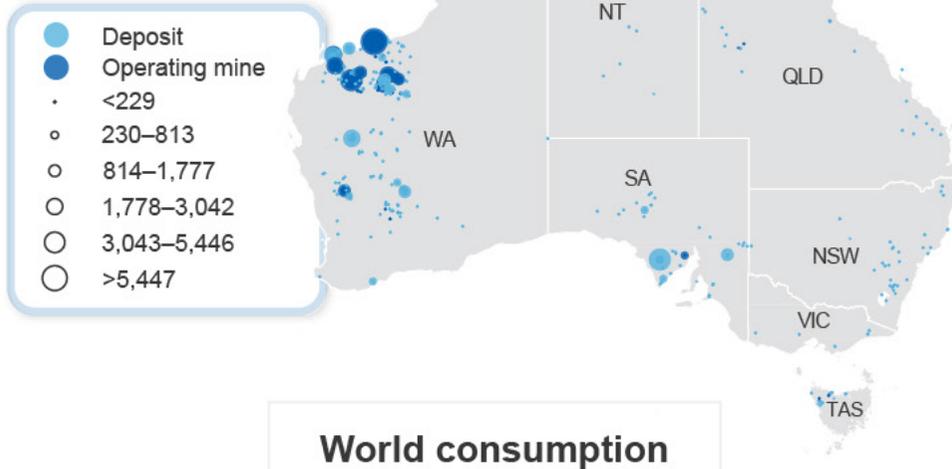


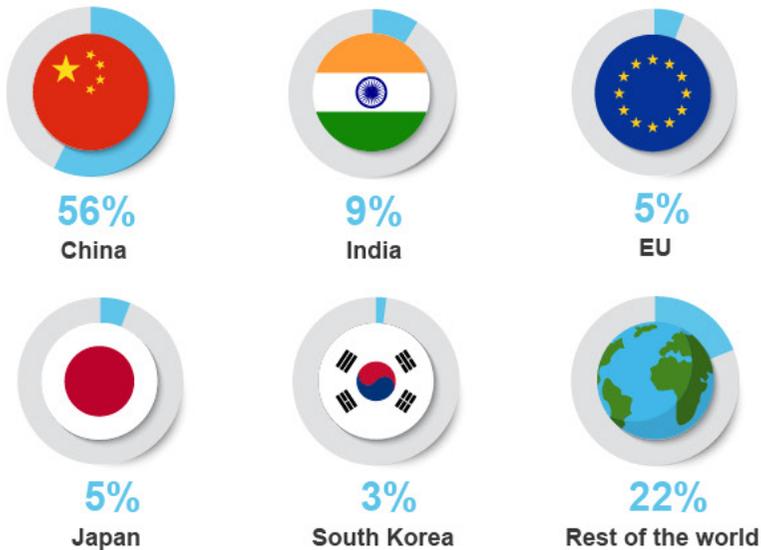


Iron Ore

Major Australian iron ore deposits (Mt)



