

IRON-ORE

DECEMBER 2022



MIXED FORTUNES

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IRON-ORE 2022

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UNITS OF MEASUREMENT

The distinction between tonne (1 000 kg) and ton (1 016.047 kg) is maintained in this report according to the information that is reported in the public domain by each company

Figures in this report may differ from other figures quoted, having been drawn from different sources

ABBREVIATIONS AND ACRONYMS

ARM	African Rainbow Minerals
ARIA	African Rail Industry Association
BT	Bombardier Transportation
CMRG	China Mineral Resources Group
CO ₂	carbon dioxide
DRI	direct reduced iron
DISR	Australia's Department of Industry, Science and Resources
Ebitda	earnings before interest, taxes, depreciation and amortisation
ESG	environment, social and governance
GHG	greenhouse gas
HEPS	headline earnings per share
HPX	High Power Exploration
HYBRIT	Hydrogen Breakthrough Ironmaking Technology
IEEFA	Institute for Energy Economics and Financial Analysis
JR	judicial reorganisation
JV	joint venture
SEC	US Securities and Exchange Commission
TFR	Transnet Freight Rail
TSF	tailings storage facility
UHDMS	ultra-high dense-media separation
WAIO	Western Australia Iron Ore
WCS	Winning Consortium Simandou
worldsteel	World Steel Association



KEY DEVELOPMENTS

June 2021: Global mining group Rio Tinto posts a massive \$21-billion net profit in its 2021 financial year.

June 2021: Australian iron-ore miner Fortescue Metals Group declares biggest-ever final dividend of A\$2.11 in its 2021 financial year.

August 2021: China imports a record \$20-billion worth of iron-ore, totalling 97.50-million tons, mostly from Australia, despite the tensions between the two nations.

September 2021: Construction materials and industrial minerals supplier Afrimat starts iron-ore production at the Jenkins mine, in South Africa's Northern Cape province.

December 2021: South African iron-ore miner Kumba Iron Ore revises its 2022 and 2023 output guidance from between 41.50-million and 42.50-million tonnes to between 38-million and 40-million tonnes.

December 2021: Diversified miner BHP posts attributable profit of \$9.40-billion in the six months ended December 31, 2021.

December 2021: Australian iron-ore mining company Fortescue signs a 36-month exclusivity agreement with the Gabon government for the development of the Belinga iron-ore project.

February 2022: Brazil-based joint venture company Samarco reports that it expects to reach iron-ore output guidance a year sooner than previously envisaged, reaching 25.70-million tonnes of iron-ore pellets by 2030.

February 2022: Fortescue unveils plans for a 5.4 GW renewable-energy project in Pilbara, Australia.

April 2022: Iron-ore major Vale agrees to sell its iron-ore mines in central Brazil to holding company J&F Investimentos at an enterprise value of \$1.20-billion.

May 2022: Cameroon's government signs a \$675-million high-grade iron-ore mining deal with a subsidiary of China-based Sinosteel Corporation.

June 2022: Rio Tinto announces first ore from the \$3.10-billion Gudai-Darri iron-ore project, in Western Australia.

June 2022: Brazilian mining company Vale expects to spend \$400-million to decommission 12 of its 30 tailings dams in 2022.

June 2022: Vale creates a \$100-million corporate venture capital arm to fund startup companies focused on sustainable mining initiatives.

July 2022: Rio Tinto, Winning Consortium Simandou and the Guinea government reach a milestone development agreement on the ports and rail infrastructure necessary to realise the multibillion-dollar Simandou iron-ore project.

July 2022: A UK Court of Appeal grants a group of claimants leave to appeal a 2020 High Court decision dismissing legal actions against the Samarco Mineração joint venture, regarding the 2015 Fundão dam failure, in Brazil.

September 2022: The Samarco Mineração joint venture, comprising Vale and BHP, agree to almost double their offer in compensation for the 2015 Fundão dam failure, in Brazil.



Loading of iron-ore concentrate into a cargo hold



MARKET OVERVIEW

The iron-ore market is predominately supplied by four major iron-ore producers: British-Australian corporation Rio Tinto, Australia-based mining companies Fortescue Metals Group and BHP, and Brazilian multinational Vale.

Australia, Brazil, China, India and Russia remain the biggest producers of iron-ore, with China the biggest consumer of the commodity in its steelmaking plants.

South Africa was the ninth-biggest iron-ore producing country in 2021.

The performance of iron-ore in 2022 was complicated by China's Covid-19 lockdown, the first of which started on March 28, 2022, having led to risk aversion across financial markets and investors' assessments of demand prospects in China.

China ended its two-month lockdown on June 1, 2022, but not without a battered Chinese economy, a disrupted supply chain and diminished international trade as consequences.

Shanghai and Beijing were placed on Covid-19 alert on June 9, with some restrictions reinstated, after recording a new surge of Covid-19 infections and launching mass testing, US State-owned radio network Voice of America reported in June 2022.

By June 28, 2022, Beijing and Shanghai reported no new local infections of Covid-19, marking the first day that both cities were in the clear since late February.

Global news service Reuters stated in June 2022 that a sustainable rally for China's ferrous complex remains uncertain, despite its Covid-19 concerns fading away and Beijing promising to continue rolling out policy support for growing its economy.

Industry news service Mining.com quoted industry consultancy Mysteel in June 2022 as saying that downstream demand remains poor, with few spot trades occurring, and that the bleak outlook for China's construction industry continues to test market confidence.

Mysteel added that a range of supportive policy measures from Beijing in 2022 have failed to result in persistent price gains, partly owing to Covid-19 impacts continuing to hover over the market.

Capital market company GaveKal-Dragonomics Research echoed the same sentiment, stating on Mining.com in June 2022 that unless China's real estate sector mounts a stronger rebound soon, the tension

between high output and weak demand will have to be resolved using lower prices and/or cutbacks in production.

China's imports of iron-ore dropped in 2021 to 1.12-billion tonnes, compared with a record 1.17-billion tonnes of the commodity imported in 2020, Reuters reported in January 2022. Notwithstanding Covid-19 impacts on China's demand, the country is also curbing crude steel production to control carbon emissions.

China's fluctuating steel output is reflected in the share prices of global iron-ore producers, Bloomberg reported in June 2022. For example, Vale's share price tumbled 17% by June 29, 2022, compared with that on June 7, 2022, while Rio Tinto's share price fell by 14% over the same period.

Bloomberg author Liz Ng said in June 2022 that unless there is a fast turnaround in China's steel production, major iron-ore producers may be forced to curb exports.

As of June 2022, rising borrowing costs and inflation globally were also depressing iron-ore sentiment and slowing down the movement of iron-ore shipments.



Trading positions

China is shaking up the global iron-ore market with its drive to buy steelmaking material from more suppliers outside of Australia, in particular. The country established in July 2022 a State-owned company called China Mineral Resources Group (CMRG) to oversee its overseas investments in iron-ore, including the Simandou project, in Guinea.

China has had rising geopolitical tensions with Australia for a number of years, and the Covid-19 pandemic exposed weaknesses in the iron-ore supply chain.

China imports about 1.10-billion tons of iron-ore a year, with each of the country's top ten companies being responsible for buying their own raw materials.

With registered capital of \$3-billion, CMRG plans on tackling the "power imbalance" between a clutch of global mining giants on the one hand and China's vast but fragmented steel industry on the other.

By centralising purchasing, China aims to gain more clout with suppliers over pricing.

The Washington Post reported in July 2022 that Chinese leaders see the company as a consolidated platform for buying resources and that it will strengthen the country's negotiating position in what is an unfriendly international environment. These leaders have accused the US and its allies, including Australia, of ganging up to try and suppress China's global rise numerous times.

In 2021, China imported 60% of its total iron-ore complement from Australia, despite deteriorating relations between the two countries.

CMRG will be chaired by the former chairperson of Aluminium Corporation of China Yao Lin, with more steelmaker veterans making their way to the board.

Washington Post cited experts who estimate that the new company will likely import about 460-million tons of iron-ore a year, or more than 40% of the Chinese total.

Citing the concerns of mining companies, The Washington Post said any attempt to reshape iron-ore trade will have ramifications for companies, such as BHP and Rio Tinto, which get more than half of their revenue from iron-ore. However, other experts argue that supply and demand will prevail and continue to influence prices more so than a centralised trade entity.

Source: The Washington Post

SUPPLY

The US Geological Survey estimates in an annual iron-ore report that global saleable iron-ore production was 2.60-billion tonnes in 2021, a 5.30% year-on-year increase, compared with 2.47-billion tonnes produced in 2020.

South Africa's share of production totalled 61-million tonnes, while the US produced 46-million tonnes. Australia, Brazil and China led the world's supply in 2021, with outputs of 900-million, 380-million and 360-million tonnes respectively.

Commodity research agency Fitch Solutions Country Risk & Industry Research states in its Global Iron-Ore Mining Outlook, published on June 23, 2022, that iron-ore production will likely accelerate from 2022 to 2026, after stagnating somewhat over the past five years.

The agency forecasts global iron-ore mine output to grow by an average 2.70% over the period, compared with a -1.30% growth rate from 2017 to 2021, which would lift yearly production by 361-million tonnes by 2026, compared with 2022 levels.

Fitch Solutions says supply growth will be driven by Brazil and Australia, since Vale, in Brazil, has made aggressive expansion commitments, while BHP, Rio Tinto and Fortescue, in Australia, plan on using buoyant profits from recent years to increase production.

In China, iron-ore production will rise once again in the next three to four years as the country works to increase its self-sufficiency and reduce reliance on Australian iron-ore imports.

However, as Chinese miners operate at the higher end of the iron-ore cost curve and the domestic ore grades continue to decline, Fitch Solutions expects Chinese companies to prioritise investment in overseas iron-ore mines, including the Simandou deposit, in Guinea.

Looking ahead, Fitch Solutions expects lower prices to eventually drag on production growth rates. It forecasts a yearly iron-ore production growth rate average of 1.10% from 2026 to 2030.

The agency is confident that iron-ore output levels will stagnate by the end of the decade.

From a regional perspective, it forecasts iron-ore production in Australia to increase at an average of 0.40% a year from 2022 to



2026. The significant slowdown, compared with the previous five years, is because limited new sources of supply from new projects were launched, consequently lifting yearly output by just 19.30-million tonnes in 2026, compared with 2022 levels.

The agency believes that Australia's rank at the lowest end of the global iron-ore cost curve will provide for a healthy buffer against falling prices in the coming years, despite the slowdown. On average, the cost of producing iron-ore in Australia is \$30/t, compared with between \$40/t and \$50/t in West Africa and \$90/t in China, Fitch Solutions finds.

The agency deems it likely that production growth will stagnate over the longer term – with production peaking mid-decade, at just under one-billion tonnes – because of junior miners' mothballing mines and a pullback in capital expenditure by larger firms as iron-ore prices decline.

Major mining companies continue to decrease costs and increase production in the longer term, focusing on higher-quality ores as much as possible to improve margins and supply 'green' steel production, the agency reports.

In Brazil, iron-ore production will rebound in coming years following contraction and stagnation from 2018 to 2020, partly owing to Vale's Brumadinho dam collapse that sparked a flurry of investigations into Vale's operations and idling operations.

Low operating costs, a solid project pipeline and Brazil's high-quality iron-ore, which is increasingly favoured by Chinese steel producers, will all contribute to higher output.

Fitch Solutions forecasts Brazil's iron-ore production to increase at a yearly average rate of 2.60%, from 409.60-million tonnes this year to 473.50-million tonnes in 2026. It also forecasts that production growth will slow over the longer term, at an average yearly growth rate of 1.20% from 2026 to 2031, which would take yearly output to 502-million tonnes by 2031.



Wetting of iron-ore stockpiles

Cornerstone plan

The Chinese government has set out to improve its iron-ore self-sufficiency rate in recent years with several policies, including the Cornerstone Plan, which was submitted for State approval by the China Iron and Steel Association in January 2022.

The plan focuses on the acceleration of domestic iron-ore development and defines three sources of iron-resources: scrap steel, domestic iron-ore and overseas iron-ore.

The country has always relied heavily on iron-ore imports. For example, the country's top steel manufacturer uses more than one-billion tons of iron-ore year, with more than 80% of this supply coming from imports. However, the Cornerstone Plan will see that China raises its equity output of iron-ore in overseas mines to 220-million tons by 2025, compared with 120-million tons in 2020.

China also aims to boost its domestic output of iron-ore by 100-million tons, to 370-million tons a year, and its steel scrap consumption by 70-million tons, to 300-million tons a year.

Ultimately, the country aims to reduce its dependence on iron-ore imports over a ten- to 15-year period.

Source: China Daily

Further, India's iron-ore output growth will be supported by the removal of export taxes for low-grade ores in the country's national budget and its mining regulation, which will soon streamline licensing and reopen closed mines.

Although India's regulation will support iron-ore output growth, the royalties included in the Mines & Minerals Development & Regulation Act will limit the sector's overall growth potential.

Fitch Solutions forecasts India's iron-ore output growth to average 0.90% a year, from 179-million tonnes in 2022 to 195.50-million tonnes in 2031.



