the Kemerton refinery to Albemarle on 18 October 2023.

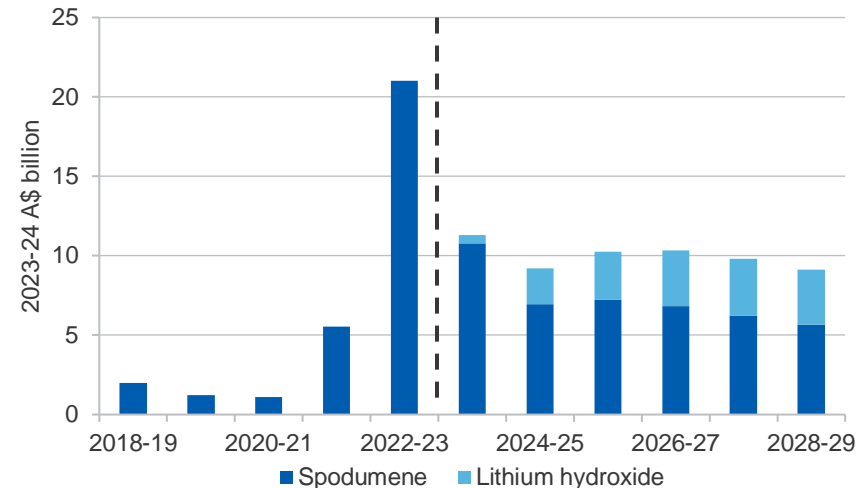
Australian production of lithium hydroxide is forecast to reach 148 kt in LCE terms by 2028–29, representing 22% of forecast Australian lithium mine production in that year.

Record lithium export earnings to decrease as prices decline

Lithium export earnings (in real terms) are expected to fall from a record

\$20 billion in 2022–23 to between \$9-11 billion a year over the outlook period (Figure 15.12). This is driven by the lower lithium prices projected. Rising export volumes should offset some of the effects of lower prices.

Figure 15.12: Value of Australian lithium exports



Source: ABS (2024), Department of Industry, Science and Resources (2024)

Revisions to the outlook

Since the December 2023 *Resources and Energy Quarterly*, the forecast for Australia’s lithium earnings in 2024–25 has been revised down by 38% (from \$15 billion to \$9.5 billion in nominal terms). This is due to a lower price forecast for lithium spodumene (see [Prices](#) section), partially offset by higher production forecasts from stronger company forward guidance (see [Australia](#) section).

Compared with the March 2023 *Resources and Energy Quarterly*, the projection for Australia’s lithium earnings has been revised down by 50% (from \$22 billion to \$10.4 billion in nominal terms) in 2027–28. This is due to the lower price forecast for lithium spodumene (see [Prices](#) section), while the production projection for 2027–28 is largely unchanged.

Table 15.1: Lithium outlook

World	Unit	2023 ^s	2024 ^f	2025 ^f	2026 ^z	2027 ^z	2028 ^z	2029 ^f	CAGR ^r
Production ^b	LCE ^a kt	1,019	1,322	1,540	1,744	1,892	2,017	2,261	14.2
Demand	LCE ^a kt	1,001	1,219	1,419	1,635	1,841	2,050	2,266	14.6
Spodumene price									
– nominal	US\$/t	3,730	1,139	1,379	1,416	1,369	1,261	1,210	-17.1
– real ^c	US\$/t	3,812	1,139	1,353	1,361	1,289	1,162	1,092	-18.8
Lithium hydroxide price									
– nominal	US\$/t	50,288	15,870	18,393	18,334	17,762	16,396	15,394	-17.9
– real ^c	US\$/t	51,395	15,870	18,050	17,613	16,719	15,112	13,892	-19.6
Australia	Unit	2022–23 ^s	2023–24 ^f	2024–25 ^f	2025–26 ^z	2026–27 ^z	2027–28 ^z	2028–29 ^z	CAGR ^r
Production									
– Mine (spodumene)	LCE ^a kt	397	493	539	655	668	676	676	9.3
Export volume									
– Ore and concentrate (spodumene) ^h	kt	3,277	3,410	3,191	3,704	3,651	3,606	3,559	1.4
– Refined (lithium hydroxide) ^h	kt	-	22	74	120	143	160	169	n/a
Export value									
– Ore and concentrate (spodumene)	A\$m	20,069	9,774	5,774	6,994	6,742	6,260	5,781	-18.7
– Refined (lithium hydroxide)	A\$m	-	478	1,883	2,966	3,478	3,629	3,566	n/a
– Total (nominal) ^d	A\$m	20,194	11,309	9,483	10,888	11,232	10,937	10,434	-10.4
– Total (real) ^{d,g}	A\$m	21,005	11,309	9,191	10,269	10,335	9,819	9,138	-13.0

