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A REVIEW OF THE IRON-ORE SECTOR

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LIST OF ABBREVIATIONS AND ACRONYMS

AIISO	Autumn Skies Iron Ore
AMSA	ArcelorMittal South Africa
ASR	Autumn Skies Resources & Logistics
Capex	capital expenditure
DIIS	Department of Industry, Innovation and Science
EU	European Union
FIMI	Federation of Indian Mineral Industries
FMG	Fortescue Metals Group
IOC	Iron Ore Company of Canada
IRL	International Resources Limited
JV	joint venture
LoM	life-of-mine
SIOSC	Sishen Iron Ore Company
SRO	short range outlook
TFR	Transnet Freight Rail
UHDMS	ultrahigh dense-media separation
WAIO	Western Australia Iron Ore
Worldsteel	World Steel Association



Picture by Creamer Media



KEY DEVELOPMENTS

March 2018: Diversified mining company Anglo American halts operations at its Minas-Rio mine, in Brazil, following the discovery of leaks in the 529 km slurry pipeline that conveys iron-ore slurry from the mine to the Port of Açu, in the state of Rio de Janeiro, for export to international markets.

May 2018: Australian iron-ore mining company Fortescue Mining Group approves construction of the \$1.27-billion, 30-million-tonne-a-year Eliwana project, in Western Australia's Pilbara region. The project will include the laying of a 143 km railway line, and higher-quality ore from the mine, which is close to the benchmark 62% iron content, will increase the grade of Fortescue's ore, thereby meeting the demands of Chinese steel mills.

May 2018: South African mining major Kumba Iron Ore appoints Darin Strange, who has more than 25 years' experience at senior management level in mining, manufacturing and engineering, as its new COO.

June 2018: The Department of Mineral Resources approves Kumba Iron Ore's application to extend the Sishen mining right, in the Northern Cape, to the nearby Dingleton area, from which the Anglo American subsidiary has been relocating the inhabitants to the town of Kathu since 2014.

July 2018: Construction starts on mining major BHP's \$3.61-billion South Flank iron-ore mining project, in Western Australia's Pilbara region, which will entail the development of an 80-million-tonne-a-year mine to replace production from the depleting Yandi mine.

September 2018: Exploration and development company Ironveld, which is developing a vanadiferous titaniferous magnetite project in Limpopo, begins supplying 10 000 t of unrefined ore to a potential offtaker for commercial-scale testing.

October 2018: Anglo-Australian mining group Rio Tinto and Japanese companies Mitsui and Nippon Steel & Sumitomo Metal approve a \$1.55-billion investment to sustain production at two operations that form their Robe River joint venture.

October 2018: Indian group Tata Steel sells its 64% stake in the Sedibeng iron-ore mining project, near Postmasburg, in the Northern Cape, to Swiss metals and mining group IMR Metallurgical Resources for R366-million.

October 2018: The South African subsidiary of iron-ore mining and steelmaking group ArcelorMittal secures full control of Kumba Iron Ore's mothballed Thabazimbi mine, in Limpopo, after paying a nominal amount of R1. The company is assessing the prospects of restarting the mine in the long term.

November 2018: A truck carrying an abnormal load hits a railway bridge on the Sishen-Saldanha iron-ore line, compelling State-owned logistics group Transnet's Transnet Freight Rail subsidiary to close the line for 12 days to facilitate repairs to the damaged bridge.

November 2018: The board of mining major Rio Tinto approves the development of the \$2.60-billion Koodaideri iron-ore mining project, in Western Australia's Pilbara region. The new mine will

produce 43-million tonnes of iron-ore a year, helping to sustain Rio Tinto's production by replacing depleted ore from the group's other operations in the Pilbara.

December 2018: Australian iron-ore mining company Fortescue Metals Group takes delivery of its eighth supersize ore carrier as it seeks to maximise tonnage per ship and improve loading rates, thereby enhancing productivity and efficiency.

December 2018: Brazilian mining major Vale announces it is to acquire smaller Brazilian rival Ferrous Resources for \$550-million. Ferrous produces about four-million tonnes of pellets a year from five mines near Vale's operations in the state of Minas Gerais and another operation in the state of Bahia.

December 2018: Mining major Anglo American announces the resumption of mining operations at its Minas-Rio iron-ore mine, in Brazil, following eight months of suspension, during which it successfully repaired a damaged section of the slurry pipeline that conveys slurry iron-ore from the mine to the Port of Açu.

December 2018: Brazilian authorities grant diversified miner Anglo American permission to expand mining into the Step 3 area at its Minas-Rio iron-ore mine, in Brazil. Access to this area will provide greater operational flexibility and allow for the mining of higher-ore grade to support an increase in production towards the operation's design capacity of 26.50-million tonnes a year.

December 2018: Australian mining company Fortescue Mining Group dispatches its first shipment of Chinese West Pilbara Fines, a product with a 60% iron content, to a customer in China.

December 2018: Brazilian mining major Vale reveals plans to invest \$770-million in the brownfield expansion of its flagship iron-ore operation, the S11D Eliezer Batista Complex, in Pará, to 100-million tonnes a year from its current nameplate capacity of 90-million tonnes a year.

December 2018: Anglo-Australian mining group Rio Tinto announces its intention to take its majority-owned subsidiary, Iron Ore Company of Canada (IOC), public by dual-listing it in New York and Toronto. Previous attempts to monetise IOC failed.

January 2019: The tailings dam at Vale's Córrego do Feijão iron-ore mine, in Minas Gerais state, fails, causing an estimated 300 deaths and immense damage to property and the environment. The disaster – the second in four years at a Vale-controlled tailings dam – prompts Vale, the world's largest iron-ore producer, to halt production of 40-million tonnes in each of the next three years as it decommissions tailings dams that, like the one at Corrego do Feijão, were built using the 'upstream construction' method.

February 2019: The authorities in Brazil cancel the provisional operating licence of the Laranjeiras dam, which stores mine waste from Vale's Brucutu mine, and also orders the immediate suspension of operations at its Jangada mine. The dam is one of eight that are subject to a court-ordered suspension.





Picture by Kumba Iron Ore

MARKET OVERVIEW

The decision by number one iron-ore miner Vale, of Brazil, to halt 40-million tonnes of production – equivalent to about one-tenth of its output – so that it can decommission tailings dams similar to the one that failed in January 2019, killing an estimated 300 people, will have major implications for the world's iron-ore mining and steelmaking industries in the near term. The decommissioning, which will require a \$1.30-billion investment, is expected to be completed over the next three years. The dam collapse, at the Corrego do Feijão iron-ore mine, in Minas Gerais state, occurred about four years after a similar disaster at Samarco, a 50:50 Brazilian joint venture involving Vale and Anglo-Australian mining group BHP.

Vale produces high-quality iron-ore and pellets – a slightly refined product with a high iron content – both of which are in huge demand in China, the world's largest consumer of the steelmaking ingredient, where the authorities are clamping down on air-polluting steel mills. China's top steel-producing city of Tangshan, for example, aims to curb up to 70% of its steel mill output, based on each plant's carbon emissions levels.

The loss of 40-million tonnes of Brazilian iron-ore will, thus, lead to significant price gains for high-quality iron-ore, which is produced by Vale and companies such as the US's Cleveland-Cliffs and Brazil's Companhia Siderurgica Nacional.

Some commentators, however, forecast that the expected increase in high-grade iron-ore prices may influence buyers to opt for cheaper, lower-quality product from Vale's Australian rivals, such as Rio Tinto, BHP and Fortescue Metals Group (FMG). This could result in Vale, which accounts for 24% of the seaborne iron-ore market, being replaced by Rio Tinto – currently

a contributor of about 23% to the seaborne market – as the number one iron-ore supplier.

Narrowing margins at Chinese steel mills have also impacted on Vale – as a high-grade ore supplier – with the mills cutting input costs by taking cheaper, lower-quality iron-ore in recent months. This has benefited lower-grade producer FMG since late 2018 and may also boost sales for the other Australian iron-ore miners.