World's biggest iron-ore operations

Rank	Property	Location	Majority ownership	Number of operating mines	2021 production (million tonnes)	2020 production (million tonnes)
1	Hammersley Mines and Channar	Australia	Rio Tinto	11	207.04	219.86
2	Northern System	Brazil	Vale	5	185.08	192.27
3	Fortescue Operations	Australia	Fortescue Metals	4	182.93	180.30
4	Area C and Yandi	Australia	BHP	2	147.81	141.49
5	Newman and Jimblebar	Australia	BHP	2	132.36	146.82
6	Hope Downs and West Angelas	Australia	Rio Tinto	2	81.15	83.25
7	Vargem Grande	Brazil	Vale	5	30.93	25.10
8	Sishen	South Africa	Kumba Iron Ore	1	28.64	25.35
9	Itabira	Brazil	Vale	3	27.61	23.91
10	LKAB Operations	Sweden	LKAB	3	27.11	27.10
11	Robe Valley	Australia	Rio Tinto	2	25.96	30.29
12	Paraopeba	Brazil	Vale	4	24.11	23.30
13	Minas Rio	Brazil	Anglo American	1	23.47	24.08
14	MontWright	Canada	ArcelorMittal	1	23.20	23.20
15	Lebedinsky	Russia	Metalloinvest	1	22.31	22.06
16	Mariana	Brazil	Vale	4	21.03	17.72
17	Stoilensky	Russia	Novolipetsk Steel	1	19.80	18.51
18	Minas Centrais	Brazil	Vale	1	19.52	15.65
19	Mikhailovsky	Russia	Metalloinvest	1	18.63	18.37
20	Carol Lake	Canada	Rio Tinto	1	16.41	17.77

Source: Mining.com

Notes:

* Annualised figures based on year to end of third quarter company reports

** No data for 2021 is available for LKAB and Mont-Wright

DEMAND

World crude steel production, of which iron-ore is a key ingredient, totalled 1.95-billion tonnes in 2021, a 3.70% year-on-year increase, compared with 2020.

The World Steel Association (worldsteel) reported in January 2022 that steel production increases in 2021 were driven by Iran, Japan and the US, with China's output falling by 6.80% year-on-year.

In a Short Range Outlook, published in April 2022, it forecast that steel demand will increase by 0.40% in 2022 to reach 1.84-billion tonnes, while steel demand will increase 2.20% in 2023 to reach 1.88-billion tonnes.

worldsteel economics committee chairperson Máximo Vedoya states in the outlook that recovery from the Covid-19 pandemic turned out to be stronger than expected in many regions, despite continuing supply chain disruptions and Covid-19 infection surges. However, a sharper-than-expected drop in China's iron-ore demand led to lower global steel production growth in 2021, he notes. The expectation

of a continued and stable recovery from the pandemic has been scrambled by the war in Ukraine and rising inflation.

The magnitude of the war will vary across regions, depending on their exposure to Russia and Ukraine.

The impact will also be felt worldwide through higher energy and commodity prices, particularly those of raw materials for steel production, and continued supply chain disruptions.

Vedoya is certain that financial market volatility and heightened uncertainty are undermining investment in new projects or production expansion.

The outlook for steel production in 2023 is highly uncertain. The assumption is that, should the conflict in Ukraine cease before the end of 2022, sanctions on Russia will largely remain.

Vedoya contends that, as a result of the war, there will also be a possible readjustment in global trade flows, a shift in energy trade and a reconfiguration of global supply chains.



China's iron-ore imports dropped by 4.30% year-on-year in 2021 to 1.12-billion tonnes, down from a record 1.17-billion tonnes of iron-ore imports in 2020, as steel production curbs imposed to combat pollution dented demand.

In the first five months of 2022, China imported 447-million tonnes of iron-ore, which was a 5.10% decrease, compared with the same period in 2021.

Daily newspaper Hellenic Shipping News in June 2022 attributed this to pandemic-induced labour shortages in Australia and weather struggles in Brazil.

Ratings and commodity information agency Moody's Investors Service says in a Metals and Mining Global Outlook, published in June 2022, that iron-ore supply and demand are coming into closer balance, with prices retreating in 2022, compared with those in 2021, and with steel demand not having surpassed levels witnessed in 2022 as of August 2022.

PRICING

Markets analyst Trading Economics' iron-ore price monitoring meter shows the iron-ore price fell to an almost four-month low of \$125/t in early May 2022, amid worries that slowing global growth will affect metals demand, particularly in China.

The price for iron-ore was about \$151/t in March 2022, compared with about \$180/t in March 2021. Trading Economics expects iron-ore to trade at about \$107/t by May 2023.

In June 2022, Benchmark 62% iron-ore fines imported into Northern China fell by 8.18% year-on-year to \$111.35/t, which marked a six-month low. British daily newspaper Financial Times cited analysts in June 2022, who warned that the iron-ore price could fall to as low as \$100/t for the first time since November 2021 if China's "flagging property market remains in the doldrums".

This compares to iron-ore's reaching a record high of above \$230/t in May 2021, as demand for the commodity surged in line with the global recovery from Covid-19.

Iron-ore prices averaged \$108/t in 2020. By the end of 2021, it was trading at about \$161/t, concluding a year where the iron-ore price reached a record high of \$237/t in May, and dropped to \$85/t in November, as China pledged to reduce its steel output.

Financial services company Australia and New Zealand Banking Group expects prices to trend lower in the remainder of 2022 as the impact of infrastructure stimulus measures globally, following Covid-19, dwindle and iron-ore demand weakens.

China asserts market control

China announced in July 2022, that it is planning to establish a State-owned iron-ore company to oversee its iron-ore investments in West Africa and the country's buying of the steelmaking material from global suppliers.

The plan will reportedly mark a massive effort on China's part to tackle what its officials argue is excessive pricing power being wielded by large mining companies such as BHP Group and Rio Tinto.

China spent about \$180-billion on iron-ore imports in 2021.

The new entity will house outbound investments, such as the Simandou iron-ore project, in Guinea, and become the sole channel for buying iron-ore from third parties, most of which are Australia- and Brazil-based.

News service Bloomberg cited an unnamed source as saying that the new firm will be led by China Baowu Steel Group executive VP Guo Bin and Aluminium Corporation of China chairperson Yao Lin.

Source: Bloomberg

US bank JP Morgan was cited by The Financial Times in June 2022 as saying that a sustained improvement in Chinese property activity, coupled with accelerated infrastructure investment, could provide a boost for steel demand and, therefore, iron-ore prices in the second half of 2022.

The bank expected the iron-ore price to average \$140/t in the third quarter of 2022 and \$125/t by the last quarter of the year. In the longer term, Capital.com forecasts that iron-ore prices will decline, dropping by an average 15% every year to reach \$55/t by 2027 as the world transitions to lower carbon dioxide-emitting economies.

WORLD TRADE

As the world's biggest producer and trader of iron-ore, Australia's exports are forecast to reach 894-million tonnes in 2022 – an increase of 2.50%, compared with 2021.

Australia's iron-ore exports account for 53% of iron-ore trade globally, with Brazil following at 22% and other countries, such as South Africa, Canada and Ukraine, at about 3% to 4%.

In turn, the biggest importers of iron-ore are China, accounting for 69% of iron-ore imports worldwide, followed by Japan, the European Union, South Korea and Taiwan.

Australia's Department of Industry, Science and Resources (DISR) expects the country's iron-ore exports to rise at an average yearly rate of 2.80%, reaching 950-million tonnes by 2024.



Mixed fortunes

Business Day columnist Neva Makgetla said in October 2022 that South Africa has developed a new dependency on exports of commodities used in steel production.

On the one hand, this showcases the adaptability of the mining sector, but also shows how heavily the country banks on mineral exports, which does not do much to remedy inequality.

From 2003 to 2013, Makgetla reported, South Africa's sales of steel inputs such as iron, manganese and chrome ore, as well as ferrous alloys, to China rose from 1% to 10%.

Steel input exports peaked at \$12-billion in 2011, before falling to \$6-billion in 2015, and recovering again to \$8-billion in 2019.

In the past two years, with the Covid-19 pandemic and the Russian invasion of Ukraine, prices for steel inputs have spiked, but fell again by mid-2022. South Africa's revenues from exports of steel inputs rose to \$9-billion in 2021, but were likely to fall again in 2022, Makgetla stated.

She discussed how South Africa's increasing reliance on exports of steel-related products has done little to directly promote inclusive growth. Only a handful of mines account for the bulk of steel input materials' production.

Together, iron-ore, manganese and chrome ore production employs 55 000 people, which is a tenth of the mining workforce and less than 0.50% of all jobs in the country.

Only about 10% of South Africa's iron-ore is refined locally, Makgetla pointed out. She added that production of steel inputs has also generated a massive dependence on China. In 2002, China accounted for about 20% of South Africa's sales of steel inputs to the overseas markets, but this number grew to 60% in 2011 and to around 70% currently.

Revenues from exports of steel inputs have been vital to South Africa's trade in the past two decades, however, the price for it has been high, as South Africa has seen slower growth and higher inequality compared with peer economies.

Makgetla believes that to ensure more sustainable benefits, the rents from South Africa's mineral exports must be directed more consistently to diversify the economy, to find new export products and markets, and to open new opportunities on a mass scale for job-seekers.



Source: Business Day



World trade in iron-ore							
Million tonnes				Annual percentage change			
	2021	2022 forecast	2023 forecast	2024 forecast	2022 forecast	2023 forecast	2024 forecast
World Trade	1.626	1.628	1.667	1.729	0.10	2.40	3.70
Iron-ore imports							
China	1.126	1.124	1.118	1.107	-0.10	-0.6	-0.90
Japan	113	116	116	115	2.60	0.30	-1
European Union	94	86	88	91	-8.60	3.40	2.50
South Korea	74	79	81	83	6.10	2.60	2.30
Rest of Asia	57	73	76	85	26.80	5.10	11.10
Iron-ore exports							
Australia	872	894	915	948	2.50	2.30	3.60
Brazil	357	373	398	423	4.50	6.70	6.30
South Africa	68	69	70	71	1.50	1.40	1.40
Canada	54	56	57	57	3.70	1.80	0
Ukraine	44	28	29	30	-36	3.50	3.40

Source: Resources and Energy Quarterly

The Australian government says in a Resources and Energy Quarterly publication for September 2022 that total exports of iron-ore from Brazil will likely reach 347-million tonnes in 2022 – a fall of 2.80%, compared with exports in 2021. Brazil's total iron-ore export volumes are expected to grow by 2.70% a year to reach 390-million tonnes by 2024.

Combined exports from other major producers, such as South Africa, Canada and India, are forecast to fall by 12% to reach 140-million tonnes by 2024, mostly owing to a projected fall of about 50% in Indian exports.

The Russian invasion of Ukraine in February 2022 has resulted in a reorganisation of iron-ore exports for both countries in 2022, and likely beyond, with supply chain constraints likely to lead to some losses in regional supply of iron-ore in 2022.

The DISR reports that some iron-ore supply in global seaborne trade has been lost, but will be offset somewhat by a redirection of products to new markets.

Ukraine exported 44-million tonnes of iron-ore in 2021. The country's iron-ore exports are forecast to drop by an estimated 36% in 2022 to reach 28-million tonnes. This will result in a loss of about 4% of the global iron-ore trade pellet trade from the global market in 2022. This is expected to have a considerable impact on European steelmakers, and particularly electric arc furnace-based steelmaking in the region.

The DISR expects Russia to seek new markets, such as Asia, Africa and the Middle East, for displaced export volumes that were previously sent to Europe; however, this reorganisation may be constrained by logistical issues in shipping to these regions, as well as ongoing self-sanctioning by other non-European steel producers.

TAILINGS DAM SAFETY

A 'Safety First: Guidelines for Responsible Mine Tailings Management' report – published in May 2022, and authored by environmental organisation Earthworks, nonprofit justice organisation MiningWatch Canada and human rights and environmental alliance London Mining Network – finds that industry standards and government regulations are still inadequately protecting communities and ecosystems from tailings failures. According to the publication, "the safest tailings facility is the one that is not built".

Currently, tailings storage facilities (TSFs) must be designed to withstand the most extreme meteorological and seismic events theoretically possible at a location, the report notes, explaining that climate change is increasingly evident in the extreme rainfall at many mine sites that have TSF structures.

The report recommends that all TSFs require regular monitoring, inspection and updates to failure scenarios, consent from neighbouring communities and yearly evacuation drills with community members in case of a ruptured tailings dam.

Moreover, the authors of the report believe that waste dams should not be allowed to be built if mining companies cannot ensure safe evacuations. The report suggests not using waste dams at all and rather fostering new technologies towards zero waste.

The report further finds that over the past 40 years, ore grades have declined on average by half for many commodities, effectively doubling the volume of mine waste generated for each unit of valuable material produced.



Current trends suggest an additional two- to ten-fold increase in the demand for many commodities by 2060, particularly those needed for energy transition technologies, which makes for much more mining waste.

The report refers to Vale's Córrego do Feijão mine's tailings dam collapse, in Brumadinho, in January 2019, which released almost ten-million cubic metres of tailings that travelled 8 km over land and killed 272 people. It also destroyed houses and buildings, with adverse effects on groundwater, surface water, soils and vegetation.

The Brumadinho catastrophe stunned the world to such an extent that it gave rise to new regulations and standards, such as the joint initiative by the International Council on Mining and Metals, United Nations Environment Programme and Church of England Global Tailings Review, which, in 2020, published the Global International Standard on Tailings Management.

The authors of the Safety First report believe that the standards lack clear and mandatory technical guidelines to progress from technologies and practices that present the greatest risk.

Vale has been strategising since the Brumadinho tailings dam failure, announcing in June 2022 that it plans on spending \$400-million to decommission 12 of its 30 TSFs in 2022. These structures represent a total volume of just under 47-million cubic metres of tailings. *Mining Weekly* reported in June 2022 that Vale's dam elimination programme started in 2018 and has cost the company \$857-million to date.