World consumption



Iron ore



Iron is the most abundant element on earth, forming much of the planet's core



Iron ore deposits were originally formed by algae

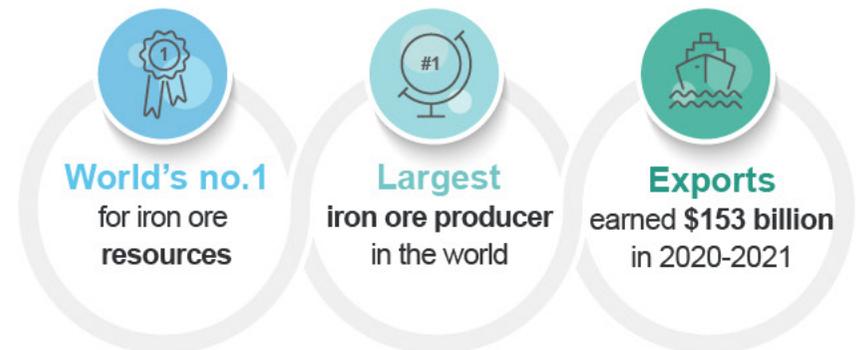


Humans have been working with iron for at least 5,000 years



Iron was central to the industrial revolution

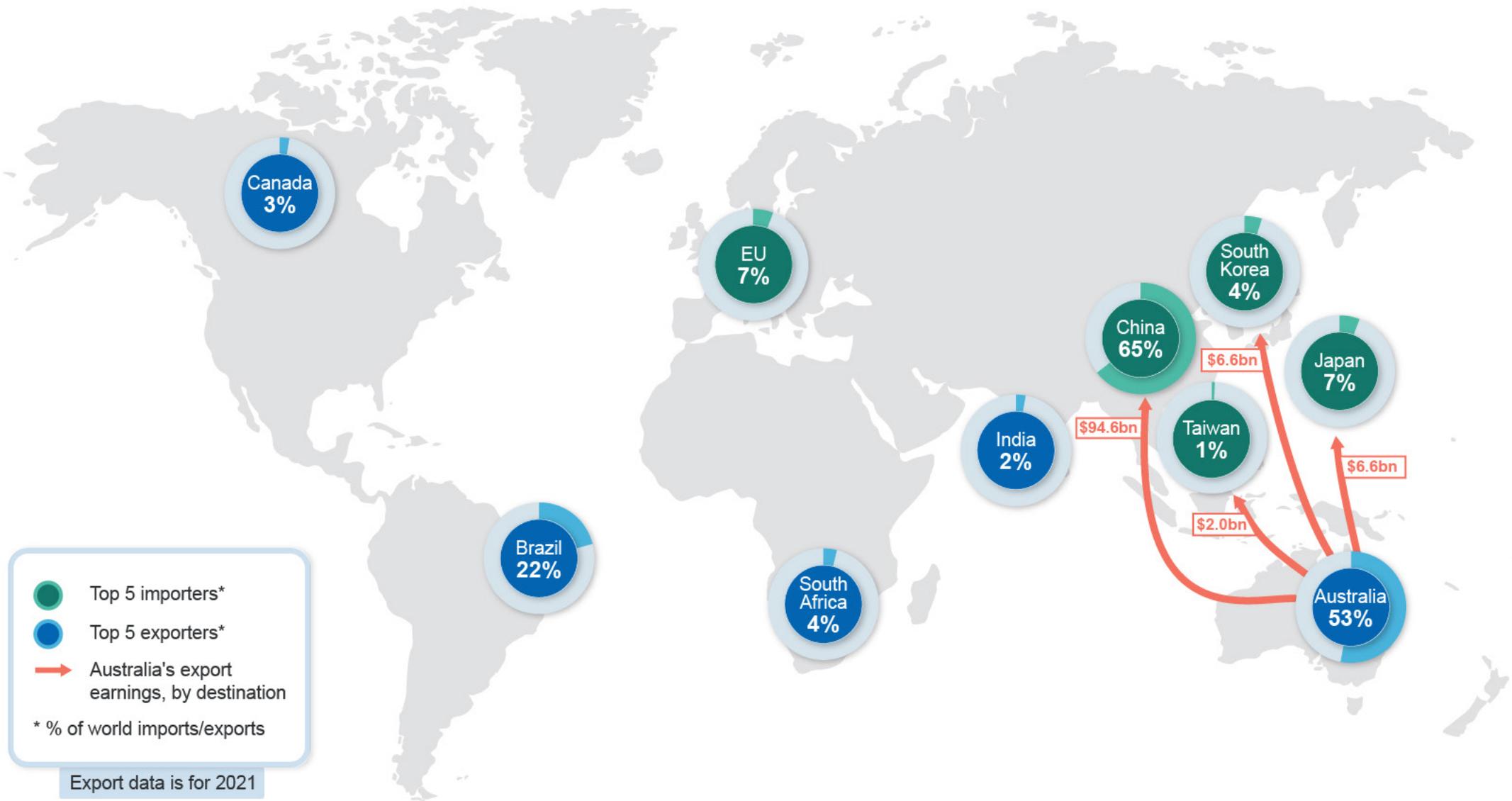
Australia's iron ore





Iron Ore

Trade map | March 2022



4.1 Summary

- After falling more than 60% through the second half of 2021, iron ore prices have rebounded in early 2022 (to around US\$140 per tonne by mid-March). This reflects an improvement in China's steel output in recent months, growing expectations of a more accommodative policy stance in China this year, and current supply concerns due to the Russian invasion of Ukraine.
- Australian export volumes are projected to grow steadily over the outlook period, from 897 million tonnes in 2021–22 to 1,044 million tonnes by 2026–27. This reflects the ramp up in production of several new and replacement mines in Western Australia.
- Australia's iron ore export earnings (in real terms) are projected to ease over the outlook period, from \$135 billion in 2021–22 to \$105 billion in 2022–23, and falling to \$74 billion by 2026–27.

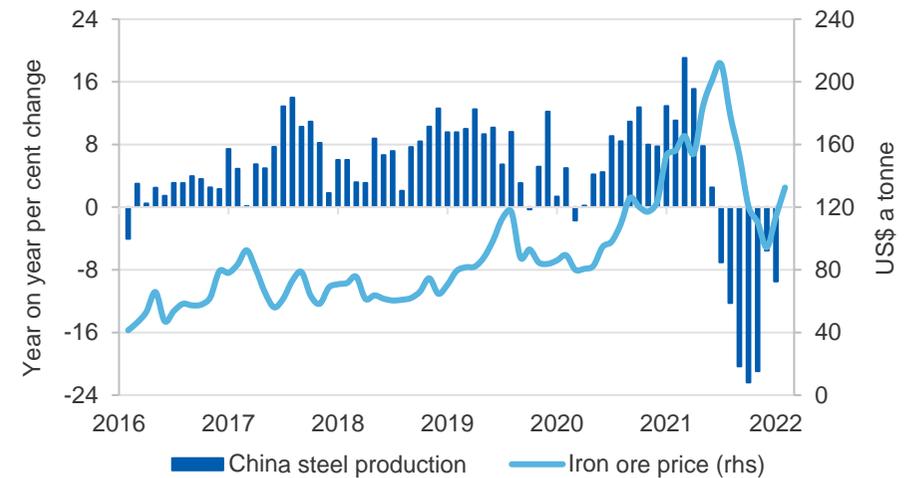
4.2 Prices

Iron ore prices partly recover the considerable falls of second half of 2021

Iron ore prices have fluctuated considerably over the past 18 months. Following record highs during the first half of 2021 (US\$230 a tonne), the benchmark iron ore spot price (62% Fe fines CFR Qingdao) fell to a low of US\$80 a tonne by mid-November. However, in February 2022, the 62% spot price averaged around \$125 per tonne, 60% off the lows reached late last year.