The loss of 11-million tonnes of pellets production as a result of Vale's mine decommissioning programme could have a more significant impact, as it represents about 10% of the seaborne pellet market. Given the high cost and long time-lag associated with replacing iron-ore pelletising capacity, consulting firm Goldman Sachs forecasts that the pellet premium price may increase to the high of \$90/t reached in September 2018.

DEMAND

About 98% of the world's mined iron-ore is used to make steel, of which it is the key ingredient, according to industry body the World Steel Association (worldsteel). China, which has experienced a steel boom since 2002, accounts for about two-thirds of the world's iron-ore consumption.

As most Chinese iron-ore mines produce low-grade material, with an average iron grade of 30% or less, the country's steelmakers have largely depended on high-grade ore (averaging 58% to 62% iron) imported mainly from Australia and Brazil. It is estimated that imports attained a compound annual growth rate of 21.38% between 2005 and 2017, with 2017 imports



totalling 1.07-billion tonnes, 62% and 31% of which originated from Australia and Brazil respectively.

Chinese iron-ore imports, however, declined to 1.06-billion tonnes in 2018, amid a prediction by Australia's Department of Industry, Innovation and Science (DIIS) of a continuing decline in the next few years. The DIIS bases this forecast on its belief that Chinese steel production peaked at 886-million tonnes in 2018 and is set to decline to 861-million tonnes in 2019 and 842-million tonnes in 2020.

Consultancy firm GlobalData also forecasts a continuing decline in Chinese iron-ore imports in the years ahead, pointing out that this will be partly attributable to the policies of the Asian country's government. These include the thirteenth Five Year Plan, which will run from 2016 to 2021 and under which the Chinese government aims to eliminate 150-million tonnes of low-quality and heavily polluting steelmaking capacity. Under this plan, 65-million tonnes of capacity was eliminated in 2016, with a further 50-million tonnes removed in 2017 and 30-million estimated to have been removed in 2018.

Further, the Chinese government's 2018–2021 Blue Sky initiative, introduced to curb air pollution, will also impact on demand for iron-ore by the country's steel mills. It focuses on winter production cuts in the major steelmaking regions, which account for 27% of China's total output. GlobalData estimates that production cutbacks in these regions during winter – from November to March – could keep 55-million tonnes of capacity idle for up

to 120 days a year. Going further than government's winter production cuts, the steelmaking city of Tangshan, in Hebei province, has ordered an extension to the summer cuts. It now requires a halt to 15% of steel mill capacity within the city's radius, while the other cities have to keep 10% to 15% of their capacity idle, based on an assessment by the local authorities.

Investment bank Morgan Stanley believes that Chinese steel production has peaked, which will lead to a decline in iron-ore demand by the country's steel mills from an estimated 1.20-billion tonnes in 2018 to 1.10-billion tonnes by 2023. The decline, according to the investment bank, will also be driven by increasing scrap use.

Also predicting a weakening in Chinese steel production – and therefore iron-ore demand by the country's steel mills – are consultancy firms S&P Global Ratings and Moody's. The former expects a 2% contraction in Chinese steel production during 2019, while Moody's has predicted lower steel consumption in the country.

Forecasts of decelerating Chinese steel consumption and, in turn, iron-ore demand, are corroborated by worldsteel's Short Range Outlook (SRO) statement for 2018 and 2019, released in October 2018, which states that economic rebalancing and stringent environmental regulations will likely continue to impact on steel demand in the Asian country. However, the association highlights that the ongoing trade tensions between China and the US, coupled with the decelerating global economy, pose

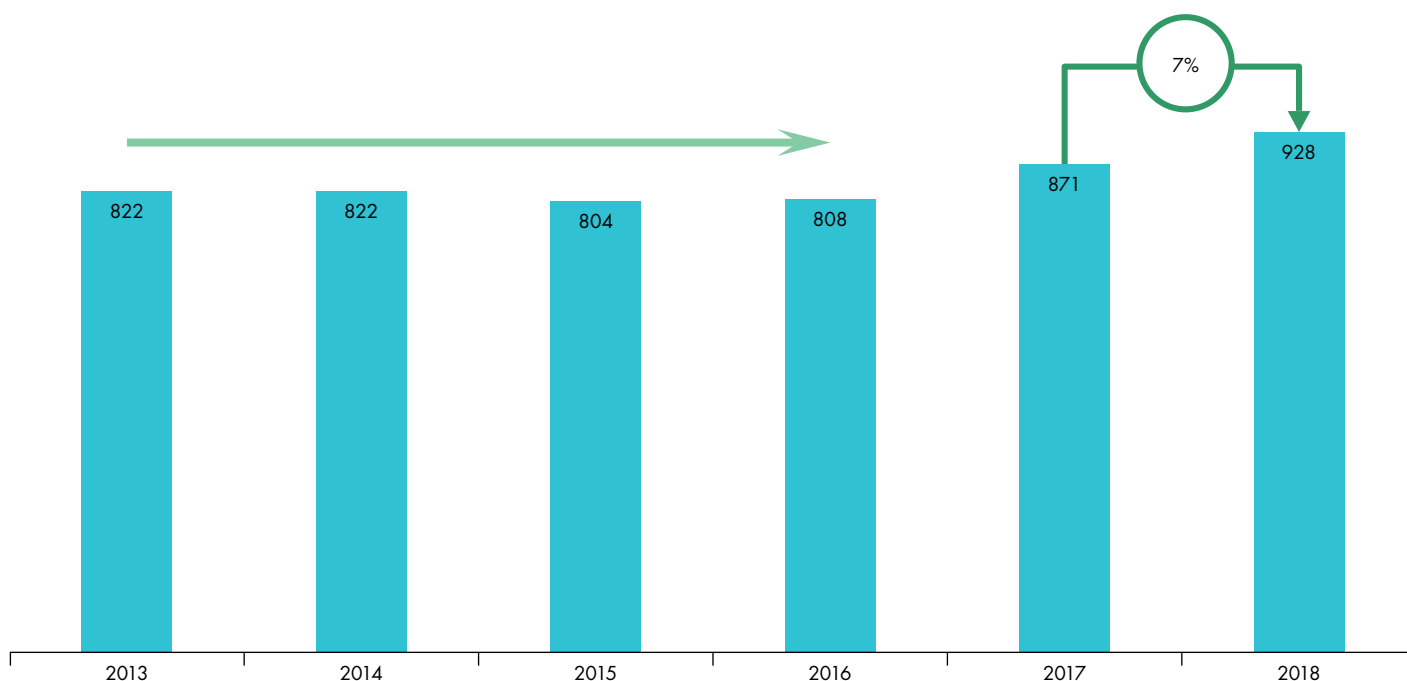


Picture by Creamer Media

The world's iron-ore resources are estimated at 800-billion crude tonnes, containing about 23-billion tonnes of iron-ore



Chinese steel production (million tonnes)



Source: World Steel Association

further downside risk to Chinese steel demand. However, should the Chinese government decide to implement stimulus measures to contain the potential slowdown of the country's economy, steel demand in the country will be boosted during 2019, the association adds.

While commentators like those at the DIIS and at Morgan Stanley, as well as worldsteel, believe that Chinese steel production has peaked, BHP, the world's third-largest producer of the ferrous ore, believes that peak steel production will be reached in the middle of the next decade, suggesting that steel mills in the Asian country will continue to require increasing quantities of iron-ore for years to come. BHP market analysis VP Huw McKay told an interviewer in October 2018 that the company believed that China would ultimately double its accumulated steel in use of about six tonnes per capita, equivalent to half the US's current per capita steel use and less than half the figures for Germany, South Korea and Japan.