Notes: **a** Lithium carbonate equivalent: this is a measure of the quantity of lithium metal in the product; **b** Refined lithium products include lithium hydroxide and lithium carbonate; **c** In current calendar year US dollars; **d** Revenue from spodumene concentrate, lithium hydroxide and other lithium products; **g** In current financial year Australian dollars; **h** Quantities refer to the gross weight of the product without adjustments for lithium content: lithium content of spodumene from Australian mines are generally, but not always, between 5 to 6 percent; **f** Forecast; **r** Compound annual growth rate (per cent), for the period from 2023 to 2029 or for the equivalent financial years; **s** Estimate; **z** Projection.

Source: ABS (2024); Bloomberg (2024); Company reports; Department of Industry, Science and Resources (2024); Wood Mackenzie (2024)



Principal markets for Australia's resource and energy exports

Table 16.1: 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	165,086	35%
Japan	\$m	50,605	45,539	34,223	75,941	98,956	21%
Other Asia ^a	\$m	34,648	29,546	33,491	46,261	51,439	11%
Korea, Rep. of	\$m	21,746	21,423	23,042	43,210	45,182	10%
India	\$m	14,427	9,449	11,612	26,418	21,265	5%
EU28	\$m	11,616	18,633	15,546	13,711	14,389	3%
<i>Other</i> ^b	\$m	35,862	38,304	41,793	66,612	70,020	15%
Total	\$m	280,071	289,489	308,494	421,691	466,338	-

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.2: 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	104,777
Japan	\$m	5,757	7,038	9,080	10,257	8,073
Korea, Rep. of	\$m	4,667	6,222	9,033	8,293	6,932
Taiwan	\$m	1,768	1,876	3,070	2,793	1,974
India	\$m	237	21	9	34	67
Indonesia	\$m	44	27	40	38	38
<i>Other</i> ^a	\$m	1,614	2,891	6,922	2,766	2,270
Total	\$m	77,553	102,861	152,975	132,489	124,131

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.3: 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
<i>Other^b</i>	\$m	1,276	1,071	1,198	2,421	2,231
Total	\$m	49,727	47,525	30,477	70,571	92,237

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 (2024) International Trade in Goods and Services, 5368.0; International Trade Centre (2024); Department of Industry, Science and Resources (2024)

Table 16.4: 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	37,712
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
<i>Other^a</i>	\$m	1,555	1,295	2,613	5,863	5,485
Total	\$m	25,958	20,376	16,009	46,258	65,500

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.5: 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	15,642
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
<i>Other</i> ^a	\$m	6,436	4,626	4,246	15,070	13,101
Total	\$m	43,637	34,245	23,187	67,588	61,922

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.6: 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
<i>Other</i> ^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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.7: 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	19,788
Belgium	\$m	na	na	na	85	169
Korea, Rep. of	\$m	na	na	na	46	90
United States	\$m	na	na	na	37	15
<i>Other</i> ^a	\$m	na	na	na	7	8
Total	\$m	na	na	na	4,899	20,069

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.9: 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	1,410
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
<i>Other</i> ^a	\$m	1,962	2,357	5,885	6,875	6,959
Total	\$m	9,770	10,208	11,440	12,128	12,262

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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)

Table 16.10: 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
<i>Other^b</i>	\$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 (2024) International Trade in Goods and Services, 5368.0; International Trade Centre (2024); Department of Industry, Science and Resources (2024)

Table 16.11: 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
Indonesia	\$m	120	95	111	164	143
<i>Other^b</i>	\$m	433	546	769	1,278	1,083
Total	\$m	4,166	3,692	3,763	5,710	5,281

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 (2024) International Trade in Goods and Services, 5368.0; International Trade Centre (2024); Department of Industry, Science and Resources (2024)

Table 16.12: Principal markets for Australia's nickel exports

	Unit	2018–19	2019–20	2020–21	2021–22	2022–23
China	\$m	339	479	307	244	572
India	\$m	0	0	0	3	60
<i>Other</i> ^b	\$m	2,110	2,443	2,898	4,158	4,324
Total	\$m	2,450	2,922	3,204	4,405	4,956

Note: Department of Industry, Science and Resources estimates based on International Trade Centre data and company reporting; **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 (2024) International Trade in Goods and Services, 5368.0; Department of Industry, Science and Resources (2024)



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.

The '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 19 March 2024.

Resources and Energy Quarterly publication schedule

Publication	Expected release date	Outlook period final year
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
March 2025	31 March 2025	Australian data: 2029–30 World data: 2030

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