The total spend of the programme is estimated at \$4-billion and will be completed by 2035. In a research initiative that has been running for more than a year as of August 2022, Vale proposes that "ore sands" generated through mining waste can be a solution for a sand deficit currently affecting the construction and aggregates markets.

Vale customer solutions leader Emile Scheepers suggests in a release, published in April 2022, that the ore sand does not come from the tailings, but rather a particular beneficiation process, and results in a material that is very similar to natural sand and can be used without toxicity.

Scheepers says the company is considering various solutions to eliminate the use of traditional tailings dams, including filtering and dry stacking. Meanwhile, the US Securities and Exchange Commission (SEC) filed a complaint in the federal court of New York against Vale in April 2022 for allegedly making false and misleading disclosures about the safety of its TSFs ahead of the 2019 Brumadinho disaster.

The commission says in its court filing, and a subsequent press release published in April 2022, that Vale manipulated dam safety audits, obtained fraudulent stability certificates and misled government and investors with its environmental, social and governance (ESG) disclosures.

Vale has denied the allegations and has said that it will vigorously defend itself in the claim. The SEC has proposed that US-listed companies be required to disclose climate-related risks. The commission created an enforcement task team to police misconduct related to ESG issues in 2021.

Dual litigation

Australia-headquartered diversified miner BHP announced in July 2022 that it had lost an appeal in a London court to block a lawsuit of more than \$6-billion by about 240 000 Brazilians over a tailings dam failure that occurred in 2015.

The collapse of the Fundão dam killed 19 people, as more than 40-million cubic metres of mud and mining waste flowed into the Doce river and obliterated villages. The spillage reached the Atlantic Ocean, which is located 650 km away from the site.

The Fundão dam is owned by the Samarco Mineração joint venture between BHP and Brazilian iron-ore miner Vale.

Claimant lawyers in the matter described the judgement as "monumental", and meaning that one of the biggest trials in English history will ensue.

The lawsuit is the latest to establish whether a multinational company can be held liable in its home country for the conduct of overseas subsidiaries. The issue relates to whether the group action can continue against BHP in the UK.

BHP reportedly said, as quoted by Reuters in July 2022, that the case was pointless and wasteful, considering that it duplicates legal proceedings and repair programmes in Brazil, which will cost the company \$5.60-billion by the end of the year. BHP, Vale and the Brazilian authorities have had 42 remediation and compensatory programmes under way since March 2016. The case had a rough start, after the High Court and the Court of Appeal blocked it for being "unmanageable", since the plaintiffs were already able to seek redress in Brazil; however, senior judges cited by Reuters believe there is a realistic prospect of a future trial yielding a real and legitimate advantage for claimants.

The lawsuit was filed in November 2018 at the UK High Court, in Liverpool, and has been permitted to proceed.

Source: Reuters



DECARBONISATION

The iron and steel sector is considered one of the hardest industries to decarbonise, owing to its high heat requirements and use of carbon as a process input, as well as its low profit margins, high capital intensity, long asset life and trade challenges. While it consumes a sizeable 7% of global energy supply, it is also responsible for between 7% and 9% of global greenhouse-gas (GHG) emissions, at 2.6 Gt/y of carbon dioxide (CO₂) equivalent emissions, state the authors of the 'Energy Research & Social Science' report, published in July 2022.

The decarbonisation of iron and steel, therefore, forms a vital part of climate change mitigation, the authors find, adding that there are no easy ways of creating large amounts of heat energy for many iron and steel processes without releasing CO₂ emissions.

Although the iron and steel industry has been pursuing efficiency and energy-savings in plants, these efforts are limited, since current iron and steelmaking processes have been operating close to their thermodynamic limits.

Instead, steel manufacturers are increasingly investigating solutions alongside iron-ore suppliers to switch from blast furnaces that use coal to green hydrogen-based direct reduced iron (DRI) processes.

However, this requires a sufficient supply of high-quality iron-ore in the market – a shortfall of which can handicap a faster switch to DRI technology and delay longer-term targets to ramp up DRI operations to reach net-zero emission targets by 2050, explains the Institute for Energy Economics and Financial Analysis (IEEFA) in the 'Iron-ore quality a potential headwind to green steelmaking' report.

The report, published in June 2022, finds that the global steel sector is still largely focused on existing coal-consuming blast furnace operations, providing iron-ore miners with an incentive to continue producing blast furnace-grade iron-ore, rather than ores with a higher iron content of 67%.

According to the IEEFA, options to address this issue include a heightened focus on the development of mines that can produce high-quality iron-ore, further processing existing ores to improve the grade or technology solutions that allow for using lower-grade iron-ore in DRI processes.

Green hydrogen has gained interest globally as a zero emissions fuel, as it can decarbonise many sectors, the institute says. However, green hydrogen remains costlier than fossil fuel-based hydrogen

and, therefore, requires a scale-up in production to become cost competitive.

The IEEFA estimates that about 71% of existing global blast furnace capacity will reach the end of its operational life before 2030, therefore requiring a switch to DRI-electric arc furnace processes before companies lock into more coal-based steelmaking.

In the IEEFA report, consultancy Wood Mackenzie estimates that 213-million tonnes a year of new 67%-grade iron-ore can possibly come on line in the next few years, with 41-million tonnes of this potential new iron-ore capacity to be "probable".

BHP CEO Mike Henry stated in October 2021, as cited by the IEEFA, that hydrogen-based steelmaking may still be 20 to 30 years away and that steel decarbonisation must remain focused on lower emissions from blast furnaces. He believes there is simply not enough high-quality iron-ore that is suitable for efficient DRI production to meet global steel demand.

Vale agrees, citing in the same report that many iron-ore bodies globally are depleting, while others face beneficiation challenges, which makes it difficult to increase supply of high-grade ores.

The IEEFA report also cites Bloomberg New Energy Finance, which anticipates that 59% of primary steel production using DRI processes by 2050 will be under a net-zero steel sector scenario, which equates to 889-million tonnes of steel production from DRI-electric arc furnaces by 2050. In turn, this requires a ten-fold increase in high-grade iron-ore supply, compared with current levels, unless technology solutions can be developed to use lower-grade iron-ore in DRI processes.

South Africa is well positioned to supply high-grade iron-ore, with major miner Kumba Iron Ore having high-quality, high-lump iron-ore available for the market.

Kumba CEO Mpumi Zikalala expects a healthy pipeline of DRI projects to come on line in the next 30 years, which should likely lead to the share of DRI in global steel production almost tripling to 26% by 2050.

To augment its quality position, Kumba will commission a R3.60-billion ultra-high dense media separation (UHDMS) project in the second half of 2023, which will turn waste into premium product, *Mining Weekly* reported in July 2022.



The UHDMs will roughly double the volume of premium lump produced by Kumba.

Beyond greener product, Kumba is also looking to reduce its Scope 1 and 2 emissions using renewable energy. The company has plans to develop a 65 MW solar plant at its Sishen iron-ore mine, in the Northern Cape, by 2025, and wheeled wind and storage by 2030.

Kumba is also reducing its diesel use through truck efficiency initiatives and hydrogen-powered truck development alongside parent company Anglo American, which launched the world's first hydrogen-powered mine haul truck in May 2022.

Metal processing solutions company Tenova says in a statement, released in June 2022, that the iron-ore market is turning a corner amid extreme market changes. With decarbonisation and green steel discussed widely, the outlook for this important steelmaking ingredient is evolving quickly.

The company is confident that demand for high-grade ores of 65% and higher will continue.

Primary steel producer ArcelorMittal is targeting a 25% reduction in GHG emissions by 2030 and carbon neutrality by 2050, to which \$10-billion worth of projects will be implemented over the next ten years to achieve those targets.

The company's plans include using DRI technology and electric arc furnaces. It is also researching the conversion of iron-ore to sheets of iron, which can be done at relatively low temperatures.

ArcelorMittal is investigating different CO₂ capture technologies at its plant in Dunkirk, France, and DRI hydrogen injection processes, through a pilot plant.

Another steelmaker, SSAB, aims to completely phase out blast furnaces by 2030, after having done extensive pilot research on using hydrogen for iron-ore reduction.

A step further

Steel production company SSAB, electric services company Vattenfall and mining company LKAB, all based in Sweden, have found through new research within its joint Hydrogen Breakthrough Ironmaking Technology (HYBRIT) project that hydrogen direct reduced sponge iron has superior properties, compared with the iron produced from fossil-based direct reduced iron (DRI).

The company have found through testing that direct reduction with hydrogen produces a product that is easy to handle, transport and store, in addition to being carbon dioxide- (CO₂-) emissions-free.

New test results from the HYBRIT initiative reveal that DRI with hydrogen creates a product with superior mechanical and aging properties, compared with DRI using fossil-based reducing gas such as natural gas.

The companies have filed for a patent with the European Patent Office.

SSAB chief technology officer Martin Pei says HYBRIT has made the hydrogen-based pathway to decarbonising steelmaking more accessible and efficient, which helps to mitigate climate change.

LKAB strategic projects senior VP Lars Ydreskog adds that the extraordinary test results confirm HYBRIT is on the right track to establish an efficient fossil-free value chain in the iron and steel industry.

SSAB, LKAB and Vattenfall started the HYBRIT initiative in 2016 to develop a new technology for hydrogen-based iron- and steelmaking, with the aim of establishing a fossil-free value chain from the mine to finished steel products.

The HYBRIT initiative in June 2021 successfully produced the world's first hydrogen direct reduced sponge iron at a pilot plant, which was built with support from the Swedish Energy Agency.

Vattenfall strategic development head and senior VP Andreas Regnell states the results from the companies' testwork not only demonstrate the climate benefits of replacing fossil fuels with hydrogen, but also that decarbonisation can actually lead to better industrial processes and products.

SSAB aims to bring fossil-free steel to the market in 2026, and largely eliminate CO₂ emissions from its own operations by 2030.



Source: Vattenfall



MAJOR GLOBAL PRODUCERS

BHP

Australia-headquartered diversified miner BHP owns interests in iron-ore assets in Australia and Brazil, in addition to its mining of copper, nickel, potash and metallurgical coal.

Its Western Australia Iron Ore (WAIO) business comprises an integrated system of six openpit mines and four processing hubs, which are connected through 1 000 km of railway lines and two port facilities in the Pilbara region.

Four of the mines – Mt Newman, Yandi, Mt Goldsworthy and Jimblebar – are managed under joint venture (JV) agreements, with BHP holding an 85% interest and Japanese corporations Mitsui and Itochu jointly holding the balance in each.

BHP, Mitsui and Itochu also have an agreement with a customer that entails the sublease of parts of the WAIO mineral lease, according to the 2021 'Iron-Ore Focus' report published by Creamer Media's *Research Channel Africa*. The ore from this JV is sold to the Mt Goldsworthy JV, with BHP being entitled to 85% of that production.

In Brazil, BHP holds a 50% interest in the Samarco Mineração JV with Brazilian miner Vale. The JV comprises a mine and three concentrators,

in the state of Minas Gerais, as well as four pellet plants and a port, in Anchieta, in the state of Espírito Santo. BHP produced 1.90-million tonnes of iron-ore pellets in the 2021 financial year.

Samarco went bankrupt in April 2021 after being burdened with loans following the tailings dam collapse that occurred in 2015 in the city of Mariana, in which 19 people died and substantial environmental damage was sustained.

According to *Mining Weekly*, BHP and Vale reaffirmed their support for the restructuring of the business in June 2022 and confirmed it would not be selling the JV or its assets, after reports that Brazilian steelmaker Companhia Siderúrgica Nacional intended to make an offer to buy Samarco.

As of July 14, 2022, a mediation process was under way between two groups presenting competing restructuring proposals for Samarco – one led by financial creditors and another by the employees' unions, the latter of which has the support of BHP and Vale.

The creditors are proposing, among other suggestions, to bring forward deadlines to ramp up production and accelerate cash flow generation, including to double iron-ore production to 14-million tonnes a year by 2024 and to reach 28-million tonnes a year by 2026.

New currency

Australia-based diversified mining group BHP delivered a shipment of iron-ore traded in the Chinese currency yuan, and not US dollar, at a port in the Shandong province in July 2022.

Hellenic Shipping News considers this as the company's attempt, alongside those of many other Australian companies, to maintain business in the Chinese market, as tense bilateral relations have ensued between the countries in recent years.

The arrival of the yuan-based spot trade iron-ore to the Rizhao port marked the beginning of BHP's Shanghai branch – a wholly owned subsidiary it has established to better serve its clients in China, the biggest importer of iron-ore in the world.

The company explains that yuan-based iron-ore trade will not only enhance the bargaining power of domestic iron and steel enterprises on iron-ore prices but also avoid the risk of exchange-rate fluctuations of the US dollar, ensuring more cost stability for Chinese enterprises and more stable market prices for BHP.

Australian news service News.com.au said in July 2022 that the US dollar is a free-floating currency, which means its value is determined by the performance of the US economy, comparative global interest rates and other market forces.

The Chinese yuan, on the other hand, is pegged. The central government, in Beijing, has arbitrarily set its value at about one-seventh that of the US dollar to make its exports more appealing.

In bullish conditions, the US dollar looks very attractive, but in a bear market, with soaring inflation and interest rates, pegged currencies offer more stability.