Meanwhile, worldsteel states in its SRO for 2018 and 2019 that it estimates that global steel demand increased by 3.90% year-on-year in 2018 to 1.66-billion tonnes, adding that it expects a further increase to 1.68-billion tonnes in 2019.

Commenting on developed-country markets, the association says it expects steel demand in these markets to increase by 1.20% overall during the outlook period. It expects the recovery of steel

demand in the European Union to continue during 2019, though at a reduced pace, compared with 2018. Steel demand in the US, which grew strongly in 2017, owing to significant consumer spending and business investment supported by tax and regulatory changes and fiscal stimuli, is expected to contract during 2019 as automotive manufacturing and construction activity are forecast to post only modest growth.

In the other major developed-country steel markets – Japan and South Korea – demand during 2019 is expected to remain stable in the former (partly as a result of demand associated with the 2020 Tokyo Olympics) and to contract in the latter.

According to worldsteel, steel demand in the developing world continues to recover, with demand in India expected to return to a higher growth trajectory, after having been impacted on by demonetisation and the introduction of a goods and services tax. Demand in the ten-member Association of Southeast Asian Nations region – which decelerated in 2017 and 2018, owing to sluggish construction activity – is also expected to resume its growth momentum from 2019, backed by infrastructure investment programmes.

The association notes that steel demand recovery in the rest of the emerging and developing economies has been slow to gain momentum, with rising uncertainty in the domestic and external environments.



SUPPLY

The world's iron-ore resources are estimated at 800-billion crude tonnes of ore containing about 23-billion tonnes of iron, according to the US Geological Survey. Mining takes place in about 50 countries, with the largest being Australia, Brazil, China, India, Russia, South Africa, Ukraine, Canada and the US.

Research and consulting firm Fitch forecasts that the iron-ore market will be well supplied for at least the next eight years, owing to capacity expansion projects and a slowdown in Chinese steel production. Iron-ore production is expected to increase marginally from an estimated 3.30-billion tonnes in 2018 to 3.40-billion in 2027, equating to an average yearly growth rate of 0.50% from 2018 to 2027. This represents a significant decline from average growth of 5% from 2008 to 2017.

Fitch says iron-ore supply growth will be primarily driven by India and Brazil, where Vale exceeded quarterly production of 100-million tonnes in the third quarter of 2018, producing a record 104-million tonnes. Vale's output, however, will be 40-million tonnes lower over the next three years as it has halted production at ten mines to facilitate the decommissioning of tailings dams built in line with the 'upstream construction' method. The move follows the collapse in January 2019 of a tailings dam at the Córrego do Feijão mine, near the town of Brumadinho, in Minas Gerais state, which was built using this method. Some of the lost production, however, will be offset by using spare

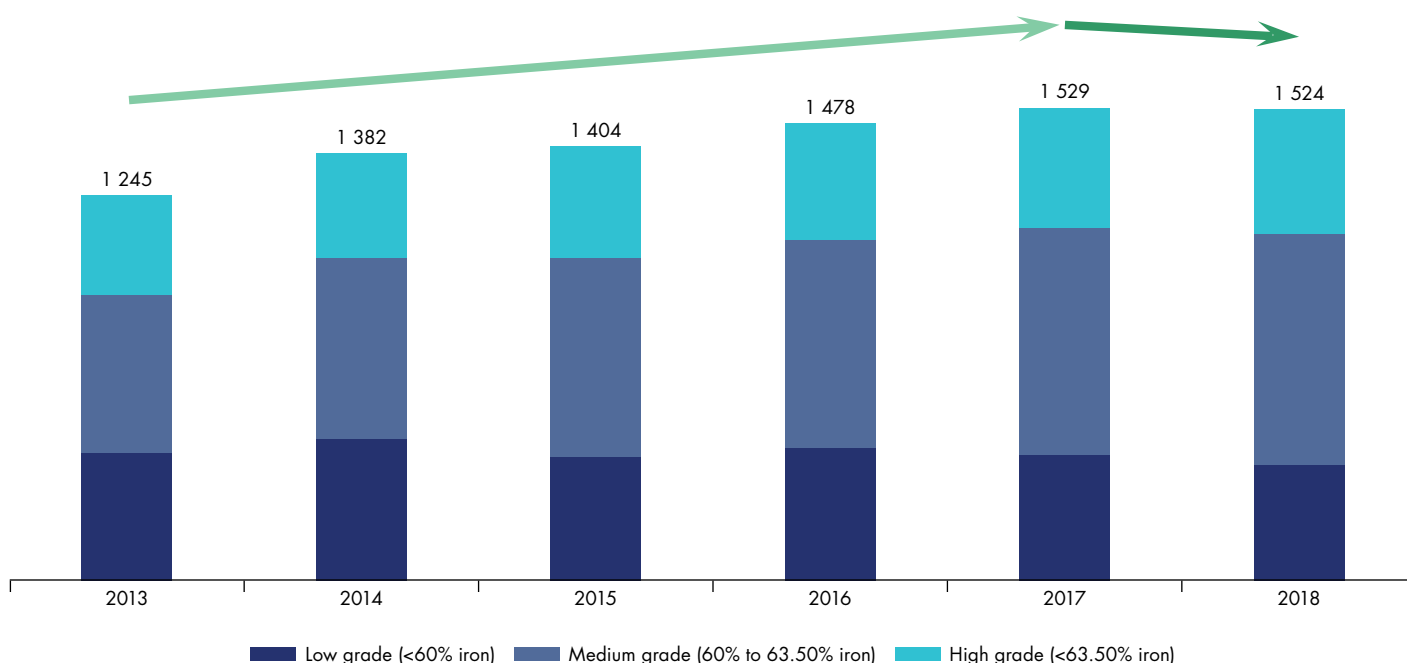
capacity in some of Vale's other mines. Consulting firm Goldman Sachs estimates that the net loss of the decommissioning will be ten-million tonnes to 15-million tonnes once Vale has ramped up production from other mines.

Some commentators, including those at Australia's Commonwealth Bank, believe that the halting of 40-million tonnes of Vale's production capacity could result in Brazil losing its position as the largest exporter of seaborne iron-ore, as the resulting rally in high-grade ore prices influences steel mills to buy cheaper, lower-grade ore. The Brazilian group has a 24% share of the seaborne trade and any loss could result in Rio Tinto, with a current market share of about 23%, becoming the dominant supplier, according to the Commonwealth Bank.

Meanwhile, Vale was reported in November 2018 as having started discussions with regulatory agencies concerning the expansion of its flagship S11D Eliezer Batista Complex (S11D), in the Brazilian Amazon state of Pará, to meet growing Chinese demand for high-grade ore. The \$14.30-billion mine, which began shipments in 2017, producing 22-million tonnes in its first year of operation, was scheduled to achieve its nameplate capacity of 90-million tonnes a year in 2020.

The plan had been to reach that peak capacity and stay at that level, but the soaring demand for high-grade ore in recent years has prompted Vale to expand from that capacity to 100-million tonnes a year from 2022, with the capital expenditure involved estimated at \$770-million. Vale intends to

Global seaborne iron-ore supply (wet million tonnes)



Source: World Steel Association



install additional iron-ore processing infrastructure and additional capacity on the railway line that hauls S11D ore to port. CEO Fabio Schvartsman – who offered his temporary resignation in March 2019 in the aftermath of the Córrego do Feijão tailings dam disaster – told the Bloomberg news agency in November 2018 that, if approved, the planned expansion would entail minimal costs and be implemented in a short period.

Vale executive director Peter Poppinga said in September 2018 that Vale intended to maintain its yearly iron-ore production at 400-million tonnes, while replacing low-quality ore with higher-grade material, the price of which has exceeded benchmark levels. With production at the S11D mine ramping up – to an estimated 55-million tonnes in 2018 – nearly 80% of Vale's sales are now considered premium product. Production at S11D is expected to increase to between 70-million tonnes and 80-million tonnes in 2019, before reaching the nameplate capacity of 90-million in 2020. Vale is also blending high-grade ore with lower-quality material to boost revenue.