The large fall in iron ore prices in the second half of 2021 reflected China's efforts to curb its steel production, as well as its subdued demand for steel due to weaker construction activity (see *Steel* chapter) (Figure 4.1). As the world's largest consumer of iron ore — with China importing around 65% of global seaborne iron ore supply in 2021 — weaker demand from China's steel industry had a significant and negative impact on global iron ore demand over the period. Recovering exports from Australia and Brazil — following a weather-affected March 2021 quarter — also helped to replenish tight seaborne iron ore supplies and put downward pressure on prices (Figure 4.2).

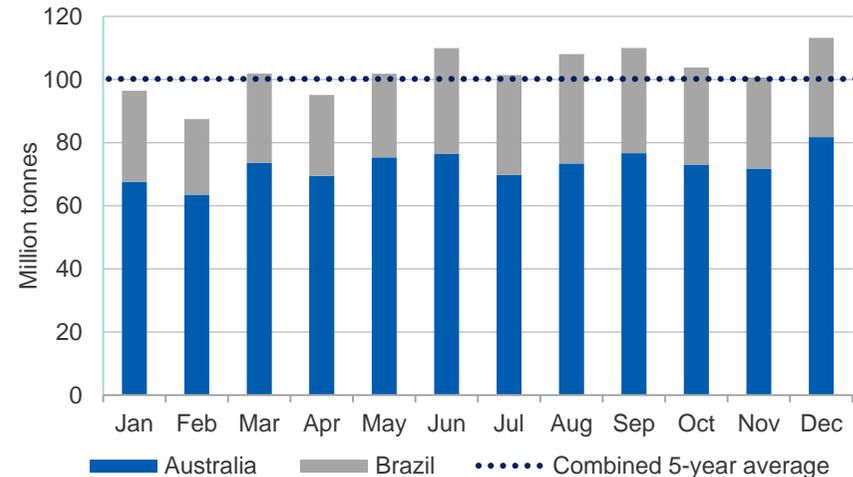
Figure 4.1: Iron ore price and China steel production, monthly



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

Source: Bloomberg (2022) China import prices; World Steel Association (2022)

Figure 4.2: Monthly iron ore exports 2021, Australia and Brazil



Source: ABS (2022); Brazilian customs data (2022)

The stabilisation of prices in more recent months reflects a partial recovery of China's steel production, which has come despite annual winter steel curbs and pollution controls in place for much of the March quarter 2022. China's steel production in January 2022 was around 82 million tonnes, 18% higher than the low reached in November last year.

Weather disruptions also impacted Brazilian supply in December and January. Heavy rains in the state of Minas Gerais reduced output from Vale's Southern and South-Eastern systems, as well as CSN's Casa de Pedra mine. While production recovered by mid-January, further rainfall — and particularly its impact on tailings dams in these systems — remains a key risk for the first half of 2022.

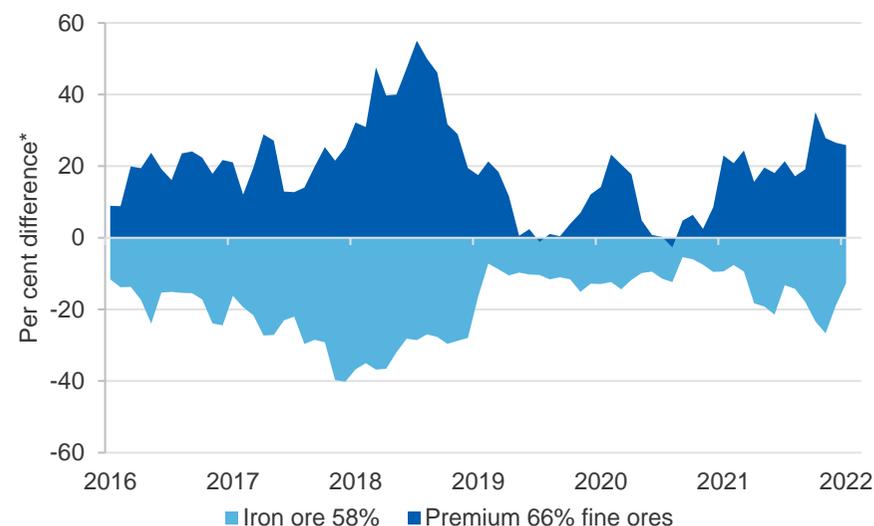
The combination of emissions-related curbs and historically elevated metallurgical coal prices (see *Metallurgical Coal* chapter) also saw the premium for higher grades of iron ore (65% Fe content and above) reach multi-year highs throughout 2021 (See Figure 4.3). These grades typically require less metallurgical coal to be used in blast furnace steelmaking, and create reduced emission levels (for a given level of output), allowing mills to maximise output while still adhering to pollution controls. With winter production curbs in place through the March 2022 quarter for Hebei — China's largest steel-producing province — this has seen a persistence of the 66% premium in early 2022.