Source: Hellenic Shipping News & News.com.au



BHP's recent iron-ore financial and operational performance

	Full year ended June 2022	Full year ended June 2021	Half year ended December 2021	Half year ended December 2020
Total output	249-million tonnes	252-million tonnes	129-million tonnes	128-million tonnes
Revenue	\$30.76-billion	\$34.48-billion	\$15.81-billion	\$14.05-billion
Underlying Ebitda	\$21.70-billion	\$26.28-billion	\$11.15-billion	\$10.24-billion

Source: BHP

Samarco's judicial reorganisation process is continuing in the commercial courts of Belo Horizonte, in the state of Minas Gerais, Brazil. Restructuring Samarco's debts will re-establish a sustainable and independent financial position for the company.

The company produced 253-million tonnes of iron-ore in the year ended June 30, 2022, compared with 254-million tonnes produced in the prior year.

The WAIO operation accounted for 249-million tonnes of output, while the South Flank mine is ramping up to full production capacity of 80-million tonnes a year.

Samarco's production of four-million tonnes in the 2022 financial year reflected a ramp-up of production capacity.

BHP set its guidance for the 2023 financial year at between 249-million and 260-million tonnes of iron-ore. The company aims to produce more than 300-million tonnes a year in the medium term.

In December 2021, BHP approved the South Flank autonomous haulage project, which involves automating its current fleet of 41 Komatsu haul trucks. The project started in June 2022 and is expected to take 18 months to complete.

In the year ended June 30, 2022, BHP generated \$21.78-billion of underlying earnings before interest, taxes, depreciation and amortisation (Ebitda), which came in lower than the underlying Ebitda of \$26.28-billion reported in the prior year, from its iron-ore assets.

BHP achieved an average realised sales price of \$113/t in the 2022 financial year, compared with an average realised sales price of \$130.56/t realised in the prior financial year.

BHP signed a letter of intent in April 2022 with a consortium comprising Rio Tinto, Oldendorff, Star Bulk and the Global Maritime Forum to assess the development of an iron-ore corridor between Australia and East Asia fuelled by ammonia.

Green corridors are specific shipping routes offering more feasibility for economics, infrastructure and logistics of zero-emission shipping. These corridors are often supported by policy and industry action.

BHP reports in its operational review for the financial year ended June 30, 2022, that the new consortium will facilitate a robust public-private dialogue to investigate conditions that need to be in place to mobilise demand and feasibly scale zero- or near-zero-emission shipping on the corridor.

Environment

BHP launched a two-pronged A\$3-million grants programme to help drive the development of Australia's blue carbon market in June 2022.

The programme's Blue Carbon Breakthrough Grant component provides support for shovel-ready projects and is open for applications, while the Blue Carbon Enabler component provides support for earlier-stage projects and is open to expressions of interest.

The three-year grant programme was developed in partnership with climate change investment and advisory firm Pollination.

BHP explains that Blue carbon is contained in near-coastal ecosystems such as mangroves, seagrasses, tidal marshes and seaweed. The protection, restoration or improved management of blue carbon is an effective natural climate solution that can significantly contribute to the mitigation of carbon dioxide (CO₂) emissions.

The company confirmed in its annual report for 2021 that is also co-investing with the Commonwealth Science and Industrial Research Organisation in a blue carbon research programme, which aims to map and estimate the climate change mitigation potential of blue carbon ecosystems in Australia.

According to the company's annual report for 2022, its operational greenhouse-gas (GHG) emissions are on track to be reduced by at least 30% by the 2030 financial year, with the 2017 financial year as a baseline, of 12.90-million tonnes of CO₂ equivalent emissions. Ultimately, it aims to achieve carbon neutrality by 2050.

BHP invested \$175-million in environmental and social programmes in the 2021 financial year. For example, BHP made 29 investments in environmental restoration and conservation initiatives, and contributed to the improved management of about 13-million hectares. The group also used 11% less water in the 2021 financial year, compared with usage in the 2020 financial year, at 113 444 Mℓ.



The group has partnerships with major steelmakers, which collectively represent about 10% of global steel production, to decarbonise steelmaking and thereby reduce BHP's Scope 3 GHG emissions.

BHP announced a commitment of at least \$400-million in the 2020 financial year to invest in GHG emissions reduction across its operated assets and value chain over the five-year life of its Climate Investment Programme.

In its 2022 financial year ended June 30, 2022, BHP spent \$47-million under this programme, targeting operational, maritime, steelmaking and BHP Ventures investments. The company is committed to spend significantly more, including up to \$65-million over coming years towards partnerships with customers in the steel sector.

BHP's 'Annual Report 2021' claims that the company was one of the first to align its climate-related disclosures with the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures.

In the 2021 financial year, BHP published its 'Climate Change Report 2020', and also participated in the Climate Action 100+ Net-Zero Company Benchmark, which assesses the world's biggest corporate GHG emitters on their progress in the transition to a net-zero future.

BHP admits in its 'Annual Report 2021' and reiterates in its 'Annual Report 2022' that it is exposed to a large range of low-carbon transition risks, including customer preference for products that support this transition such as green steel. The company says in the report that its iron-ore, among other commodities, provides an essential building block for renewable power generation and electric vehicles, and can play an important part in the transition to a low-carbon economy.

BHP's partnerships with State-owned iron and steel company China Baowu Group, Japan-based steel manufacturer JFE Steel Corporation, and Chinese iron and steel manufacturing conglomerate HBIS Group, for the research and development of steel decarbonisation pathways, can provide opportunities for the development of new products and markets.

The company is confident that iron-ore demand will continue to increase, in part owing to the worldwide construction of renewable-energy plants, particularly wind power.

FORTESCUE METALS GROUP

Australia-based Fortescue Metals owns and operates three mining hubs in the Pilbara, Western Australia – Chichester, Solomon and Western – which are connected through 760 km of railway to Herb Elliot port and Port Hedland.

In the year ended June 30, 2022, Fortescue shipped a record 189-million tonnes of iron-ore, following the prior record-breaking production of 192.20-million tonnes in the previous financial year.

Fortescue chairperson Dr Andrew Forrest expects to break further shipping records, setting its guidance at between 187-million and 192-million tonnes for the 2023 financial year.

The miner said in July 2022 that the 2022 financial year was the third consecutive year of record shipments for the company, reflecting the strong performance across Fortescue's entire supply chain and the successful integration of its newest Eliwana operation, which started operations in January 2021 in the Pilbara.

While Fortescue generated a record net profit after tax of \$10.29-billion in the 2021 financial year, net profit after tax amounted to \$6.20-billion in the 2022 financial year.

The company declared a total dividend of A\$2.07, and a final dividend of \$1.21, in the reporting period, following on its biggest ever final dividend of \$2.11 declared in the prior financial year, which came to a A\$3.58 total dividend.

Underlying Ebitda amounted to \$10.56-billion in the 2022 financial year, and to \$16.38-billion in the 2021 financial year.

The company's average realised price amounted to \$100/t in the reporting year, against an average realised price of \$135/t in the prior year.

Meanwhile, Fortescue has been progressing the development of its Iron Bridge magnetite project, which represents one of the few large-scale iron-ore growth projects under construction worldwide. The project is located 145 km south of Port Hedland and incorporates the North Star and Glacier Valley orebodies. The project is an unincorporated JV between Fortescue's subsidiary FMG Iron Bridge and steel producer Formosa Steel IB.

The project will deliver 22-million tonnes of high-grade iron magnetite concentrate a year, with first production scheduled in December 2022 and a ramp-up process to proceed for about 12 to 18 months thereafter. The project includes the installation of a 135 km concentrate slurry pipeline to Port Hedland, together with a return water pipeline.

In May 2022, Fortescue published a technical and commercial assessment of the project, with a revised capital estimate of between \$3.30-billion and \$3.50-billion. In the six months ended December 31, 2021, Fortescue completed a module offload facility to allow for the successful delivery and installation of the first modules to site, as well as completed earthworks for a tailings storage facility and a concentrate handling facility at Port Hedland.



Fortescue's recent iron-ore financial and operational performance

	Full year ended June 2022	Full year ended June 2021	Half year ended December 2021	Half year ended December 2020
Total output	188.60-million tonnes	185.80-million tonnes	97.60-million tonnes	90.30-million tonnes
Revenue	\$17.39-billion	\$22.28-billion	\$8.12-billion	\$9.34-billion
Underlying Ebitda	\$10.56-billion	\$16.38-billion	\$4.76-billion	\$6.64-billion

Source: Fortescue Metals Group

On a corporate note, Fortescue CEO Elizabeth Gaines announced in December 2021 that she would step down from her position as the company transitions from a pure resources company to a vertically integrated green energy and resources group.

Gaines will assist with the global search for a new CEO to lead the development of the company, and thereafter continue to serve on the board as a nonexecutive director.

New prospect

Fortescue Metals Group entered into a 36-month exclusivity agreement with the government of Gabon in December 2021 to study the opportunity of developing the Belinga iron-ore project in the West African country.

The area pertaining to the agreement spans 5 500 km² and has been progressively assessed by Fortescue since 2018.

Fortescue plans on creating a Gabon mining company, owned 80% by Fortescue, to hold tenure over the project. Outgoing CEO Elizabeth Gaines said that the company is pursuing global opportunities in iron-ore that align with its strategy and expertise.

Source: Reuters

Environment

Fortescue aims to achieve net-zero Scope 1 and Scope 2 emissions by 2030, and net-zero Scope 3 emissions by 2040. The company is investing in renewables and new decarbonisation technologies to transform its mining fleet to run on renewable energy by the end of the decade and develop green iron-ore trains.

Fortescue's autonomous fleet represents one of the biggest in the world, with more than 190 trucks operated in the Pilbara.

Fortescue established a global portfolio of renewable-energy opportunities in 2022, which it will undertake through a company it created, Fortescue Future Industries, with a particular focus on green hydrogen and green ammonia.

Founder and chairperson Dr Andrew Forrest notes in the company's annual report for the 2021 financial year that the company generates just over two-million tonnes of GHGs every year. He believes that green hydrogen is the purest source of energy in the world and

one that can replace up to three-quarters of global emissions, if the technology were to be improved and scaled. He says the "tricky" part is transporting green hydrogen, but Fortescue is actively researching ways in which to do so.

Forrest adds that Australia is in a unique position to scale green steel, as the region accounts for 40% of the world's iron-ore production.

Meanwhile, Fortescue and its partners have announced more than \$800-million worth of renewable-energy infrastructure projects since October 2019. The company announced a 5.4 GW solar photovoltaic, wind and battery energy storage project in February 2022, which it plans to build in Western Australia.

The Uaroo Renewable Energy Hub will be built 120 km south of Onslow and 170 km west of Fortescue's Eliwana mine site. The

Truck deal

Australian iron-ore mining company Fortescue Metals Group partnered with multinational equipment manufacturer Liebherr in June 2022 to develop "green" mining haul trucks, with zero-emission power system technologies.

The company aims to transition its diesel-powered mine haul fleet to a green mine haul fleet before 2030.

Fortescue would acquire 120 haul trucks from Liebherr, with delivery being aligned to its fleet replacement and sustaining capital expenditure forecast.

About 200-million litres of diesel was consumed by Fortescue's mine haul truck fleet in 2021, and accounted for 26% of its Scope 1 emissions.

The phased supply of haul trucks is expected to start following a two-year joint development period to allow for the development and integration of Fortescue's proprietary power system into Liebherr's base truck.

The trucks will then be supplied in battery- and fuel cell-electric configurations. Fortescue aims to have its first green haul truck operational at a mine site by 2025, and commercialise green power system technologies to the broader heavy duty mobility market thereafter.

Source: Mining Weekly



Fortescue Future Industries Successes in the 2021 financial year

1. The successful combustion of ammonia in a locomotive.
2. The testing of battery cells for use on Fortescue haul trucks, as well as the design and construction of a hydrogen-powered haul truck.
3. Finalising design work for the next-generation ore carrier that will use renewable green ammonia.
4. Completing the design and construction of a hydrogen-powered drill rig.
5. Successfully producing high-purity green iron from Fortescue's ores at low temperatures.

Source: Fortescue Metals Group FY21 Annual Report

company proposes to build a 3.33 GW solar farm and a 2.04 GW wind farm, spread across 10 000 ha. The hub will also include battery storage capacity of 9.1 GWh.

The development of the hub will include a 220 kV transmission line connecting the Uaroo main substation to a substation at the Eliwana mine. Fortescue envisions, as quoted by Australian news publication PV Magazine in February 2022, that the Uaroo project will reduce the company's carbon emissions by at least 1.50-million tonnes a year by 2030.

The hub will be integrated with the company's \$700-million Pilbara Energy Connect programme, which includes a \$250-million transmission project that will install 275 km of high-voltage transmission lines to all Fortescue's mining operations in the region.

Two sites, Christmas Creek and Cloudbreak, which are part of the Chichester Hub, are already partially powered by solar energy from Fortescue's 60 MW Chichester Hub Solar Farm. The construction of the Uaroo hub will proceed once all approvals are finalised.

The initiatives Fortescue is undertaking to reduce its Scope 3 emissions by 2040 include converting existing maritime vessels, including Fortescue's fleet of ore carriers, to be fuelled by green ammonia; supporting the adoption of green ammonia in new vessel construction; pursuing opportunities for emission reduction in iron and steelmaking using green hydrogen and renewable energy; and researching how to produce green iron and cement from its ores at low temperatures, without coal.

RIO TINTO

Australia-headquartered diversified miner Rio Tinto mines and produces iron-ore in the Pilbara region of Western Australia, in addition to producing aluminium, copper, lithium, borates, titanium

and diamonds. It also produces iron-ore pellets and concentrate at Iron Ore Company of Canada.

Its iron-ore operations comprise a network of 16 mines, four port terminals and a 1 700 km rail network.