Iron-ore production in India, according to Fitch's estimates, increased to 209-million tonnes in the 2018/19 financial year ending March 31, 2019. This is in line with the forecast by the Federation of Indian Mineral Industries (FIMI), which expects production of 210-million tonnes during the same period – the highest output since 2009/10, when the country produced 219-million tonnes. The increase is largely attributable to economic growth driving demand for steel and steelmakers expanding their mills. Miners that do not have their own mills and sell their output on the market are also ramping up production ahead of a 2020 deadline to return their mines to government for re-auctioning under India's new mining policy, which was introduced in 2015 to clamp down on corruption following scandals over discretionary allotments of mines.

Fitch expects Indian iron-ore production to increase from its estimate of 209-million tonnes in 2018 to 221-million tonnes in 2027, representing average yearly growth of 1.60% over the next eight years, which is higher than the average growth rate of 0.40% posted for the period 2009 to 2017, following the imposition of mining bans in the largest iron-ore mining states of Goa, Odisha and Karnataka. Some Indian mining industry stakeholders, however, are concerned that the leases of several mines are due to expire by March 2020 and be put up for auction by the respective state governments. The cause for concern is that, while state governments have been asked to start the auctions by July 2019, there have been delays in abiding by these timelines, which could potentially lead to disruptions in iron-ore supplies, should mines be forced to close down before the new auctions have been finalised.

Meanwhile, analysts at London-based consultancy CRU say they expect the strongest supply response to the curtailment

of production at Vale as it decommissions upstream dams to come from high-cost producers in China, the Commonwealth of Independent States and, to some extent, Australian juniors. The major mining groups' supply response is expected to be muted, as they were already incentivised by high margins to maximise production before the accident and are not expected to change their production targets. Rio Tinto, BHP and FMG – the second-, third- and fourth-largest iron-ore producers respectively – have very little ability to meaningfully increase shipments. All three have been increasing capacity in recent years and approved major iron-ore projects with a combined value of \$6.67-billion during 2018. By increasing production volumes, the larger mining groups attain economies-of-scale advantages. Rio Tinto and BHP, for example, currently boast cash costs of \$14.30/t and \$15/t respectively. However, unlike the massive capacity ramp-up at the height of the commodities super cycle, which led to a global oversupply of iron-ore and a decline in prices, the new mines are being built to replace depleted resources.

The restart of Anglo American's 26.50-million-tonne-a-year Minas-Rio mine, in Brazil, which was closed from March to December 2018, following the detection of two leaks in the pipeline that conveys ore from the mine to a port in Rio de Janeiro state for export, will also add to incremental supplies in 2019.

TRADE

According to the DIIS, an estimated 1.59-billion tonnes of seaborne iron-ore was traded in 2018, up from 1.55-billion tonnes in 2017, with a further increase to 1.64-billion tonnes predicted in 2020 on the back of increasing production in Australia and Brazil, the world's largest and second-largest exporters of the steelmaking ingredient.

The seaborne iron-ore market is dominated by Australia, which, in 2017, had a 52% share of exports, with Brazil in second place, at 24%, followed by South Africa (4%), Canada (3%) and Ukraine (2%). Producers from other countries accounted for the balance of 15%.

The DIIS estimates that Australian exports are estimated by the DIIS to have increased from 827-million tonnes in 2017 to 840-million tonnes in 2018. Further increases to 879-million tonnes in 2019 and 882-million tonnes in 2020 are projected, as the country's major iron-ore miners improve productivity and progress their capacity expansion projects, while new mines are scheduled to come on line in the next few years. Pilbara Ports Authority CEO Roger Johnson said in April 2019 that iron-ore shipments from the bulk terminals it oversees – at Port Hedland, the Port of Dampier and the Port of Ashburton – were set to increase in the next 12 to 18 months because of the new supply coming on to the market.



Second-largest iron-ore exporter Brazil posted a 25.40% year-on-year increase in shipments to international markets – to 394.24-million tonnes – in 2018, according to government statistics released in January 2019. This is less than the 398-million tonnes that had been forecast by the DIIS. Vale is responsible for the bulk of Brazil's iron-ore shipments and had forecast a 6.50% increase in 2018 production to 390-million tonnes, which means it exported virtually all its production. In its 'Resources and Energy Quarterly' report for the December 2018 quarter, the DIIS forecast that Brazilian iron-ore shipments would increase to 430-million tonnes in 2019 and 437-million tonnes in 2020 on the back of the continuing production ramp-up at the S11D mine. However, following the halting of production at ten of its mines to facilitate the decommissioning of tailings dams over the next three years, it is unlikely that this output level will be achieved. However, Vale has given the assurance that, despite the suspension of operations at the ten mines, it will not declare force majeure on contracted deliveries. According to analysts at consultancy Goldman Sachs, the miner has 30-million tonnes of iron-ore in stocks at Chinese and Malaysian ports, which can partially alleviate supply concerns in the short term.

According to the DIIS, Ukraine's iron-ore exports increased from 33-million tonnes in 2017 to an estimated 35-million tonnes in 2018, but are expected to decline to 30-million tonnes in 2019 and 29-million tonnes in 2020.

Exports from India increased from 22-million tonnes in 2016 to 29-million in 2017 and are estimated by the DIIS to have contracted to 11-million tonnes in 2018, with further contractions to ten-million tonnes in 2019 and eight-million tonnes in 2020 projected.

However, Indian imports of the steelmaking ingredient, which totalled five-million tonnes in 2017, have been on an upward

trend, with the DIIS forecasting an increase to 12-million tonnes in 2019 and 19-million tonnes in 2020. In the eight months to November 2018, the country's iron-ore imports more than doubled, compared with the figure for the corresponding period a year earlier, according to the country's Trade Ministry. Inadequate logistics infrastructure has meant that steel mills in India, which is set to become the second-biggest steel producer after China, have increasingly been relying on overseas supplies of iron-ore. Wood Mackenzie believes that the significant increase in Indian iron-ore imports posted in 2018 is the beginning of long-term structural trending, with the consulting firm forecasting that the country could import as much as 100-million tonnes a year by 2030.

Concerns have, however, been expressed by domestic producers of the raw material, the authorities in the iron-ore-rich state of Karnataka and other stakeholders about the sharp increase in imports while large stocks lie unsold at pitheads across the iron-ore-producing states. These stakeholders have petitioned the Indian government to substantially increase the duty on iron-ore imports from the current 2.50% to curb imports. Discussions are ongoing concerning the quantum of the increase, but the FIMI has suggested a 30% import duty on iron-ore and pellets.

The DIIS forecasts that Japanese and European Union (EU) imports are on an upwards trend, with shipments to the former increasing from 127-million tonnes in 2017 to an estimated 129-million tonnes in 2018 and set to increase further to 130-million tonnes in 2019 and 132-million tonnes in 2020. EU imports, which totalled 144-million tonnes in 2017, are estimated to have increased to 155-million tonnes in 2018, with further growth to 158-million tonnes in 2019 and 159-million tonnes in 2020 anticipated.

Imports into China decreased to 1.06-billion tonnes in 2018 from a record 1.08-billion tonnes in 2017, the country's General Administration of Customs announced in January 2019. Although

World trade in iron-ore (in million tonnes)				
	2017	2018 e	2019 f	2020 f
World trade	1 554	1 590	1 636	1 638
Iron-ore imports				
China	1 075	1 064	1 062	1 059
European Union	144	155	158	159
Japan	127	129	130	132
South Korea	72	77	75	75
India	5	5	12	19
Iron-ore exports				
Australia	827	840	879	882
Brazil	384	398	430	437
Ukraine	33	35	30	29
India	29	11	10	8

Source: Australia's Department of Industry, Innovation and Science, citing statistics from the World Steel Association and the International Trade Centre

e – estimate; f – forecast



this represented the first yearly decline since 2010, imports still exceeded one-billion tonnes for the third successive year. The lower import figure came on the back of a 70% reduction in steelmakers' profit margins from late October 2018, which diminished the incentive for the steelmakers to ramp up production and restock raw materials. According to China Metallurgical Planning Industry and Research Institute forecasts, iron-ore consumption in the country will continue to decline in 2019 as steel production wanes in China and internationally.