More expansionary policy in China to buoy iron ore demand in 2022

China is expected to engage in more expansionary fiscal and monetary policies this year, following a relatively tight stance through 2021. This is expected to bolster steel and iron ore demand in 2022.

China's Central Government has announced an emphasis on infrastructure spending in 2022, with financing for over 100 mega projects to be frontloaded in the first half of the year (See *Steel* chapter). The Government has been taking further steps to stabilise its residential property sector, another major consumer of steel. This includes ensuring the completion of existing residential projects, with many state-owned developers taking over distressed assets and purchasing new land.

Figure 4.3: Iron ore price spread between grades



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

Source: Bloomberg (2022); China import prices

China's so-called 'Three Red Lines' policy has also been loosened, with funds in escrow now able to be used by developers to finish projects. The People's Bank of China has also made cuts to both the Bank Reserve Ratio Requirement (RRR) and the benchmark mortgage rate in recent months, signalling a potential upswing in China's credit impulse.

Collectively, these actions are expected to see a lift in total construction activity in 2022, particularly from the June quarter.

In response to recent high prices, China's Central Government has also announced an intention to clamp down on speculative and excessive hoarding behaviour in iron ore markets in 2022. This will include greater inspection of domestic exchanges and major ports, and stronger reporting requirements around iron ore market information.

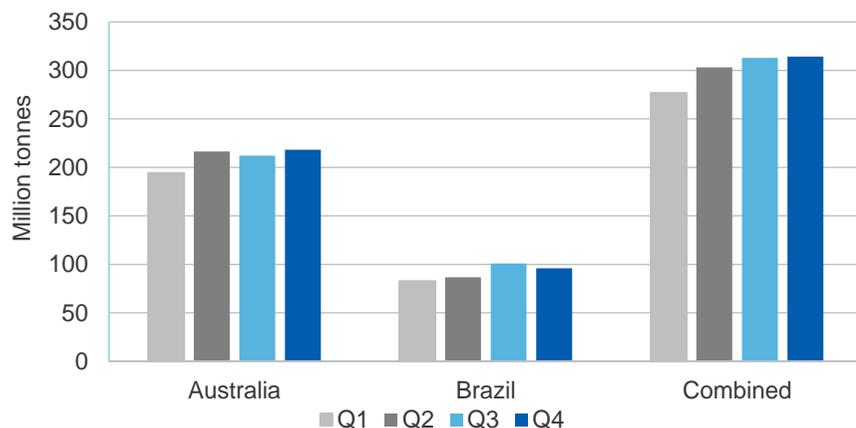
Over the outlook period, China has announced a desire to further consolidate its steel industry, which would help to strengthen its market position and negotiating power in global markets.

Iron ore prices vulnerable to supply shocks in 2022

Combined exports volumes for the world's two largest iron ore producers — Australia and Brazil — reached close to 318 million tonnes in the December 2021 quarter. This was 5.3% higher than the five-year (quarterly) average, and the best result for the December quarter since 2017. Due to a relatively dry start to the year in the Pilbara region, Australia's strong export volumes have continued into 2022, with total iron ore volume for the month of January of 74 million tonnes, 9.6% higher year-on-year, and the largest export tonnage on record for the month of January.

However, the potential for seasonal rainfall to impact global iron ore supply remains a key risk in the first half of 2022. The March quarter of each calendar year is typically the most impacted by weather, with average iron ore export volumes in Australia around 8% lower than the annual (quarterly) average (Figure 4.4). This phenomenon also impacts Brazilian supply, with average export volumes in the March and June quarters typically around 10% and 5% lower respectively than the full year quarterly average.

Figure 4.4: Average iron ore export volumes, 2016 to 2021



Notes: Average is for period 2016 to 2021

Source: ABS (2022); Brazilian customs data (2022)

Australian producers have continued to be impacted by labour supply shortages in recent months. This includes issues at existing operations, as well as the tie-in of replacement capacity. With an ongoing rebound in China's steel output so far in 2022, these labour shortages raise the risk of global supply shortfalls in the near term.

The current Russian invasion of Ukraine also has the potential to tighten seaborne iron ore markets in 2022. Combined exports for both countries in 2021 were estimated to be around 70 million tonnes (equivalent to around one month's export volumes for Australia), with major export destinations including China, the EU and Asia. With Russia and Ukraine also accounting for a significant share of global steel supply (see *Steel* chapter), increased exports from other major steel producers to fill this shortfall could further boost global iron ore demand in coming months.