An "end to the era of record returns" in the mining sector, was signalled when Rio Tinto reported a sharp drop in interim profit and dividend payment in the six months ended June 30, 2022.

Rio Tinto posted an underlying Ebitda for iron-ore of \$10.40-billion in the period, down from \$16.06-billion of underlying Ebitda for iron-ore generated in the six months ended June 30, 2021.

Since the iron-ore price was twice as high this time in 2021, the company could not manage to declare a similar interim dividend of 376c apiece, instead, it announced a 267c apiece dividend.

Rio Tinto said it suffered a \$1.50-billion loss from inflation in the reporting period, as well as market-driven costs. The company realised an average iron-ore price of \$110.90/t on a freight on board basis in the first half of the 2022 financial year, compared with an average iron price of \$154.90/t realised in the first half of the 2021 financial year.

Shipments of iron-ore in the six months under review totalled 151-million tonnes, compared with shipments of 154-million tonnes reported in the prior comparable six months.

The company remains on track to ship between 320-million and 335-million tonnes of iron-ore in the 2022 financial year.

In the year ended December 31, 2021, Rio Tinto reported shipments of 321-million tonnes, which was 3% down on the prior year's 330-million tonnes shipped.

However, underlying Ebitda was 46% higher year-on-year at \$27.59-billion, driven by higher prices. Underlying Ebitda amounted to \$18.83-billion in the year ended December 31, 2020.

The average realised price for the full year came to \$143.80/t in the year under review, against the prior year average realised price of \$98.90/t.

Net profit totalled \$21.09-billion in the 2021 financial year at group level, including for other commodities besides iron-ore, compared with net profit of \$9.77-billion that the company posted in the 2020 financial year.

Rio Tinto declared a final dividend of 417c apiece, as well as a special dividend of 62c apiece, in the year under review, improving on the 309c dividend declared in the prior year, considering all its commodities.



Rio Tinto's recent iron-ore financial and operational performance				
	Full year ended December 2021	Full year ended December 2020	Half year ended June 2022	Half year ended June 2021
Total output	319.70-million tonnes	333.40-million tonnes	150.30-million tonnes	152.30-million tonnes
Revenue	\$39.58-billion	\$27.50-billion	\$16.61-billion	\$21.70-billion
Underlying Ebitda	\$27.59-billion	\$18.84-billion	\$10.40-billion	\$16.06-billion

Source: Rio Tinto

On the growth front, Rio Tinto's \$800-million investment in the Western Turner Syncline Phase 2 mine, which is part of the company's Greater Tom Price operations, in the Pilbara, will facilitate mining of new deposits and includes the construction of a new crusher and a 12-km-long conveyor.

The project achieved first ore in October 2021, following commissioning of the mine's autonomous mining truck fleet.

In July 2022, the company launched its most technologically advanced mine to date, Gudai-Darri, in the Pilbara.

Rio Tinto CEO Simon Trott says the mine's data and analytics, machine learning and automation capabilities will make it much safer and more productive to operate, compared with the average iron-ore mine.

The mine has, for example, a robotic ore-sampling laboratory that provides visibility of the ore grades out of the mine within minutes, and a digital replica of the processing plant to allow for the testing of different situations digitally before implementing.

Gudai-Darri is the company's first greenfield mine in the Pilbara in more than a decade and marked a \$3.10-billion investment in the state of Western Australia. It will produce 43-million tonnes a year once fully ramped up in 2023.

Environment

Rio Tinto aims to reduce its Scope 1 and 2 emissions by 15% by 2025, and by 50% by 2030, on its journey to reaching net-zero carbon emissions by 2050. The company announced these decarbonisation targets in October 2021.

It estimates that it will invest about \$7.50-billion in capital from 2022 to 2030 to deliver on these targets, with the average spend amounting to \$1.50-billion from 2022 to 2024.

The company explains in its 'Climate Change 2021' report there will also be incremental operating expenditure on building new capabilities, energy efficiency initiatives and research and development of about \$200-million a year until 2030.

Rio Tinto's absolute Scope 1 and 2 emissions in 2021 were 31-million tonnes of CO₂ equivalent, slightly below the 31.50-million tonnes of emissions posted in 2020 and 4.30% below the 2018 equity emissions baseline.

Since 2018, Rio Tinto has been using renewable energy at the Kennecott mine, in the US, and the Escondida mine, in Chile.

In terms of its iron-ore operations, Rio Tinto has built a 34 MW solar farm comprising 83 000 solar panels at the newly launched



Gudai-Darri mine

Source: Rio Tinto



Gudai-Darri mine, in Western Australia, which will power one-third of the mine's electricity requirements. The solar farm was commissioned in August 2022.

The miner also plans to develop a 1 GW solar and wind plant in the Pilbara to power some of its other operations, which could be seven times larger than Western Australia's current biggest solar farm. Rio Tinto aims to electrify all its Pilbara operations, including haul trucks, mobile equipment and rail operations, by replacing diesel-heavy fleets with battery or hydrogen technology.

The company has vowed that, by 2030, the acquisition of diesel-powered truck fleets at its operations will end, while it aims to electrify its trains. In January 2022, Rio Tinto agreed to buy four battery-electric trains to transport ore from its mines to ports, with initial trials due to start in the Pilbara in early 2024.

A full transition to net-zero emissions technology across Rio Tinto's fleet of rail locomotives will reduce its diesel-related carbon emissions in Western Australia by an estimated 30% a year.

In considering its Scope 3 emissions, Rio Tinto recognises that decarbonising the steel value chain is an immense challenge. Steel is currently responsible for about 8% of global CO₂ emissions.

Rio Tinto says it is working with customers, governments, suppliers and academia to support research and development to achieve this. The company has earmarked \$200-million a year towards steel value chain decarbonisation, including exploring the use of biomass instead of coking coal in the steelmaking process and using clean hydrogen to replace coking coal at Australian steelmaker BlueScope's Port Kembla Steelworks.

VALE

Brazil-based diversified miner Vale produces iron-ore across four systems – the Northern, Southeastern, Southern and Midwestern – in Brazil. It also operates 11 iron-ore pellet operations in Brazil and two in Oman. Some of these operations are JVs with other companies.

It holds a 50% interest in the Samarco JV with diversified miner BHP, in Brazil.

Samarco owns an integrated system comprising two different pits, three beneficiation plants, three pipelines, four pellet plants and a port.

The JV also owns the Fundão tailings dam, which ruptured in November 2015, releasing tailings downstream.

Since the rupture of the dam, Samarco has been subject to extensive litigation and been in financial distress. Samarco has defaulted under several financing agreements and, in April 2021, the JV filed for Judicial Reorganisation with the second State Court for Corporate Matters of Belo Horizonte, to restructure, among other debts, its financial debt.

Samarco filed its first reorganisation plan in June 2021. New plans were subsequently filed in February, March and April 2022. The general creditor meeting was installed in March 2022, and is currently suspended in agreement with creditors

Vale also produces nickel, manganese, coal, cobalt, silver, gold, platinum-group metals and copper.

The Northern and Southeastern systems are fully integrated with mines, rail infrastructure, maritime terminals and ports. The Southern system comprises two mining complexes and two maritime terminals.

Vale sold the iron-ore, manganese and logistics assets in its Midwestern system, also referred to as Center-West, to an entity controlled by private investment firm J&F Investimentos for an enterprise value of \$1.20-billion in July 2022. The company says in an article, published in April 2022 by trade publication NS Energy, that the disposal is in line with its strategy of streamlining its portfolio and focusing on growth opportunities.

Vale shipped 277.50-million tonnes of iron-ore in the year ended December 31, 2021, compared with the 254.86-million tonnes shipped in the year ended December 31, 2020.

Adjusted Ebitda came to \$31.30-billion in the year ended December 31, 2021, which was \$13.80-billion higher than adjusted Ebitda generated in the prior year, mainly owing to higher prices.

The company paid dividends of \$3.50-billion to shareholders, after reporting a net profit of \$22.40-billion in 2021, nearly four times higher than that achieved in 2020.

Vale's recent iron-ore financial and operational performance

	Full year ended December 2021	Full year ended December 2020	Half year ended June 2022	Half year ended June 2021
Total output	275-million tonnes	254-million tonnes	137-million	142-million
Revenue	\$38.70-billion	\$27.29-billion	\$14.36-billion	\$21.14-billion
Adjusted Ebitda	\$26.58-billion	\$18.28-billion	\$11.63-billion	\$16.04-billion

Source: Vale



The company reported an average realised price for iron-ore of \$140.50/t in the year under review, compared with an average realised price of \$107.42/t in the prior year. The realised average price for iron-ore in the six months ended June 30, 2022, was \$112.80/t. Adjusted Ebitda amounted to \$11.46-billion in the six months ended June 30, 2022, compared with adjusted Ebitda of \$19.71-billion posted in the six months ended June 30, 2021.

In the six months ended June 30, 2022, Vale shipped 137-million tonnes of iron-ore, compared with 142-million tonnes shipped in the prior interim period.

In mid-July 2022, Vale cut its iron-ore production forecast for the 2022 financial year, partly because it took into account lower market prices that prevailed at the time, and owing to the sale of its Center-West system assets.

It now aims to produce between 310-million and 320-million tonnes, instead of the previously stated guidance of between 320-million and 335-million tonnes.

Environment

Vale aims to reduce its absolute Scope 1 and 2 carbon emissions by 33% by 2030 and achieve net zero by 2050, in line with the Paris Agreement.

According to Vale's 'Integrated Report' for 2021, it plans on investing between \$4-billion and \$6-billion over the next ten years to develop low-carbon solutions such as electrification, biofuels use and renewable electricity generation and use.

The company has 40 projects in progress to achieve the 2030 target, particularly to achieve 100% renewable electricity consumption at its operations, in Brazil, by 2025 and to reach 100% renewable electricity consumption at its operations globally by 2030.

In 2021, Vale spent \$187-million on GHG emission and climate change mitigation efforts.

Meanwhile, the company has created a corporate venture capital arm to back startup companies focused on developing game-changing innovations for mining and metals challenges.

The venture is starting with a \$100-million budget to invest in firms involved in sustainable mining initiatives. The fund aims to provide initial funding for early-stage investments and to hold a stake – from 3% to 5% – in the firms.

The first company in Vale's venture capital portfolio is US-based Boston Metal, which is focused on steel decarbonisation technology. The startup is also supported by cleantech venture capital funds,

other mining companies and steel users. Vale invested \$6-million in Boston Metal in September 2021.

In Brazil, the company has started construction on a "green" pig iron plant in Marabá, near its Carajás iron-ore mine.

Vale will incorporate technology of its subsidiary Tecnoored, which is a viable solution for the decarbonisation of the steel industry value chain, it explains, adding that it envisions an initial production capacity of 250 000 t/y of green pig iron, and an expanded production capacity of up to 500 000 t/y in future.

The plant is expected to start commercially operating in 2025, following a capital investment of \$336-million.

In terms of Scope 3 emissions, Vale signed a memorandum of understanding in April 2022 with the world's third-biggest steel producer, Nippon Steel Corporation, to pursue ironmaking solutions focused on carbon neutral steelmaking.

The companies intend to jointly study and explore metallurgical usage solutions, such as direct reduced iron and pig iron produced by Tecnoored technology, as well as using Vale's green briquettes in ironmaking.

The green briquettes are made of iron-ore and an agglomeration technological solution, which can be obtained using sand, which is, in turn, provided by the treatment of Vale's mine tailings.

Vale aims to reduce 15% of its net Scope 3 emissions by 2035, with 2018 as the baseline. The board approved the conversion of pelletising plants 1 and 2 at the Tubarão complex into iron-ore briquetting plants to produce green briquettes in December 2020.

The company will also build a new briquetting plant at its Vargem Grande complex. The initial production capacity of these plants will be about seven-million tonnes a year, with commercial startup expected in 2023 at a total capital cost of \$185-million.

Gas-powered pellet production

Brazilian diversified miner Vale signed a deal with power distribution company Eneva in July 2022 to access natural gas supply for its São Luis pelletising plant, in Brazil, from 2024.

The deal will result in natural gas supply from Eneva being distributed by Brazilian firm Gasmar.

The contract between the companies will last for five years and will enable the São Luis plant to stop running on fuel oil. The transition will lower costs for the company and reduce the plant's greenhouse-gas emissions by 28%.

Source: Mining Weekly



SOUTH AFRICAN PRODUCERS

South African iron-ore production and sales							
Production		Local sales		Export sales		Total sales	
Tonnes		Tonnes	R'000	Tonnes	R'000	Tonnes	R'000
2010	58 709 330	10 560 910	3 270 326	47 492 581	40 148 279	58 053 491	43 418 606
2011	58 056 897	9 844 323	4 207 746	51 890 937	58 444 148	61 735 260	62 651 894
2012	67 100 474	8 392 835	4 448 978	57 109 694	48 193 830	65 502 529	52 642 808
2013	71 644 761	9 295 336	5 776 442	58 180 390	57 360 500	67 475 726	63 136 942
2014	80 741 034	9 571 453	5 741 815	61 944 607	52 944 638	71 516 060	58 686 453
2015	72 805 534	7 512 691	5 071 073	64 175 896	34 394 014	71 688 587	39 465 086
2016	66 450 089	6 160 597	3 855 830	58 392 326	39 240 118	64 552 923	43 095 948
2017	74 789 394	7 177 079	5 187 033	60 678 253	44 188 638	67 855 332	49 375 671
2018	74 272 974	8 024 968	5 732 580	61 715 193	45 529 223	69 740 161	51 261 803
2019	72 406 782	7 548 006	5 630 784	60 582 727	65 040 115	68 130 733	70 670 899
2020	55 635 308	5 885 791	3 260 059	60 177 593	83 304 860	66 063 384	86 564 919
2021	73 090 918	6 811 992	5 101 679	60 814 531	115 680 173	67 626 523	120 781 852

Source: Department of Mineral Resources and Energy

South Africa's iron-ore production amounted to 73.10-million tonnes in 2021, according to mining industry employer organisation Minerals Council South Africa, making it the ninth-biggest iron-ore producer in the world.