Chinese iron-ore imports have also been impacted on by the policy of that country's government to eliminate inefficient steelmaking capacity and the shift by steelmakers towards high-grade iron-ore. This has affected imports from producers such as FMG, Australia's largest low-grade iron-ore producer. During its 2018 financial year, when its product mix had an iron content ranging from 56% to 59%, the company suffered an 18% revenue loss, owing to lower demand from China. Another Australian low-cost iron-ore producer, Cleveland-Cliffs, has had to close 11-million tonnes of iron-ore production capacity.

Given expected lower profit margins during 2019, Chinese steel mills will likely increase consumption of lower-grade iron-ore, while reducing demand for imported medium- and high-grade ore, according to analysts at Sinosteel Futures. The DIIS also predicts a continuing decline in Chinese iron-ore imports, stating in its 'Resources and Energy Quarterly' report that it expects a reduction to 1.06-million tonnes in 2019 and to 1.06-million tonnes in 2020.

Fortescue takes delivery of eighth ore carrier

Australian iron-ore producer Fortescue Metals Group (FMG) took delivery of the eighth addition to its fleet of super-size ore carriers at Port Hedland, in Western Australia, in December 2018.

The eight ships, the first of which was delivered in December 2016, will provide about 12% of the company's shipping requirements.

The ships, built at China's Yangzijiang Xinfu and Guangzhou shipyards, have helped FMG maximise tonnage per ship and improve loading rates, thereby enhancing productivity and efficiency. Their innovative design will also ensure vastly improved safety and manoeuvrability in the Port Hedland channel.



Picture by FMG

FMG Nicola's maiden voyage into Port Hedland, Australia

Source: Fortescue Metals Group

PRICING

For about 40 years prior to 2010, iron-ore prices were determined by buyers and sellers, who negotiated long-term contracts. This system began to disintegrate when Chinese demand for the ferrous ore surged as the country invested heavily in housing and other infrastructure. As Australia and Brazil, China's traditional suppliers of iron-ore, started to struggle to keep up with this increasing demand, Chinese steel mills started securing material from neighbouring India on an ad hoc basis, leading to the launch of the first spot price indices.

From 2008, companies like The Steel Index started compiling spot prices for traders, producers and consumers. Chinese steel mills soon realised that some of the year-long contracts they had with mining companies were higher than the spot prices, leading some to default on the long-term contracts when prices slumped during the financial crisis. From April 2010, steel mills started buying iron-ore on short, index-linked contracts. Initially, the contracts were based on quarterly prices, but they are currently based on monthly average prices. Iron-ore is also traded on futures markets, including China's Dalian Commodity Exchange and the Singapore Exchange.

To gain greater power over the pricing of key commodities, China opened its domestic futures market to international investors in May 2018. Commentators pointed out that, in the case of iron-ore, the move was intended to challenge benchmark prices provided by platforms such as the Singapore Exchange and Platt.

However, the Dalian Commodity Exchange – where China's futures are traded – still has a lot of work to do to achieve this objective, as the Singapore Exchange has probably the greatest influence on the global iron-ore market, according to a 2016 study by Goldman Sachs.

In its December 2018 'Resources and Energy Quarterly' report, the DIIS forecasts that the iron-ore price's decline will continue into 2019 and 2020, averaging \$53/t and \$51/t respectively, owing to declining demand. Further suppressing demand for iron-ore in the outlook period will be Chinese steelmakers' use of a higher proportion of scrap, thus reducing demand for iron-ore. Higher scrap use will be driven by an increase in arc-furnace steelmaking and greater use of scrap in oxygen-furnace steelmaking as mills seek to attain greater productivity and lower emissions.

However, taking into account China's planned fiscal and monetary easing and a boost to infrastructure spending, financial services firm Citigroup announced in November 2018 that it had raised its iron-ore price forecast for 2019 from \$61/t to \$63/t, with the 2020 forecast increasing from \$55/t to \$60/t.



Meanwhile, former Vale CEO Fabio Schvartsman said in December 2018 that he expected iron-ore to trade between \$60/t and \$80/t from early 2019. He stated that Vale – which delivers iron-ore to China at less than \$30/t – would be prepared to take the necessary action should the price decline below \$60/t. He did not elaborate on the action that the miner would take.

The iron-ore price surged in the immediate aftermath of the Vale dam failure disaster and the company's announcement of its decision to halt 40-million tonnes of yearly production, and the forced closure of some of its other tailings dams and those of other miners in Brazil. Disruptions caused by a tropical cyclone in Australia during March 2019 further drove iron-ore prices up, with the contract price for high-grade ore extending its gains above \$100/t in Singapore at the beginning of April 2019.

An opinion piece from Bloomberg Intelligence, published in February 2019, suggests that the rally is unlikely to be sustained. This is because 40-million tonnes is a tiny figure in the context of

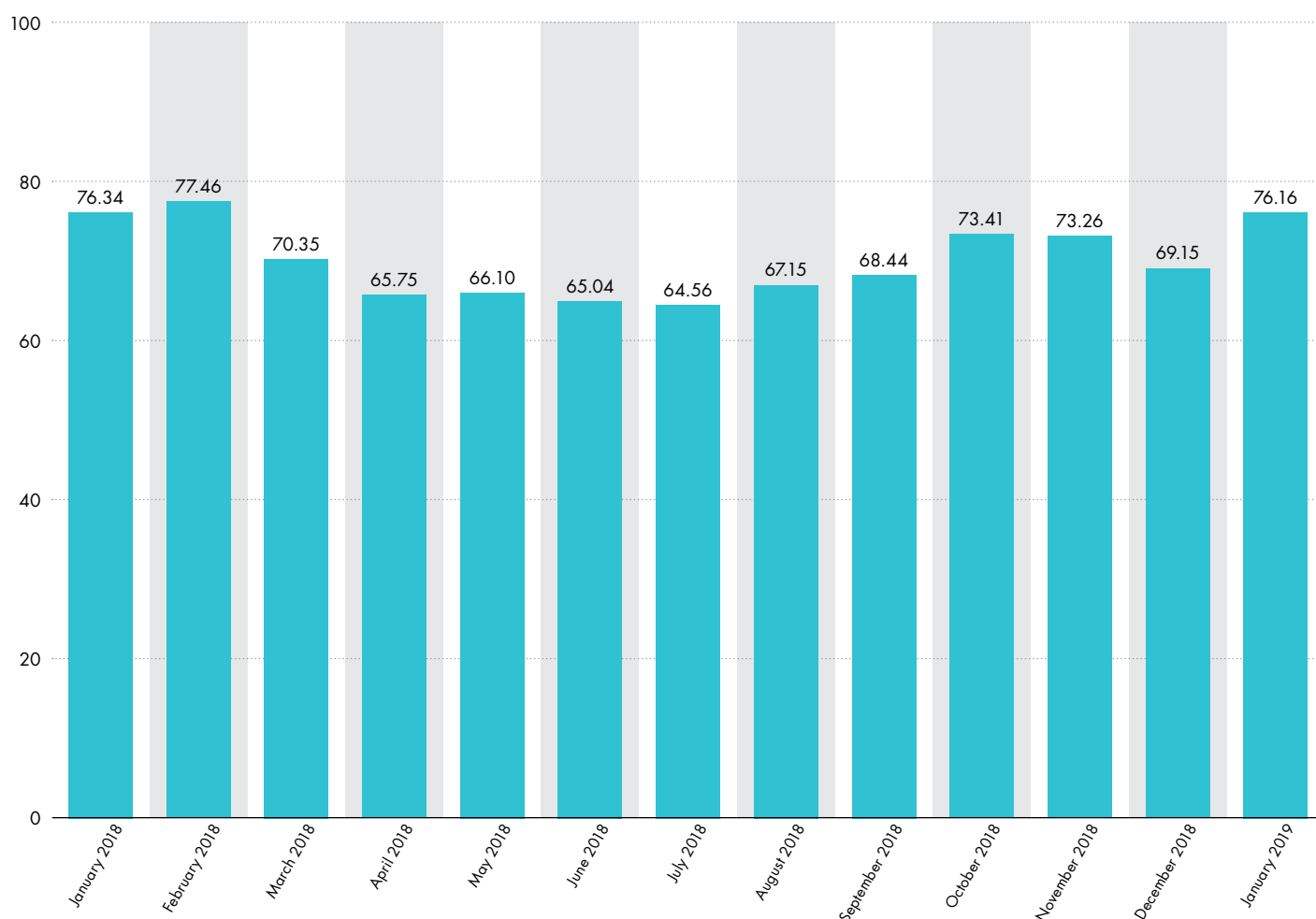
the global seaborne iron-ore market, which ships about 1.60-billion tonnes a year. Further, while Vale's ore is uniquely prized because of its high grade, the suspended operations are at the company's lower-quality pits. More importantly, according to the Bloomberg Intelligence opinion piece, the S11D mine is running at only a fraction of its nameplate capacity of 90-million, providing scope to compensate for the halted production at other pits.