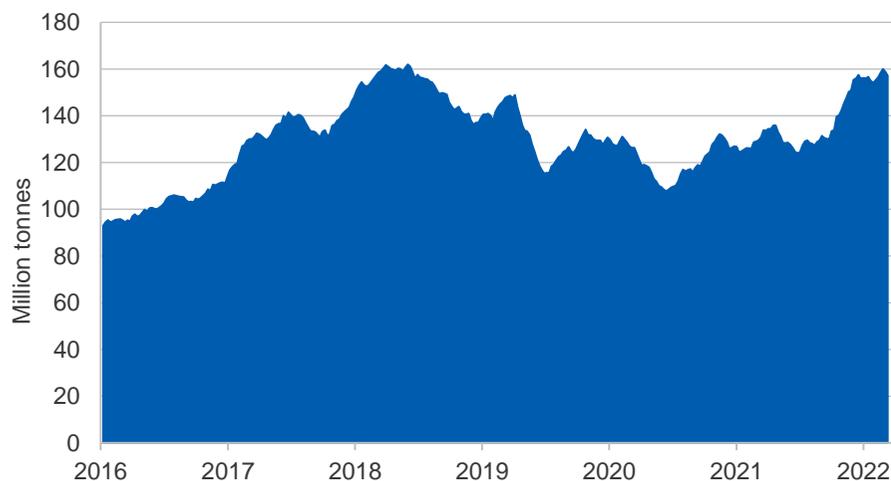
Chinese portside iron ore inventories were around 160 million tonnes by the middle of March, well above the five-year average and just off multi-year highs (Figure 4.5). This accumulation initially reflected reduced portside sales due to the significant drop off in steel output in the second half of 2021. However, the lower price for iron ore in the December quarter 2021 also saw increased stockpiling by portside traders, in preparation for the ramp up in steel production anticipated from the end of the March quarter 2022. High portside inventories will provide some buffer for steel mills to restock iron ore supply in 2022, reducing the risk of a tightening in the seaborne iron ore market similar to that seen in the first half of 2021.

Stronger prices in 2022 to fade over the outlook period

The boost in new infrastructure investment and easier credit conditions in China this year is expected to provide further support to prices for the rest of 2022. The spot price for 62% Fe iron ore fines (FOB) for calendar 2022 is now forecast to average US\$110 per tonne for 2022.

Downside risks to this outlook include continued weakness in China's residential property market. Throughout 2021, China made attempts to address surging property prices and high debt in the sector, which led to lower construction activity going into the start of 2022. With property

Figure 4.5: China's weekly iron ore port stocks



Notes: Benchmark used is 62% iron fines CFR

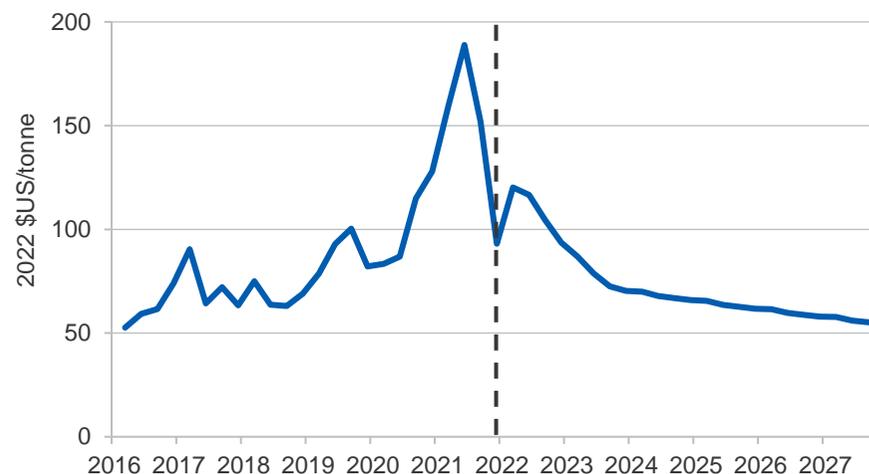
Source: Bloomberg (2022)

construction a major end-user of steel (around 30% of China's total demand), continued weakness in this sector would have significant implications for the country's total demand for iron ore.

Over the outlook to 2027, iron ore prices are projected to decline to lower long-run levels. This decline will come as a result of more modest growth in blast-furnace steelmaking (compared with the past decade) from major producers such as the EU, US and China, as the world undergoes a transition to a low emissions environment. This softer demand growth will also take place alongside growing supply from Australia, Brazil and Africa, and is expected to dampen prices over the outlook period to 2027.

From a forecast average price of around US\$110 per tonne (62% Fe fines, FOB) in 2022, the real benchmark iron ore price is then projected to average US\$80 per tonne in 2023. Over the outlook to 2027, real benchmark iron ore prices are projected to decline by around 15% a year, to reach US\$55 per tonne in 2027 (Figure 4.6).

Figure 4.6: Iron ore price outlook, quarterly



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

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

4.3 World trade

Global iron ore supply to continue improving in 2022

Total shipments for the world's four largest iron ore exporters — Australia, Brazil, South Africa and Canada — were estimated to be 1.35 billion tonnes in 2021. This was 1.6% higher compared with 2020 and 1.2% higher than 2018, the last full year of unaffected global seaborne supply prior to the 2019 Brumadinho tailings dam collapse in Brazil.

The total volume of iron ore exported from Australia in 2021 was 872 million tonnes. This was 0.6% higher compared with 2020. The modest improvement reflected a recovery in production in Western Australia in the latter part of the year, following the dissipation of acute weather disruptions seen in the March 2021 quarter. Export volumes also continued to improve throughout 2021, despite ongoing maintenance work at the ports of Dampier and Hedland, and pandemic-related delays for major producers in bringing replacement supply online in 2021 (see *Australia* section).