This compares with 55-million tonnes produced in 2020, when mining production was heavily hampered by intermittent Covid-19 lockdowns.

Five of South Africa's iron-ore producers are members of the Minerals Council: African Rainbow Minerals, Assore, Afrimat, Kumba Iron Ore and Sedibeng Iron Ore. These companies' operations are based primarily in the Northern Cape.

The biggest iron-ore producer in the country, Kumba, says the most sought-after iron-ores for steelmaking are hematite and magnetite, the former of which comprises 95% of South Africa's production.

Kumba produces high-quality lump and high-grade sinter fines for the domestic and export markets.

Minerals Council reports in its 'Facts and Figures 2021' pocketbook that employment in the iron-ore industry increased by 4.70% in 2021 to 21 427 direct employees, earning R8.60-billion combined for the year.

South Africa's iron-ore sales totalled R120.78-billion for 67.63-million tonnes in 2021.

This compares with iron-ore sales of R86.56-billion in 2020, for 66.06-million tonnes. Exports accounted for 96% of these sales.

KUMBA IRON ORE

Kumba Iron Ore, a subsidiary of diversified mining group Anglo American, is the biggest iron-ore producer in South Africa.

Its operations comprise the openpit Sishen mine, near Kathu, and the Kolomela mine, near Postmasburg, both in the Northern Cape.

Kumba also operates port operations in Saldanha Bay, in the Western Cape, from where the iron-ore is shipped to export markets.

The company posted production volumes of 40.86-million tonnes in the year ended December 31, 2021, which marked a 9% year-on-year improvement, compared with 37.62-million tonnes produced in the year ended December 31, 2020.

Of this, Sishen accounted for 28.01-million tonnes of production, and Kolomela the balance.

Kumba's export sales volumes were, however, impacted on by logistical constraints and increased slightly to only 40.16-million tonnes, compared with the previous year's export sales volumes of 39.95-million tonnes.



Green premium

Afriforesight materials engineer and project innovation manager Dr Brandon Davoren says it will still be a long while before South Africa produces green steel, but exporting green iron-ore is attainable in the medium term.

Mining Weekly quoted Davoren in December 2021 as saying that, with steel producers in a drive to decarbonise the steel industry, the iron-ore industry, by extension, is also undergoing changes to this effect, particularly as iron-ore producers want to reduce their Scope 3 emissions, which pertain to the value chain of the commodity.

Consultancy Wood Mackenzie reports that emissions in the steel sector must fall by 75% to limit global warming to within 2 °C, which would require a reduction from more than three-billion tonnes of carbon dioxide equivalent in 2020 to about 780-million tonnes by 2050.

This goal can be achieved by, among other initiatives, tripling direct-reduced iron production and use.

Mining Weekly states further that the Western Australian government committed A\$1-million to investigating the viability of sustainably processing iron-ore into green steel.

Davoren says the European steel industry will likely produce green steel by 2025, in relatively small amounts.

He explains that if multinational steel producer ArcelorMittal achieves success with its green steel offering in Europe, its South African operations will surely follow suit; however, only in the long term, given the country's persistent electricity constraints and reliance on carbon-heavy coal-fired electricity generation.

Fortunately, Davoren adds, many mining companies are promoting renewable-energy projects in South Africa, which creates the potential for green iron-ore mining – using renewable energies to meet all a mine's energy needs, including the charging of electric mine vehicles. These projects may be realised sooner than expected, as a result of Cyril Ramaphosa's power plan announcements in July 2022, which encourages more private-sector power generation in various forms.

Green iron-ore can fetch a premium for being produced at a lower carbon rate, as is the case with aluminium.

Source: *Mining Weekly*

The company's headline earnings per share (HEPS) amounted to R103.65 in the year under review, compared with HEPS of R71.07 generated the year before. The board declared a final cash dividend of R30.50 apiece, taking the total dividend for the year to R103.20 apiece, compared with the previous year's total dividend of R60.90 apiece.

Profit for the year amounted to R43.66-billion, compared with the prior year's profit of R29.84-billion. Earnings before interest, taxes, depreciation and amortisation (Ebitda) amounted to R64.56-billion, marking a 41% year-on-year increase compared with that of the prior year.

Kumba deemed 2021 a year of two halves for Chinese steel production. In the first half of the year, buoyant end-user demand, supported by government's stimulus measures, drove Chinese mill margins to near record highs, and motivated mills to ramp up steel production to 1.13-billion tonnes on an annualised basis.

However, to prevent a potential energy crisis in China, regulators rolled out nationwide production cuts, which resulted in steel output falling back to 932-million on an annualised basis in the second half of the year, Kumba reports.

It also noted the record-high steel prices in many parts of the world in 2021, which led to more demand for high-quality iron-ore.

Even with increased iron-ore price instability and the moderation of iron-ore prices in the second half of the year, the company delivered an average realised free-on-board export price of \$161/t in 2021, which was 18% above the benchmark price, compared with an average realised free-on-board export price of \$164/t realised in 2020.

Subsequently, Kumba declared an interim cash dividend of R28.70 apiece for 17.76-million tonnes produced in the six months ended June 30, 2022. This compares with a R72.78 dividend declared for 20.37-million tonnes produced in the six months ended June 30, 2021.

An Ebitda decrease of 48% year-on-year to R23.08-billion was driven by significantly lower market prices and higher operating expenses.

Kumba expects to produce between 38-million and 40-million tonnes of iron-ore in the year ending December 31, 2022. The company originally intended to produce between 41.50-million and 42.50-million tonnes. However, the company revised its production guidance for 2022 downwards to between 39-million and 41-million tonnes, and again to between 38-million and 40-million tonnes, owing to State-owned freight utility Transnet's stacker reclaimer refurbishment programme at the Port of Saldanha, which will impact on port capacity and Kumba's value chain.



Kumba Iron Ore's recent iron-ore financial and operational performance

	Full year ended December 2021	Full year ended December 2020	Half year ended June 2022	Half year ended June 2021
Total output	40.86-million tonnes	37.62-million tonnes	17.76-million tonnes	20.37-million tonnes
Revenue	R102.09-billion	R80.10-billion	R42.97-billion	R63.62-billion
Ebitda	R64.56-billion	R45.81-billion	R23.08-billion	R44.37-billion

Source: Kumba Iron Ore

The iron-ore miner has subsequently advised it expects shipments for 2022 to be 6% lower, owing to an 11-day strike at Transnet early in October 2022, which disrupted the utility's rail and port operations.

Kumba has revised its full-year export guidance from between 38-million and 40-million tonnes to between 36-million and 37-million tonnes.

Production is expected to be impacted on by the tie-in of the Sishen ultra-high dense-media separation (UHDMS) in 2023. The UHDMS will turn waste into saleable product and be a "game-changer" for the company. Kumba CEO Mpumi Zikalala explains in a *Mining Weekly* article, published in February 2022, that what would have been declared waste can now be classified as reserves.

From 150-million tonnes of waste, Kumba will be able to produce 50-million tonnes of saleable ore, she highlights. The UHDMS plant will also serve to reduce Kumba's strip ratio and, with that, assist in reducing unit costs.

The plant is also poised to improve the quality of Kumba's product, once the final handover of the plant happens in the first half of 2024, and extend the Sishen mine life by four years to 2039.

Meanwhile, Zikalala confirmed in February 2022 that the company will continue to invest in mineral exploration.

The company has identified various anomalies and targets following exploration work conducted in the past eight years, the most advanced of which is the Kapstevél South project, at the Kolomela mine. The R7-billion Kapstevél South development is expected to produce first ore in the second half of 2023.

The Ploegfontein project is at prefeasibility stage while conceptual work is being finalised on the Heuningkranz project.

Environment

Kumba is working on a regional renewable-energy ecosystem that will result in between 3 GW and 5 GW of solar, wind and hydropower being built.

The first phase of these plans comprises a 65 MW plant for the Sishen mine.

It is also investigating green hydrogen to reduce its Scope 1 emissions, alongside another Anglo subsidiary Anglo American



Kumba Iron Ore's iron-ore operations in Saldanha Bay

Source: Kumba Iron Ore



Platinum, which launched the world's first hydrogen-powered mine haul truck in May 2022.

Kumba is also establishing multiple partnerships with steelmaking customers, including Japanese steelmaker Nippon Steel Corporation, which involves modifying the specifications of Kumba's premium lump ore to reduce emissions in a blast furnace context.

The company also has a partnership in place with steelmaker Salzgitter, in Germany, to use premium lump ore in a direct reduction iron steelmaking process.

ASSMANG

Assmang is a 50:50 joint venture (JV) between mining and marketing company Assore and diversified miner African Rainbow Minerals (ARM).

It owns manganese and iron-ore mining operations – Khumani and Beeshoek – both in the Northern Cape.

The Khumani mine is located adjacent to Kumba Iron Ore's Sishen mine, in Kathu, while the Beeshoek mine is close to Postmasburg.

ARM reports its ferrous division's headline earnings were 16% lower at R6.68-billion in the year ended June 30, 2022, driven by a R2.80-billion decrease in headline earnings from the iron-ore division.

The iron-ore division's headline earnings amounted to R4.65-billion in the year under review, compared with headline earnings of R7.52-billion posted in the 2021 financial year.

The company explains that its iron-ore division has been negatively affected by lower average realised US dollar prices, lower sales volumes, higher freight rates and the stronger rand against the US dollar exchange rate.

Additionally, the iron-ore headline earnings included a R618-million negative fair value adjustment on iron-ore sales, of which 45% is based on confirmed prices and 55% is based on forward prices.

ARM received R5.50-billion of dividends from the Assmang JV in the year under review, compared with R4-billion of dividends received in the prior year.

Total iron-ore sales volumes decreased by 2% year-on-year to 16.10-million tonnes, compared with total iron-ore sales of 16.40-million tonnes produced in the prior year.

The average realised US dollar export iron-ore price achieved was 22% lower year-on-year on a free-on-board equivalent basis, at \$121/t, as the 62% iron-ore fines index dropped from peak levels above \$230/t at the start of July 2021. The average realised US dollar export iron-ore price was \$156/t in the 2021 financial year.

Drones incoming

Drones-as-a-service provider Delta Drone International signed a contract with Assmang in July 2022 to conduct drone surveying on the Khumani iron-ore mine, in the Northern Cape.

The three-year contract is valued at \$609 740, and will include survey mapping and blast inspections for the mine.

Source: International Mining

Environment

Assmang ordered a large fleet of battery-electric mining equipment from Sweden-based equipment supplier Epiroc in April 2022, to be deployed at Assmang's Black Rock underground manganese mine, in the Northern Cape, in a deal valued at \$12.50-million.

More of these trucks might also be ordered for Assmang's iron-ore operations.



The Scooptram ST14 Battery and Minetruck MT42 Battery machines have numerous intelligent features, including a collision avoidance system and a telematics system that allows for automated monitoring of productivity and machine performance, according to news service International Mining.

Moreover, Assmang confirmed in February 2020 that a scoping study was under way to determine the self-generation of electricity for its mines, but not its smelters.

Assmang CEO Charles Walters said at the time, as quoted by *Mining Weekly*, that solar power would be “ideal”, considering the Northern Cape’s abundance of this resource.

South Africa’s biggest iron-ore mines			
Operation	Owner	Production in 2021	Current LoM
Sishen	Kumba Iron Ore	28-million tonnes	2039
Kolomela	Kumba Iron Ore	12.8-million tonnes	2031
Khumani	ARM/Assmang	12.6-million tonnes	2041
Beeshoek	ARM/Assmang	3.2-million tonnes	2027

Source: Mining Technology & Mining Weekly
ARM – African Rainbow Minerals

OTHER PRODUCERS

There are two notable smaller producers of iron-ore in South Africa – diversified mining and construction group Afrimat and Sedibeng Iron Ore.

Afrimat owns and operates the Jenkins and Demaneng iron-ore mines, in South Africa’s Northern Cape province, while Sedibeng, which is majority-owned by Switzerland-based commodity house IMR Metallurgical Resources, owns and



operates the Sedibeng mine, near Postmasburg, also in the Northern Cape.

Afrimat’s Demaneng mine production is due to be replaced by production from the Driehoekspan and Doornpan iron-ore mines once the end of its mine life is reached in 2025.

The Jenkins mine is producing at 500 000 t/y, which is being ramped up to 1.25-million tonnes a year, while the Demaneng mine produces up to 870 000 t/y.

Afrimat reported an operating profit of R1.11-billion in the year ended February 28, 2022, compared with a restated operating profit of R1.06-billion in the prior financial year. The bulk commodities segment contributed an operating profit of R820-million, compared with an operating profit of R735-million in the prior year, to the group figure.

The Demaneng mine contributed an operating profit of R604-million, while the Jenkins mine contributed a R264-million operating profit.

The headline earnings a share for the group of 542.90c in the 2022 financial year marked a 22.90% year-on-year increase.

Afrimat declared a final gross dividend of 146c apiece in the year under review, compared with a final dividend of 112c apiece paid in the 2021 financial year.