Some commentators, however, have estimated that the production outage at Vale could remove up to 70-million tonnes from the market. In February 2019, consultancy Wood Mackenzie estimated that a loss of about 50-million tonnes would sustain prices at about \$85/t, while a loss of 75-million tonnes would send prices to \$100/t.

Consultancy UBS Group believes that the price will moderate in the medium term as supply recovers and scrap consumption in China increases, forecasting an average price of \$83/t for 2019. Financial services group Barclays forecast a 2019 average of \$75/t.

The iron-ore price (in dollars per dry metric ton) – January 2018 to January 2019

Price in US dollars per dry metric ton unit



Source: Statista





Picture by Kumba Iron Ore

SOUTH AFRICA'S IRON-ORE SECTOR

Iron-ore mining is an important sector of the South African economy, providing direct employment for 18 077 people in 2018 – up 4.20% on the previous year – according to industry body Minerals Council South Africa's 'Facts and Figures 2018' booklet. During that year, production totalled 74.60-million tonnes, about 0.20% lower than in 2017. The industry's sales revenues, at R45.50-billion, were 7.80% lower year-on-year. Exports accounted for 88% of total sales; because South Africa's iron-ore is of a high grade, it commands prices in the upper tier in world markets.

Iron-ore mining companies contributed R2.20-billion to the fiscus in royalties during 2018, a 33.10% year-on-year increase, and also paid R6.30-billion in employee remuneration, which was 9.10% higher than the previous year's figure.

According to the Minerals Council, the South African mining industry is facing several challenges, including policy, regulatory and operational uncertainty, which have inhibited investment and exploration for new orebodies. Without further exploration and additional discoveries, it is projected that known iron-ore reserves will be exhausted in the next 20 years.

Other challenges include inadequate rail capacity and the reliability of the dedicated iron-ore railway line from the Northern Cape iron-ore mining hub to the Port of Saldanha, on South Africa's West Coast; double-digit increases in administered prices, particularly the prices of electricity and water; community unrest, which impacts on operations; and challenges within municipalities where the iron-ore mining companies operate.

KUMBA IRON ORE

Iron-ore mining in South Africa is dominated by Kumba Iron Ore, which came into being in November 2006, when the iron-ore assets of the former Kumba Resources were unbundled and separately listed on the JSE. Kumba Resources had been established in 2001 to house the mining assets of former State-owned group Iscor, with what was to later become ArcelorMittal South Africa (AMSA) simultaneously established as the steelmaking and mining vehicle.

Diversified mining group Anglo American is Kumba's largest shareholder, with a 62.95% interest, with the other shareholders including two State-owned entities – the Industrial Development Corporation and the Public Investment Corporation – with stakes of 12.88% and 1.85% respectively.

In 2016, after the iron-ore price had slumped, Anglo American announced its intention to reduce its exposure to South Africa and divest from the iron-ore business, but, as commodity prices improved and its balance sheet became healthier, the diversified miner stated in February 2018 that it was halting the sale of its assets.

Kumba Iron Ore has a 76.30% shareholding in Sishen Iron Ore Company (SIOC), which holds the company's operating assets, the Sishen and Kolomela openpit mines, located near the Northern Cape towns of Kathu and Postmasburg respectively. The other SIOC shareholders are empowered mining group Exxaro Resources, with 19.98%, the SIOC Community Development, with 3%, and an employee share ownership scheme called Envision, with 3.10%.



Kumba Iron Ore 2018 production summary (tonnes)			
	December 2018	December 2017	Percentage change
Total	43 106	44 983	(4)
Lump	29 172	29 812	(2)
Fines	13 934	15 171	(8)
Mine production	43 106	44 983	(4)
Sishen mine	29 246	31 119	(6)
Kolomela mine	13 860	13 864	–

Source: Kumba Iron Ore audited annual results for the year ended December 31, 2018

Ore reserves at the Sishen and Kolomela mines as at December 31, 2018, stood at 732.90-million tonnes grading 59.10% iron, an 8% net increase on the 676.40-million tonnes that Kumba reported a year earlier. The reserve base at Sishen had increased by 9% year-on-year at the end of 2018 on the back of a pit slope optimisation exercise. This helped increase the mine's remaining life-of-mine (LoM) from 13 years in 2017 to 14 years in 2018. Meanwhile, at Kolomela, on-lease exploration resulted in ore reserves increasing by 7%. The mine has a remaining LoM of 14 years. However, Kumba CEO Themba Mkhwanazi said in February 2019 that the company had been granted permission to expand into the adjacent Heuningkranz area, which provided an opportunity to further extend the LoM.

In addition to these reserves, Kumba had mineral resources estimated at 1.10-billion tonnes grading 48% iron as at December 31, 2018.

Operations

The Sishen iron-ore mine is Kumba's flagship operation. At 14 km long, it is one of the world's largest operational iron-ore openpit mines, producing about 30-million tonnes a year. The mine has been in operation since 1953 and has produced more than 900-million tonnes to date. It is the only hematite ore mine in the world to beneficiate all the material it produces.



Picture by Creamer Media

Sishen iron-ore mine

The Kolomela mine, which was commissioned in 2011, is also an opencast operation. It produces primarily high-grade direct shipping ore.

Mkhwanazi said during a media visit to the Sishen mine in May 2018 that the company was conducting greenfield and brownfield exploration in its Northern Cape base. It was also considering regional consolidation and using technology to exploit stockpiled low-grade material to increase and replace mined ore at the two mines. He said in an interview with *Mining Weekly*, published in July 2018, that the exploration programme had entailed more than 200 000 m of drilling, expressing his optimism that the prospects identified during exploration would be converted within two to three years.

Kumba has also made considerable progress in elevating lower-grade ore to high-grade material by applying ultrahigh dense-media separation (UHDMS) beneficiation technology. Steps are under way to fully incorporate the UHDMS beneficiation technology into the business, with 201-million tonnes of low-grade mineral resource in the Sishen pit earmarked for UHDMS projects. A further 150-million tonnes could be produced through the optimisation of the pit shell and incorporating the cost and stripping benefits that the UHDMS projects will realise. Meanwhile, a bankable feasibility study into the installation of a large-scale UHDMS plant to treat 260-million tonnes of stockpiled material is at an advanced stage.