For 2022, Vale has set guidance at 320 to 335 million tonnes. This target reflects a new strategy, outlined late last year by the company, aimed at prioritising value over volume, and lowering supply of some of its high-silica, low margin product. The move is part of Vale's aim to reduce Scope 3 emissions by 15% by 2035, and is expected to lead to lower production of 12-15 million tonnes in 2022.

Vale continues to aim for a return to 400 million tonnes annual capacity within the next few years. This includes bringing its Serra Sul 120 project — with 20 million tonnes of additional capacity — into production by 2024. The plans also include development of a new dedicated iron ore port for its Northern system that could provide up to 560 million tonnes of annual export capacity, with construction expected to get underway in mid-2022, and operations to start by 2025.

Total Brazilian exports are forecast to reach 375 million tonnes in 2022, a rise of around 4.5% compared with 2021. Over the outlook period, Brazil's total iron ore export volumes are projected to grow by around 3.6% annually, to reach around 440 million tonnes by 2027 (Figure 4.7).

Combined exports from other major producers South Africa, Canada and India are forecast to reach 159 million tonnes in 2022. This will contribute to projected world exports (excluding Australia and Brazil) of 417 million tonnes in 2022, 1.2% higher than the previous year. However, the current Russian invasion of Ukraine carries the potential to tighten seaborne iron ore supply in the near term, with combined exports from these two countries of around 72 million tonnes in 2021 (or around 6 million tonnes per month). Over the outlook period, world iron ore exports (exc. Australia and Brazil) are projected to grow by around 0.5% annually, to reach around 460 million tonnes by 2027.

[New iron ore mines in Africa to come online later in the outlook](#)

In March this year, the China Iron and Steel Association announced a new plan to diversify the country's iron ore supply chain (of which Australia currently accounts for over 60% of the nation's iron ore imports). The plan includes boosting domestic output by 100 million tonnes (to 370 Mt) by 2025; increasing steel scrap consumption by 70 million tonnes (to 300Mt)

over the same period; and increasing equity output from overseas mines (from 120 million tonnes in 2020) to 220 Mt by 2025.

China is investigating a number of possible iron ore mines in Africa. The most notable prospect is the proposed Simandou iron ore mine, located in Guinea. The project has been increasingly emphasised as a key element in China's future supply chains, with potential full production capacity of 200 million tonnes per year (around 15-20% of output currently produced in the Pilbara region of Western Australia) of 65% grade ore.

However, there are significant risks for this development. The project requires long term and significant investment in mining-related and transport infrastructure to get minerals to market, including the development of a new port and 650 kilometres of new railway. While construction of this infrastructure began early in 2021 — with an intended completion date of 2024 — recent political events in the country could delay the project's timeframes. Following a coup that took place against President Alpha Condé late last year, in early March the Guinean Government ordered a full halt of the project and has proposed a further review of the infrastructure plans in 2022.

The Nimba iron ore project in Guinea has also come up for further review announced by the neighbouring Liberian Government in late 2021. The project is aiming to produce 30 million tonnes a year of high grade ore in Guinea, but also requires the construction of extensive port and rail infrastructure, primarily in Liberia. Construction is forecast to begin in 2023 and cost around US\$3 billion (including US\$600 million for rail and port development). However, this new government review in 2022 risks delaying this schedule.

New prospects also continue to be developed in Cameroon, the Democratic Republic of the Congo, Mauritania and Gabon. This includes Gabon's Belinga iron ore project, for which Fortescue Metals Group recently signed a 36 month exclusivity agreement (for exploration). Belinga is believed to be one of the largest undeveloped Direct Shipping Ore (DSO) deposits in the world, capable of producing 30 million tonnes per

year. However, the project would also require new port and railroad infrastructure to be built in order to mine and export the iron ore.

The tightness in global iron ore markets seen in recent years is expected to ease over the outlook, with growth in exports from both Australia and Brazil over the next few years. New iron ore supply from Africa is also projected to start from the latter half of the outlook period (Figure 4.7). However, Australia's market share is expected to hold up to 2027. On the demand side, while traditional major steel producers are expected to see slower growth in steel output (particularly blast-furnace production) over the outlook to 2027, new production capacity across South and South East Asia, and South America is expected to see healthy growth in global steel production and iron ore consumption over the period.

4.4 Australia

Iron ore export earnings set calendar year record in 2021

Australia's total iron ore export earnings reached \$153 billion in 2021. This was \$37 billion (or 32%) higher than the previous calendar-year record set in 2020. The achievement primarily reflects an elevated price for iron ore sustained throughout the year, with the average unit export price in 2021 of \$178 per tonne, around 30% higher compared with 2020.

Australia exported 872 million tonnes of iron ore in 2021, 0.6% higher than in 2020. This followed severe wet weather experienced throughout the first half of the year, maintenance work undertaken at Port Hedland and Dampier, and pandemic-related delays for the major producers in bringing replacement supply online in 2021.

Iron ore exports to China reached close to \$126 billion in 2021, representing 82% of Australia's total iron ore export earnings. By value, Australia's exports to China in 2021 were 33% higher year-on-year, while volume (720 million tonnes) was around 2.8% higher.