Meanwhile, the Sedibeng mine is producing about two-million tonnes a year of iron-ore, but could increase that to up to three-million tonnes a year if more rail capacity becomes available.

Sedibeng’s output capacity matches the rail allocation that it has on the 861-km-long, electrified heavy-haul ore export line to the Port of Saldanha, for export to global markets.



SOUTH AFRICA'S IRON-ORE EXPORT INFRASTRUCTURE

South African iron-ore is transported along an 861-km-long railway for export from the Northern Cape to the Port of Saldanha Bay, in the Western Cape.

The port has a dedicated iron-ore terminal, accounting for 96% of all iron-ore exports from the country.

The Sishen–Saldanha railway line has a design capacity to transport 60-million tonnes of iron-ore a year, equal to the iron-ore terminal's capacity.

The terminal handled more than 54.50-million tonnes of iron-ore in the financial year ended March 31, 2022.

The operator of the country's railway lines, State-owned freight utility Transnet Freight Rail (TFR), does not have enough locomotives. The group's plan to procure new locomotives has also been put on hold in light of in-principle agreements reached between Transnet and two original-equipment manufacturers – CRRC E-Loco, of China, and Alstom, which has acquired Bombardier Transportation (BT) – with which it has been in legal dispute.

TFR CEO Sizakele Mzimela said in November 2022 that the agreements, concluded in August 2022 and October 2022 respectively, were likely to result in TFR acquiring much-needed spares, the absence of which has left 311 locomotives standing idle. It will also help secure the outstanding locomotives procured in 2015 under the so-called 10-64 contract.

Under the contract, which was divided between four suppliers, General Electric was awarded a contract to supply 233 of the 465 diesel locomotives, while China North Rail was contracted to supply the balance. China South Rail was awarded a contract for 359 of the 599 electric locomotives ordered, with BT to supply 240. The two Chinese firms subsequently merged under CRRC E-Loco.

Transnet has reportedly taken delivery of 595 locomotives arising from the 2015 contract, representing 56% of the original order.

Prior to the agreements, Transnet CEO Portia Derby indicated that the group was preparing to procure about 400 new locomotives to close the gap, given that Transnet had taken delivery of some locomotives under the 10-64 contract.

"The in-principle agreement that has been reached with the Chinese will result in them helping us to bring back to service the long-standing locos first, but also to complete . . . the supply of the outstanding number of locomotives that would have been part of the initial order," Mzimela said.

Despite TFR's dearth of locomotives, the State-owned freight utility has been subjected to a scourge of cable theft and vandalism over the past few years.

Transnet reports in a 'Freight Rail 2022 Report' that more than 1 500 km of cable were stolen in the past five years, resulting in a net financial impact of R4.10-billion.

Iron-ore mining companies, as well as other commodity companies, are in talks with Transnet about extending private security and technology initiatives to their rail corridors to combat crime that is disrupting exports.

Transnet said in February 2022 that it needs R3-billion to upgrade its security infrastructure across all its corridors, with about 80% of this to be funded through external means.

The freight utility has long bemoaned historic underspending in the rail and port network, as well as mechanical equipment, in addition to its cable theft and vandalism woes.

There has been a 177% increase in criminal incidences and security breaches along the utility's network nationwide over the past five years, leading to a 343% loss in tonnage railed over the same period.

RAIL AND PORT CONSTRAINTS

Minerals Council South Africa states in its 'Integrated Annual Review 2021' that iron-ore exports lost opportunities worth between R6-billion and R14-billion, as a result of rail and port constraints. The council states in a *Mining Weekly* article, published in June 2022, that in the four months to April 30, 2022, iron-ore export volumes were 7% lower year-on-year, with the value of sales down by 25%.

The council has, therefore, urged government to address rail and port constraints.



Transnet explains in its 'Integrated Report' for 2022 that underinvestment has led to spiralling challenges around operational reliability and efficiency.

Transnet – through TFR and Transnet National Ports Authority – has numerous infrastructure development and refurbishment programmes under way, including a planned R8.40-billion capital investment programme at the Saldanha port over the next seven years.

The State-owned entity will also effect operational improvements to the Sishen–Saldanha rail line and rolling stock, in addition to increasing the Port of Saldanha Bay's capacity on the line to 67-million tonnes in the medium term and 77-million tonnes in the longer term.

Transnet states its focus areas for 2022/23 are the sale of wagons and developing the required enabling environment for future wagon sale events, including associated commercial, operational and related matters.

The entity also intends to develop a sustainable expansionary roadmap for the Port of Saldanha, including planning for partnership or alternative funding-related processes to expand the capacity of the port and iron-ore channel.

THIRD-PARTY ACCESS

In 2020, President Cyril Ramaphosa announced that Transnet would be granting third-party access to the country's rail network. While this does not mean the privatisation of Transnet, it does enable private freight rail operators to use the country's rail network, adding significant volumes to it.

Transnet says in its 'Integrated Annual Report' for 2022 that the accounting separation of rail infrastructure and operations is far advanced, and pilot projects are being finalised to release the first tranche of rail capacity to third-party operators before the end of 2022.

News service Business Day quoted African Rail Industry Association (ARIA) in September 2021 as estimating that 58-million tonnes of freight can be transferred from road to rail, should third-party access to the network be allowed, which would help grow the economy considerably.

According to the association, Transnet has not been able to keep pace with customer demands, with the country's having no other choice but to effect greater private-sector participation to match those demands.

However, *Engineering News* cites ARIA in July 2022 as saying that Transnet has imposed restrictive terms and conditions related to third-party access of the rail network.

The association argues that Transnet's approach to its 16 slot sales will not result in private investment, owing to only two-year contracts being offered; that slots have been offered on a "voetstoots" basis, meaning that third-party operators must accept the current state and performance of the network, with its high crime levels and damage to infrastructure; that Transnet has reserved special 'grandfather rights' for itself, meaning that the entity can take precedence over these slots, owing to its being the original operator; and that only a portion of the network is being offered, with no transparency in fee calculation.

A 50-wagon train set costs about R200-million to produce, with every slot requiring three to four train sets. The private sector has not invested hundreds of millions of rands in train sets in advance of the structural reform becoming a reality, so there are no train sets ready to deploy.

ARIA adds that locomotives and wagons last for about 20 years and that long-term funding is required to provide commercially viable freight rates. Despite this, Transnet is offering only short-term slots, rendering its current proposal "fundamentally meaningless", says ARIA CEO Mesela Nhlapo.

ARIA represents the four biggest private operators in South Africa and can, therefore, confirm that there is no existing capacity.

The dearth of capacity is not owing to an absence of investment appetite or customer demand, but because no private operator will make material investments in train capacity before the implementation of a third-party access structural reform while rates, terms and conditions remain undefined, she adds.

Nhlapo suggests that slots be made available for a period that is aligned to the life span of the assets being invested in, and thereby creating a level playing field.

ARIA suggested in August 2022 that Transnet re-introduce systems it used in the past and prioritise the maintenance of currently disabled locomotives, since Transnet effectively made a trading loss of about R5-billion in the 2022 financial year. This while TFR spent R2.70-billion on maintenance, compared with the R3.40-billion last spent in 2012.

Over the same period, the salary bill has increased by R6.10-billion to R13.60-billion, and the workforce has decreased by 3 800 people.

ARIA estimates an accumulated backlog of at least R27-billion in maintenance expenditure on the rail network.

ARIA says Transnet was running an internationally respected and dynamic network planning system, called MultiRail; however, the system was inexplicably cancelled in 2010 and has been replaced by manual operation of the network using spreadsheets.



The association believes this manual operation leads to suboptimal decisions, wasted time, train delays and manipulation of the system.

Hundreds of active locomotives are standing for 24 hours every day across the local railway network, while about 300 locomotives await maintenance interventions. ARIA contends that Transnet cannot afford to raise more debt to buy more locomotives as set out in its integrated report.

ARIA suggests that, to arrest inefficiencies at Transnet and boost its locomotive uptime, Transnet should reintroduce a dynamic network planning system and improve the existing trains in its network, instead of buying more trains.

Later, in August 2022, ARIA said it is, nonetheless, encouraging that government is progressing in a direction that will allow for more private-sector participation in sectors, such as ports and freight rail, to increase competition.

The association believes that allowing private rail operators onto South Africa's core rail network will provide a multibillion-rand boost for the economy, potentially create thousands of jobs and drive massive economic benefits. Simultaneously, Transnet will derive a material new income stream through access fees without having to compete with private rail operators.

Rail solutions company Traxtion Group already announced an initial locomotive and wagon build programme of R1.50-billion, with plans to invest a further R14-billion in locomotives and wagons over the next five years as part of a scaled rolling stock investment programme.

In a media statement released in October 2020, Traxtion says the rolling stock investment programme will result in the company's partnering with original-equipment suppliers for locomotives to be assembled in the local market, and with local manufacturers for the wagons.



Rail wagon on the Sishen–Saldanha railway line

Picture by Creamer Media



AFRICAN DEVELOPMENTS

Iron-ore production in Africa is dominated by South Africa, Mauritania and Algeria, with untapped reserves in many countries, particularly in West Africa.

According to statistics provider Statista, iron-ore mine production in Africa totalled 96.80-million tons in 2021, representing a 28% increase, compared with that of 2020. Iron-ore production in Africa peaked in 2014 at about 121-million tons. *Mining Weekly* reported in July 2020 that mining projects in Africa, particularly those in the iron-ore sector, require deep pockets, lengthy feasibility studies and complementary infrastructure assets, including efficient logistics to get products from mine to market.

While Africa's iron-ore potential remains underexplored and unrealised, a few new projects are poised to come on stream within the next few years.

GUINEA

Multinational group Rio Tinto has long signalled its intention to develop the Simandou iron-ore project, in Guinea. The deposit is considered the world's biggest untapped resource of iron-ore at an estimated 8.60-billion tons.

The project has spent years in limbo because of ownership rights disputes, and the significant investment required to extract and transport the ore.

Rio Tinto has struggled to reach an agreement with fellow developers and the government of Guinea over building a railway line of more

than 600 km, from Beyla to Forécariah, and a deep-water port at Moribayah, in Forécariah.

Guinea's Mining Minister ordered all work on the Simandou project to stop on July 3, 2022, after Chinese-led Winning Consortium Simandou (WCS) and Rio Tinto Simfer missed an extended deadline to agree on a joint venture (JV) with government.

WCS is the holder of Simandou North blocks 1 and 2, with the government of Guinea holding a 15% interest in the mining special purpose vehicle controlling the blocks.

WCS is a consortium of Singaporean company Winning International Group, United Mining Suppliers International and Weiquao Aluminium, the latter of which is part of the China Hongqiao Group, with the companies owning 45%, 20% and 35% of WCS respectively.

The Simandou South blocks 3 and 4 are controlled by the Simfer JV, which comprises Simfer Jersey Limited, with 85% ownership, and the government of Guinea, with 15% ownership.

In turn, Simfer Jersey is a JV between Rio Tinto, owning 53%, and Chalco Iron-Ore Holdings, owning the balance.

Chalco is a JV between Chinese corporations Chinalco, with majority ownership of 75%; Baowu; China Rail Construction Corporation; and China Harbour Engineering Company.

Government put a 14-day ultimatum to the companies to form a JV, which was intended to cover the rail and port infrastructure the companies will use to export the iron-ore.

More access to Simandou

Australia-listed Arrow Minerals executed a nonbinding term sheet to acquire a controlling interest of up to 60.50% in Singapore-based company Amalgamated Minerals, which holds a 100% interest in the Simandou North iron-ore project, in Guinea, in July 2022.

This early-stage opportunity affords Arrow access to the premium iron belt in West Africa, which the company says is well timed, as significant infrastructural improvements are under way in the country and should deliver shared purpose infrastructure to the area by December 2024, enabling commercial production from mines in the area by 2025.

Simandou North comprises an exploration permit, situated at the northern end of the Simandou Range, and forms an extension of the stratigraphy that hosts one of the biggest undeveloped high-grade iron-ore deposits in the world.

Arrow says in a statement cited by *Mining Weekly* in July 2022 that Simandou North enables Arrow to participate in the development of an area where, until now, mineral wealth has been locked up, owing to infrastructural constraints.

Source: *Mining Weekly*



The three parties – Rio Tinto, WCS and the Guinean government – ultimately reached an accord on the development of the rail and port infrastructure to service the Simandou project on July 27. The parties will incorporate the La Compagnie du TransGuinée JV to serve as the central structure for the co-development of the rail and port components of the project.

Following the incorporation of the JV, the parties will turn their focus to concluding a shareholding agreement, finalising cost estimates and funding arrangements, and securing all necessary approvals and permits to progress the co-development of infrastructures.

High Power Exploration (HPX) – a mining company controlled by Canadian mining company Ivanhoe Mines chairperson Robert Friedland – secured access to a Liberian railway in March 2022, which opens the way for it to tap into iron-ore reserves in Guinea.

The company's Nimba concession, in Guinea, holds an estimated one-billion tons of high-grade iron-ore. HPX plans to start work on a connecting rail link in 2024, and aims to start mining production in 2027. The mine will extract at least 30-million tons of iron-ore a year, and will cost \$2.77-billion to develop, including \$600-million in capital costs for rail and port builds in Liberia.

HPX owns 85% of Société des Mines de Fer de Guinée and Ivanhoe Liberia, which are developing the project.

Under the Nimba project's 2021 prefeasibility study, significant additional infrastructure investment will be undertaken in Liberia by Ivanhoe to facilitate the transportation of ore to the port from the mine site.