The company reported when it announced its results for the 2018 financial year – in February 2019 – that it had increased the average iron content of its products to 64.50%. As a result, its market share of premium lump ore with more than 65% iron and fine ore with above 64.50% iron more than doubled to 30% in 2018. It aims to increase this further to 40% through blending intermediate products from the Sishen and Kolomela mines.

Meanwhile, Kumba produced 43.11-million tonnes of iron-ore during the 12 months to December 31, 2018, compared with the previous year's production of 44.98-million tonnes. Sishen's contribution, at 29.25-million tonnes, was 6% lower than in 2017, while production at Kolomela was flat, at 13.86-million tonnes. The reduced overall production, however, was in line with guidance



of 43-million tonnes to 44-million tonnes. Production in 2019 is expected to range between 43-million tonnes and 44-million tonnes, comprising about 30-million tonnes from Sishen and about 13-million tonnes from Kolomela.

Iron-ore sales totalled 43.26-million in 2018, comprising 3.29-million tonnes supplied to AMSA and 39.97-million tonnes shipped to international customers. The 2018 sales volumes represented a decline from 44.89-million tonnes in 2017, driven by a 3.80% reduction in export sales caused primarily by logistical challenges on the dedicated iron-ore heavy-haul line that runs from Sishen to the Port of Saldanha and a six-week scheduled refurbishment of a ship loader at the port. Whereas in the past China was the destination of two-thirds of Kumba's iron-ore exports, the miner continued to diversify its offshore customer base in 2018, reducing China's share to 56%.

The 3.80% reduction in sales volumes resulted in a 1% year-on-year decline in revenue to R45.73-billion during 2018, while headline earnings of R9.68-billion were about the same as those in 2017.

Investment

Kumba's capital expenditure (capex) during 2018 totalled R4.46-billion, up from R3.07-billion in the previous year. This comprised stay-in-business capex of R2.29-billion, deferred stripping expenditure of R1.67-billion and expansion capex of R500-million.

Kumba granted licence to operate drones

Diversified miner Anglo American subsidiary Kumba Iron Ore has worked through two years of complex legal, governance and logistics challenges to be granted a licence to fly its own remote aircraft systems, or drones.

The drones – which are able to access constricted areas – have optimised mine surveying in terms of time and coverage. Routine tasks historically conducted by surveyors, such as measuring the volume of waste dumps and stockpiles, are now being performed by drones, which collect digital imagery that is analysed to perform calculations.

The drones are also being used to conduct engineering inspections on equipment that cannot be easily accessed, eliminating safety risks.

Five staff members have been trained to date to pilot the drones, and they have been licensed by the South African Civil Aviation Authority.

Source: Mining Weekly

The stay-in-business capex included the reconditioning or overhauling of capital spares for heavy mining equipment to improve the performance of the equipment.

Included in the expansion capital is R200-million that was spent on the installation of a second modular plant at Sishen, which was commissioned in November 2018. A further R200-million was allocated to the Dingleton project, which was started in 2014 and entails the relocation of the Dingleton community to expand mining operations at Sishen. While the application to extend the Sishen mining right to include the Dingleton properties was approved by the Department of Mineral Resources in June 2018, mining in this area will start only when environmental authorisation has been granted. To date, the company has relocated 507 households from Dingleton to Siyathemba and built a school for 600 learners, a multipurpose centre and a police station. A new clinic and a youth centre are expected to be completed by the end of 2019.

The capex for 2019 is estimated at R4.60-million to R4.80-billion. Thereafter, expansion capital will largely entail the project incorporating UHDS technology, currently at the feasibility stage. Construction on the UHDS project – the estimated cost of which is R2-billion to R3-billion – is expected to start in 2020, following the completion of the feasibility study towards the end of 2019. Should it go ahead, the project will start production in the fourth quarter of 2022.

ASSMANG

Assmang, a 50:50 joint venture (JV) between JSE-listed companies African Rainbow Minerals (ARM) and Assore, is South Africa's second-largest iron-ore miner. It owns the Khumani and Beeshoek openpit mines, located near the Northern Cape towns of Kathu and Postmasburg respectively.

New COO appointed

Kumba Iron Ore appointed Darrin Strange the company's COO, effective May 1, 2018. He served in the same position at Syrah Resources from December 2014 to November 2017. Strange has more than 25 years' experience in mining, manufacturing and engineering at senior management level in Australia and internationally. He was GM for Rio Tinto's West Angelas and Robe Valley operations, where he was responsible for a three-mine, 70-million-tonne-a-year operation.

Another major change to the company's management team during 2018 was the appointment of Sam Martin as executive head: strategy and business development, effective July.

Source: Kumba Iron Ore and Bloomberg





Khumani iron-ore mine

Formerly known as the Bruce, King and Mokaning mine – a reference to the three farms on which the iron-ore resources are located – the Khumani mine is located about 30 km south of Kathu and about 65 km north of the Beeshoek mine, which it has replaced as Assmang's main iron-ore producer.

Although it was initially designed to produce ten-million tonnes of iron-ore a year, the Khumani mine has capacity to produce 16-million tonnes a year, following the completion of Phase 2 of the Khumani expansion project. The ore mined at Khumani is exported through the Saldanha Bay iron-ore bulk terminal, on South Africa's West Coast, while the Beeshoek mine primarily supplies the local market, with small volumes exported.

As at June 30, 2018, Beeshoek boasted total reserves of 35.14-million tonnes grading 64.85% iron, while Khumani boasted 447.13-million tonnes with an iron content of 62.24%.

Assmang produced 18.58-million tonnes of iron-ore during the year ended June 30, 2018 – 5% up on the preceding year – with Khumani contributing 14.70-million tonnes and Beeshoek 3.88-million tonnes. The increased production was largely attributable to Beeshoek's output being 730 000 t higher than in the 2016/17 year as an opportunity to export 404 000 t from the mine arose when a rail loop to the Saldanha export channel was completed. The 134 000 t production increase at Khumani was attributable to selective mining and improved in-pit blending of the iron feed, which resulted in the on-grade ratio improving from 32% in 2016/17 to 35% in 2017/18.

Commensurate with the increased production in 2017/18, iron-ore sales were 600 000 t, or 4%, higher year-on-year, at 17.90-million tonnes. Beeshoek's sales increased by 750 000 t, while sales from Khumani were 150 000 t lower, with the decrease attributable to derailments on the iron-ore export line.

Of the 17.90-million tonnes of iron-ore that Assmang sold in 2017/18, 14.30-million tonnes were exported, while 3.60-million tonnes were sold on the domestic market. Seventy-one per cent of the export sales were destined for Asia, where China was by far the largest market, while the rest of Africa and the Middle East accounted for 20% and Europe 9%.

During the six months to December 31, 2018, Assmang produced 8.74-million tonnes of iron-ore, 4% lower than production for the corresponding period in the previous year. Sales for the period, at 8.75-million tonnes, down from 9.12-million tonnes for the period July to December 2017. The lower sales were attributable to logistical challenges on the Sishen–Saldanha railway line.

Investment

Assmang's iron-ore capex in 2017/18 increased by 52% to R1.78-billion, with R1.31-billion spent on Khumani. This was mainly used to boost the trackless mining machinery fleet to facilitate selective mining, replace the mining fleet and equipment, and implement waste stripping at the Bruce and King pits. The Beeshoek mine capex totalled R474-million, compared with R277-million in the previous year. Of this amount, R98-million was used for waste stripping in the mine's Village pit and R85-million for the replacement of trackless mining machinery and crusher spares. Of the R1.98-billion capex for the period July to December 2018, nearly half was allocated to the iron-ore division, including R443-million for waste stripping and R404-million in replacement capital.

Others

Besides Kumba Iron Ore and Assmang, several smaller companies have iron-ore operations in South Africa or are developing projects in the country.