Rio Tinto shipped 322 million tonnes of iron ore in 2021. This was slightly below their 2021 guidance (325 to 340 million tonnes), and 3% lower than 2020. The company indicates the result was due to above-average rainfall in the first half of the year, and cultural heritage management. The

company has also identified delays in its efforts to bring 90 million tonnes of replacement capacity online during 2021. This was largely due to COVID-19 restrictions, labour shortages and supply chain disruptions.

Despite these issues, the ramp up of tie-in replacement capacity is expected in 2022. Rio Tinto's West Angelas project (30 million tonnes per annum capacity) and Mesas B, C and D project (25 million tonnes per annum) achieved first ore in June and August 2021, respectively. And the company's third brownfield replacement project, Western Turner Syncline Phase 2 (32 million tonnes per annum), achieved first ore in October 2021. Rio Tinto also projects its greenfield project Gudai Darri (43 million tonnes per annum) to start producing from the June 2022 quarter. Rio Tinto has provided 2022 guidance of 320 to 335 million tonnes.

BHP's total iron ore production was 129 million tonnes for the first six months of the 2021–22 financial year (and around 257 million tonnes for the 2021 calendar year). This was around 1% higher than for the same period in 2020. The increase came despite major maintenance undertaken during the second half of the year at Port Hedland, as well as railway labour shortages related to COVID-19 border restrictions. Despite the issues, BHP has retained 2021–22 guidance at 249 to 259 million tonnes. This will include a ramp up of its South Flank project, which achieved first ore in May 2021, and is expected to reach full production of 80 million tonnes per year over the next few years. In September 2021, BHP also received regulatory approval to lift capacity at its Port Hedland operations (from 290 million tonnes per annum) to 330 million tonnes per annum.

Fortescue's total iron ore exports were around 93 million tonnes in the second half of 2021 (and around 185 million tonnes for the 2021 calendar year). This half year result was 3% higher than the same period in 2020, and set a new record for total volume shipped in a six month period. This has come as Fortescue's newly developed Eliwana project ramps up, with an eventual production capacity of 30 million tonnes per year. Fortescue is continuing to develop its 22 million tonne per annum Iron Bridge Magnetite Project, with first output scheduled for December 2022. This new project

will deliver high grade 67% Fe magnetite concentrate. Fortescue has set 2021–22 fiscal year production guidance at 180 to 185 million tonnes.

In February 2022, the Western Australian Government endorsed a development plan to increase Port Hedland’s export capacity to 660 million tonnes of iron ore per year (previously 495 million tonnes per annum). This includes a substantial increase in allocation for BHP, Fortescue and Roy Hill. The WA Government expects final approvals by mid-2022.

With increasing production volumes and continued strength in prices, Australia’s iron ore export earnings are forecast to be \$135 billion in 2021–22. Prices for iron ore are expected to continue to ease from the second half of 2022, leading to lower earnings over the outlook. Total export earnings for iron ore is forecast to be \$105 billion (in real terms) in 2022–23, before falling to \$74 billion by 2026–27 (Figure 4.8).

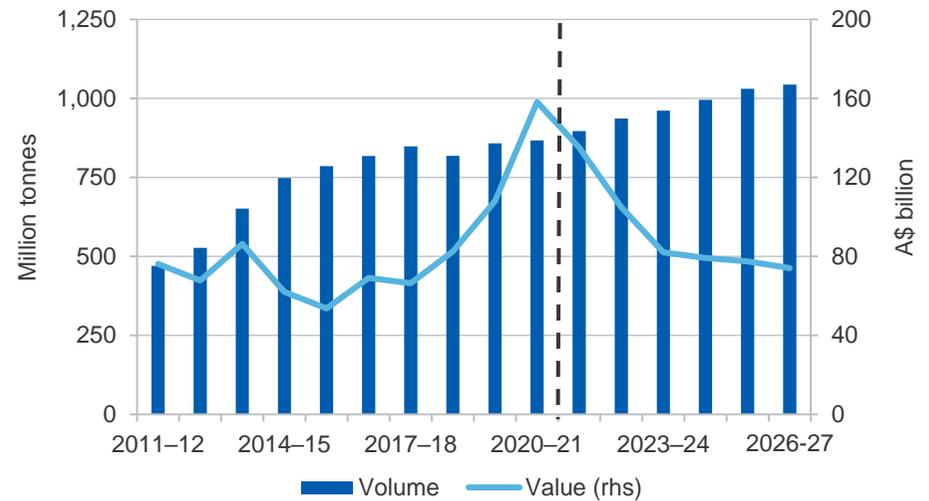
Iron ore exploration expenditure is growing as prices lift

A total of \$131 million was spent on iron ore exploration in the December quarter 2021 (Figure 4.9). This was a fall of 25% compared with the previous quarter, but 19% higher than the same quarter in 2020. For the calendar year 2021, expenditure was \$558 million, more than 40% higher than the previous year. Exploration has been elevated in recent quarters as iron ore prices have reached historical highs in the first half of 2021.