This includes the expansion of the capacity of the existing rail infrastructure between Tokadeh, in Liberia, and the Buchanan port, which spans about 243 km. The expansion will also include the rehabilitation of rail infrastructure alongside an abandoned rail right-of-way, from Tokadeh to Yekepa, as well as a significant expansion of the Port of Buchanan through the construction of a new berth and bulk materials handling facilities.

This rehabilitation and expansion will also provide for passenger and light-freight rail access, which could contribute significantly to regional trade and economic development.

HPX also believes that there is potential to expand mining operations in northern Liberia and southern Guinea, *Mining Weekly* reported in April 2022.

CAMEROON

China's Sinosteel Corporation signed a \$675-million deal in May 2022 to exploit iron-ore in southern Cameroon. China is working towards decreasing its reliance on Australian and Brazilian iron-ore supply.

Under an initial 20-year mining convention, Sinosteel plans to produce ten-million tons of ore a year containing 33% iron from the Lobe mine. The company will then enrich the output to produce four-million tons of high-grade ore, with more than 60% iron content.

High-grade iron-ore is particularly valued in steelmaking, owing to its lower carbon emissions effect, compared with that of lower-grade ore.



Source: Bloomberg



The project will be 30% self-funded, with the balance comprising financing from bank loans.

The Lobe mine holds an estimated 630-million tonnes of iron-ore and is located 200 km from the economic capital of Cameroon, Douala, and 40 km from the port town of Kribi.

Sinosteel plans on building a beneficiation plant, a pipeline to transport the ore to the port and a mineral terminal at the port, as well as a power plant.

While Sinosteel officials are yet to confirm when mining will start, Cameroon's mining code stipulates that the company must start within five years from the granting of a mining permit.

The convention that the company signed with Cameroon allows for 15% of the iron-ore to be supplied domestically, but the country could authorise for some supply to be exported if local demand is weak.

GABON

Fortescue Metals Group entered into a 36-month exclusivity agreement in December 2021 with the government of Gabon to study the opportunity of developing the Belinga iron-ore project in the West African country.

The area in question spans 5 500 km² and has been progressively assessed by Fortescue since 2018.

According to an article published by news service Reuters in December 2021, Fortescue plans on creating a Gabon mining

company, 80%-owned by Fortescue, to hold tenure over the project. Outgoing Fortescue CEO Elizabeth Gaines said in the article that the company is pursuing global opportunities in iron-ore that align with its strategy and expertise.

NIGERIA

Australia-listed Kogi Iron published an updated scoping study on the Agbaja iron-ore mining and steel billet project, in Nigeria, in July 2022.

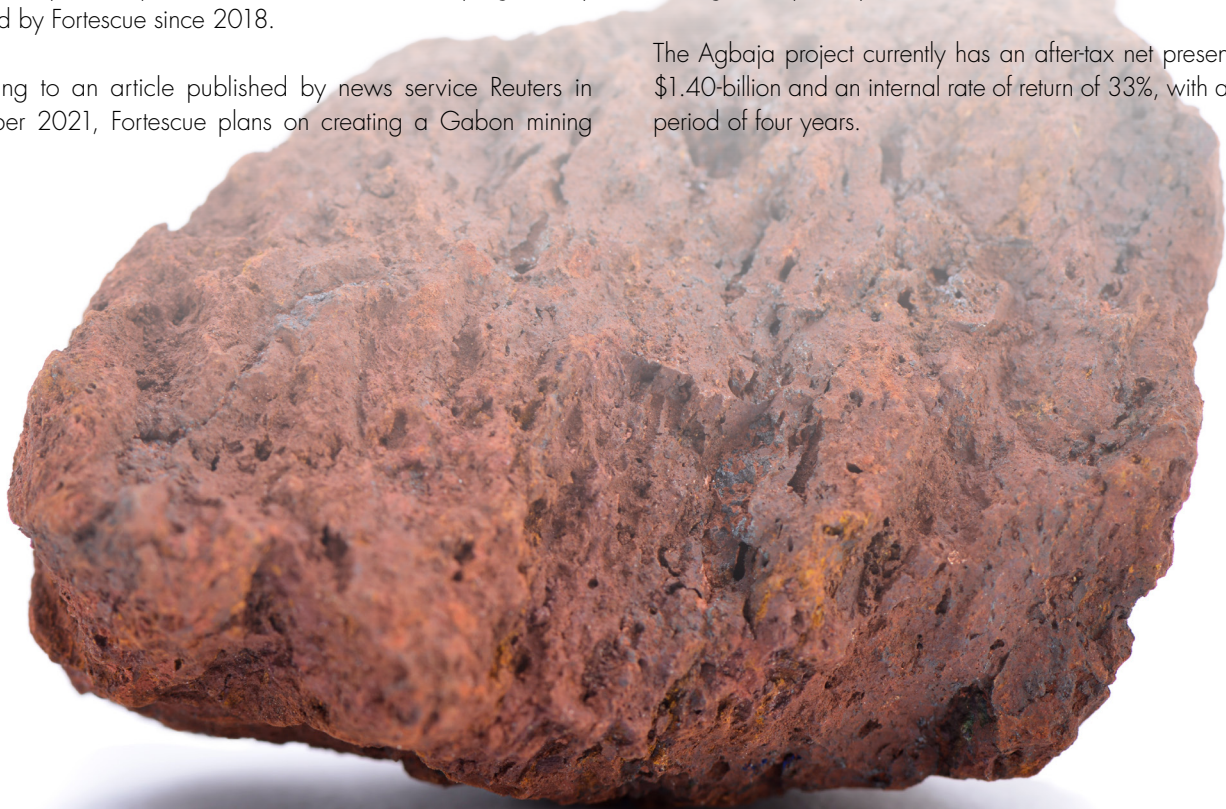
The study verifies that the deposit has suitable quality and size potential to supply a long-term operation.

Mining Weekly reported in July 2022 that Kogi aims to develop an integrated mining operation and processing facility to produce steel billets at a capital cost of \$557-million for the mining and processing facilities.

Based on a portion of the mineral resource estimate of 586-million tonnes grading 41.30% iron, the project can achieve a production rate of 1.70-million tonnes a year, grading 46.70% iron, for an initial mine life of 25 years. The study also envisages steel billet production of 500 000 t/y, which will mostly be sold domestically.

The company plans to appoint a mining contractor to conduct all site development, overburden and waste removal, openpit mining, haulage to a primary crusher and site rehabilitation.

The Agbaja project currently has an after-tax net present value of \$1.40-billion and an internal rate of return of 33%, with a payback period of four years.



OUTLOOK

Financial market data provider Refinitiv said in July 2022 that Australia-based iron-ore miners, such as Rio Tinto and Fortescue Metals Group, are unlikely to see a repeat of record profits booked in recent years, as they face soaring costs, falling commodity prices and a tight labour market.

Multinational investment bank UBS agreed, noting that the persistent downward trend in iron-ore prices will weigh on earnings of top producers, starting in the second half of 2022.

Mining Weekly reported in July 2022 that a rebound in iron-ore prices from pandemic lows powered mining companies' profits and distributions to shareholders in 2021, but that a resurgence of Covid-19 curbs and a deepening crisis in China's real estate sector have been among the factors hindering iron-ore demand growth in 2022.

The impact from a dearth of skilled labour in resource-rich Western Australia and surging global inflation will also subdue results for the

Empty iron-ore ships switch to coal to survive China's slump

Cargo ships struggling under weak Chinese demand for iron-ore are finding a more lucrative alternative as the global energy crisis spurs a greater need for coal, news agency Bloomberg notes in an article in November 2022.

Miners and traders are reducing shipments of iron-ore, the second-most widely traded seaborne commodity, and re-assigning their bulk carriers to highly unusual coal routes to sustain earnings.

More vessels are ferrying the fuel from Russia to China and from Australia to Europe, according to owners, brokers and traders. The cargo switching comes as a deepening crisis in China's housing market is dousing hopes of a demand recovery in iron-ore, Bloomberg states.

Meanwhile, coal has resurged after Moscow's invasion of Ukraine in February 2022 forced countries to replace Russian gas.

Bulk ships typically seek out stable long-term contracts of one commodity and adhere to it, but when profits are more attractive elsewhere, vessels can temporarily switch to transport other types of cargoes.

Some of the biggest iron-ore ships, known as Capesizes, are transporting Russian coal to China and India. In a normal market, this strategy is usually shunned by traders because Russian coal ports, like Ust Luga, do not have waters deep enough for Capesize vessels to fully load, forcing ships to take only partial cargoes.

However, about 33 Capesize vessels have called at Ust Luga in 2022, in the far north-west of Russia, up from a lone ship observed from 2015 to 2021, according to analyst at Arrow Shipbroking Group Harry Grimes...

Meanwhile, Australian coal is heading to Europe as the continent seeks to replace supplies from Russia, according to a senior economist at maritime data provider Shipfix Ulf Bergman.

The number of such voyages in September 2022 rose to 26, a monthly record since the company began tracking data in 2017.

"The vast majority of the shipments were on Capesizes . . . This has obviously offset some of the negative effects stemming from lower iron-ore demand," Bergman says.

Grimes contends that Capesize and Panamax ships moved about 20-million tons more coal in the first ten months of 2022, compared with the same period in 2021, while they transported 18-million tons less iron-ore.

The increased focus on coal has not, however, rescued shipowners from the ripple effects of China's economic slowdown, as the Baltic Dry Index is down 50% from a year earlier, Bloomberg notes, tracking the dismal performance of iron-ore prices.

Further, while global coal demand is surging, imports to China are slowing as the country ramps up domestic production.

Beijing's adherence to Covid Zero policies will likely continue to complicate progress in construction projects, weighing on iron-ore consumption and freight rates.

Source: Bloomberg



foreseeable future, the article continues, adding that China's plan to centralise iron-ore acquisitions has also cast doubt on prospects of global mining companies.

In contrast, diversified miner BHP stands to benefit from its exposure to a variety of commodities, including coal, the prices of which have been increasing amid the Ukraine-Russia conflict.

However, BHP stated in its production report for the quarter ended June 2022 that more turbulence for iron-ore miners is to come, as costs are ballooning and demand suffers headwinds.

BHP said commodity prices had been slumping in the months up to the end of June as demand wavered in China. Iron-ore plunged below \$100/t in mid-July, as China "tackled fresh turmoil in its beleaguered property market, including a wave of homebuyer boycotts of mortgage payments," Bloomberg reported.

BHP CEO Mike Henry expects the lag effect of inflationary pressure on input costs, labour market tightness and supply chain constraints to continue in the 2023 financial year. He mentions that stimulus measures in China will boost growth over the coming year; however, there is uncertainty about when government's steps to shore up the economy will take effect.

In an economic and commodity outlook, published by the company in August 2022, BHP market analysis and economics VP Dr Huw McKay summarises the key near-term uncertainties for iron-ore as being the pace of steel end-use sector recovery in China, how the Chinese authorities will administer steel production cuts in the remainder of 2022, and the performance of seaborne iron-ore supply.

Iron-ore miner Kumba Iron Ore says in its Interim Results 2022 booklet that structural factors relating to decarbonisation and the adoption of Scope 3 carbon emission reduction interventions by steel manufacturers will underpin demand for Kumba's iron-ore products going forward.

Research firm Fitch Solutions Country Risk & Industry Research expects iron-ore prices to average from \$90/t to \$120/t in 2022 and from \$75/t to \$110/t in 2023, and to follow a multiyear downward trend thereafter, on the back of cooling Chinese steel production, reaching \$50/y by 2031.

Fitch forecasts global iron-ore mine output growth to average 2.70% from 2022 to 2026, which will lift production by 361-million tonnes a year by 2026, relative to 2022. This compares to a -1.30% growth rate from 2017 to 2021. The agency says supply growth will be driven by Brazil and Australia, owing to aggressive expansion commitments having been made by miners BHP, Rio Tinto and Fortescue.

Fitch expects lower prices to eventually drag on production growth rates beyond 2026, with yearly iron-ore production growth likely to average 1.10% from 2026 to 2030.

While Fitch believes cooling Chinese steel production will dampen iron-ore demand, Australian iron-ore producer Fortescue Metals contends that global market conditions remain supportive of iron-ore, as Chinese industrial activity is expected to increase in the coming months.

Fortescue Metals also believes that demand for iron-ore will remain strong amid global supply constraints because of supply chain disruption, owing to the prevailing conflict in Ukraine.

Any prolonged military activity between Russia and Ukraine would severely impact on yearly iron-ore exports, totalling almost 70-million tonnes, eventually tightening the global balance Singapore-based information agency Navigate Commodities said in February 2022.

Echoing Navigate Commodities' sentiment on iron-ore export pressure, Maritime news journal Lloyd's List predicts lower year-on-year iron-ore exports globally in 2022, owing to lower production already reported from Australia and Brazil, and Black Sea iron-ore exports being down 30-million tonnes as of May 17, 2022.

In the near term, iron-ore market trends will largely depend on the timing of China's Covid-19 controls, following which the country's steel exports may surge to fill a deficit caused by the loss of Black Sea-origin steel supply metals, news service Metal Bulletin notes.

Analysts believe that iron-ore prices are on track to end 2022 at their lowest level in the past three years, and will likely languish next year as well. Estimates are that the iron-ore price will range between \$90/t and \$115/t at the end of 2022.

Analysts at investment bank JP Morgan, cited by Reuters in October 2022, have cut their price forecasts for iron-ore to \$103/t for the second half of the year and to \$94/t for 2023, from prior estimates of \$133/t and \$105, respectively.



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