Revisions

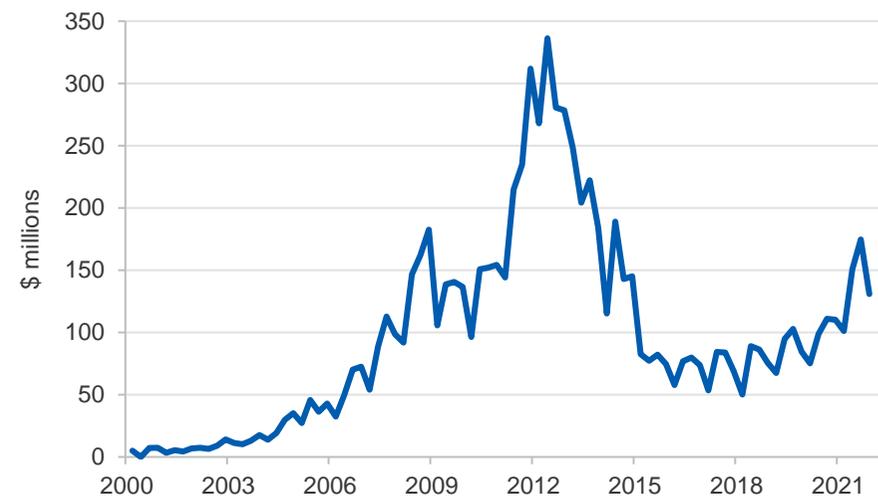
Forecast export earnings for 2021–22 (in nominal terms) have been revised upwards from \$118 billion in the December 2021 *Resources and Energy Quarterly* to \$135 billion in this edition. This reflects stronger prices in 2022, due to a projected easing in China’s credit conditions and increased fiscal spending by Beijing. Export earnings have also been revised up (by around \$23 billion) for 2022–23 to \$108 billion, reflecting continued price strength through 2022. Compared with the March 2021 *Resources and Energy Quarterly*, forecast Australian earnings in 2025–26 (in nominal terms) have been revised down by 25% to \$86 billion. This reflects a downward revision in projected export volumes and lower prices in the latter half of the outlook period.

Figure 4.8: Australia’s iron ore export volumes and values



Source: ABS (2022) International Trade, Australia, 5368.0; Department of Industry, Science, Energy and Resources (2022)

Figure 4.9: Australian iron ore exploration expenditure



Source: ABS (2022) Mineral and Petroleum Exploration, Catalogue 8412

Table 4.1: World trade in iron ore

	Million tonnes							CAGR ^r
	2021	2022 ^f	2023 ^f	2024 ^z	2025 ^z	2026 ^z	2027 ^z	
World trade	1,642	1,710	1,772	1,826	1,884	1,926	1,954	2.9
Iron ore imports								
China	1,088	1,091	1,092	1,083	1,077	1,073	1,068	-0.3
Japan	116	116	116	115	114	113	112	-0.5
European Union	113	117	117	118	119	119	118	0.8
South Korea	76	80	82	84	84	84	84	1.6
Rest of Asia ^a	97	98	101	111	122	124	129	4.9
Iron ore exports								
Australia	872	919	951	976	1,012	1,041	1,047	3.1
Brazil	359	375	400	425	440	442	444	3.6
South Africa	65	66	67	68	69	70	70	1.2
Canada	55	56	57	57	58	58	58	0.9
India	34	36	37	38	39	40	40	2.7

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

Source: World Steel Association (2022); International Trade Centre (2021); Department of Industry, Science, Energy and Resources (2022)

Table 4.2: Iron ore outlook

World	Unit	2021	2022 ^f	2023 ^f	2024 ^z	2025 ^z	2026 ^z	2027 ^z	CAGR ^r
Prices ^a									
– nominal	US\$/t	143	109	79	71	68	66	63	-13
– real ^b	US\$/t	148	109	77	68	63	59	56	-15
Australia	Unit	2020–21	2021–22 ^f	2022–23 ^f	2023–24 ^z	2024–25 ^z	2025–26 ^z	2026–27 ^z	CAGR ^r
Production									
– Steel ^e	Mt	5.67	5.92	5.98	5.98	5.98	5.98	5.98	0.9
– Iron ore	Mt	906	941	970	997	1,033	1,068	1,081	3.0
Exports									
Steel ^e	Mt	0.80	0.88	0.90	0.88	0.86	0.80	0.82	0.4
– nominal value	A\$m	773	884	932	932	932	893	932	3.2
– real value ^g	A\$m	794	883	909	892	871	815	830	0.7
Iron ore	Mt	867	897	936	961	996	1,031	1,044	3.1
– nominal value	A\$m	152,975	135,119	108,223	86,816	85,994	86,218	84,495	-9.4
– real value ^g	A\$m	158,144	135,119	104,947	82,003	79,214	77,484	74,083	-12

Notes: **b** fob Australian basis; **c** Spot price, 62% iron content basis; **d** In 2021 US dollars; **e** In 2021–22 Australian dollars; **f** forecast; **h** Crude steel equivalent; Crude steel is defined as the first solid state of production after melting. In ABS Australian Harmonized Export Commodity Classification, crude steel equivalent includes most items from 7206 to 7307, excluding ferrous waste and scrap and ferroalloys; **i** In 2020–21 Australian dollars; **r** Compound annual growth rate; **s** estimate; **z** Projection
Source: ABS (2021) International Trade in Goods and Services, Australia, 5368.0; Bloomberg (2021) Metal Bulletin; World Steel Association (2021); AME Group (2021); Company Reports; Department of Industry, Science, Energy and Resources (2022)