Afrimat entered the iron-ore mining arena when it bought the Demaneng mine, in the Northern Cape, out of business rescue in 2016, restarting operations in July 2017, following substantial revamping. It exported its first ore to China the following year. The R320-million acquisition was part of a diversification strategy for the company, which now has 41 mines, including industrial



minerals and construction materials operations. Afrimat business development and group strategy head Grant Dreyer said in July 2018 that the Demaneng mine – previously called Diro – was expected to ramp up production from 600 000 t/y to one-million tonnes a year by October 2018. The mine produces iron with a 64%-plus iron content, which ensures minimal breakdown during handling and transportation and is associated with optimal reduction in blast furnaces, resulting in improved efficiencies and furnace productivity. The mine uses the Sishen–Saldanha export railway line. It has proven run-of-mine reserves totalling ten-million tonnes.

Aquila Resources, a subsidiary of Chinese group Baosteel, states on its website that it has submitted a mining right application for the Maletse project, which it is developing near Thabazimbi, in Limpopo. The Maletse deposit hosts 80.80-million tonnes of ore grading 61.09% iron, 75% of which falls in the measured and indicated categories. Maletse will be an openpit operation producing lump and fine ore. A rail siding near the mine will facilitate the transport of ore to the coast for shipment to international markets, as well as to customers in South Africa.

Autumn Skies Resources & Logistics (ASRL's) Autumn Skies Iron Ore (ASIO) mine, near Postmasburg, in the Northern Cape, started production in May 2017, becoming only the fifth active iron-ore mine in the country. The mine has a mineable resource of about 18-million tonnes of iron-ore. ASRL chairperson Phemelo Sehunelo told an interviewer in February 2018 that the mine had a current capital investment of R182-million. With the strategic and technical support of the Estupendu group, ASRL, which is fully black owned, intended to produce about 42 000 t of iron-ore a month, he said, adding that 504 000 t would be supplied during the first year of operation – from February 2018 – ramping up to 12-million tonnes a year over the next 12 months. Following the installation of a new jig plant in January 2018 and a new crushing and screening plant two months later, the mine produces top-grade ore, which is exported using the Sishen–Saldanha iron-ore export channel.

Ironveld is developing a vanadiferous titaniferous magnetite project on the northern limb of the Bushveld Complex, in Limpopo. The project, which is also called Ironveld, boasts a resource containing 27-million tonnes of high-purity iron and 1.40-billion pounds of vanadium *in situ*. The company initially intended to build a 15 MW smelter to process the ore from the mine, but later decided to acquire a 7.5 MW smelting facility in Middelburg, Mpumalanga, to allow for early production. It paid a R7-million deposit towards the acquisition during the year ended June 30, 2018, and subsequently raised £400 000 through a share placement to buy a secondary gyratory crusher and magnetic separation equipment for the processing of magnetite

ore to the specifications of a potential offtake partner. In September 2018, Ironveld started mining and supplying unrefined ore to the potential offtake partner, a specialist subsidiary of an international steelmaking group, which had requested a 10 000 t sample for commercial-scale testing. Initial analysis has demonstrated that the ore is good enough for processing by the offtaker, which has indicated that it may undertake longer-term testing of a significantly larger sample. The extended testing programme could take about 12 months, after which a longer-term commercial offtake agreement could be entered into.

Manngwe Mining commissioned its Assen iron-ore mine, near Brits, in the North West, in April 2017. Boasting a measured resource of about 20-million tonnes, the mine will initially produce 60 000 t of saleable ore a month. The black-owned and -managed company intends to expand its business by consolidating the nearby fragmented Limpopo iron-ore deposits. It will supply all its production to steelmaking company AMSA, delivering four-million tonnes to five-million tonnes a year over the next five years. There has not been any recent update on the project.

Mapochs, a magnetite mine located in Limpopo, was bought out of business rescue at an auction in September 2017 by Chinese group International Resources Limited (IRL). The mine, which remains dormant, went into business rescue in May 2015 along with its parent and main customer, Evraz Highveld, owing to operational challenges at the steelworks of the latter. IRL has not announced when it intends to resume operations at the mine, which formerly produced 2.20-million tonnes a year. Its mining right provides for the extraction of vanadium and iron-ore, as well as many other metals and minerals.

Tata Steel, the holder of a 64% stake in the Sedibeng iron-ore mine, near Postmasburg, in the Northern Cape, announced in October 2018 that it had decided to sell its entire shareholding in the mine to Swiss metals and mining group IMR Metallurgical Resources for R366-million. The other shareholders in the mine are the Cape Gannet consortium, with a 26% shareholding, and the State-owned Industrial Development Corporation, with 10%. *Mining Weekly* reported in July 2018 that the JV partners intended to construct and digitalise a dense-media separation plant at the mine. The project aims to incorporate Industry 4.0 technologies, including sensors and instrumentation, to allow for machine learning and eventually artificial intelligence technology by integrating the existing programmable logic controllers and supervisory control and data acquisition units. There is scant public information on the mine, which, according to a Tata Steel corporate brochure published in July 2017, was forecast to produce two-million tonnes of ore a year, all of which would be exported to Tata group companies in Europe.





Picture by Creamer Media

SOUTH AFRICA'S IRON-ORE EXPORT INFRASTRUCTURE

South Africa's export-bound iron-ore is transported from the country's iron-ore mining hub, in the Northern Cape, along a dedicated 861-km-long heavy-haul line to the deep-water Port of Saldanha, on South Africa's West Coast.

Isacor, the then iron-ore mining and steelmaking parastatal, started building the railway line in 1973, completing it in May 1976. In 1977, the railway line, which starts at Sishen, was transferred to State-owned freight logistics group Transnet's Transnet Freight Rail (TFR), which was known as South African Transport Services at the time. Another Transnet subsidiary, Transnet Ports Authority, operates the Port of Saldanha, which, besides a dedicated iron-ore export facility, has a multipurpose terminal, thereby providing additional export capacity for iron-ore.

The capacity of the Sishen–Saldanha line has increased over the years, with the latest expansion, from 47-million tonnes a year to 60-million tonnes a year, having been completed in 2013. This unlocked capacity for Kumba's Kolomela mine and provided access for junior mining companies. Although feasibility and specialist studies for further expansion to 82.50-million tonnes a year have been completed, iron-ore miners have not shown much keenness to commit to new capacity on a take-or-pay basis, owing to the downturn in the commodities market in recent years.

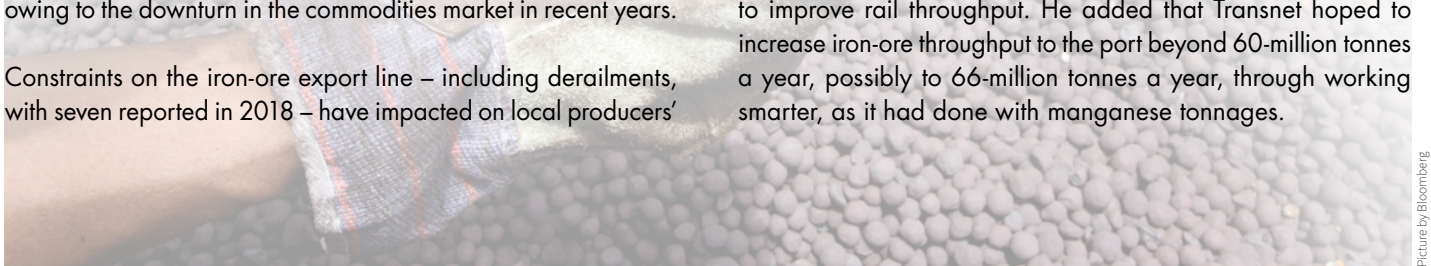
Constraints on the iron-ore export line – including derailments, with seven reported in 2018 – have impacted on local producers'

shipments to international markets. In the first half of the year, the derailments resulted in lost sales opportunities for Kumba that translated into a R2-billion revenue loss for the half-year. However, as a result of the work of a joint executive steering committee comprising representatives from Kumba and Transnet to manage the performance of the line, there was a significant improvement in the second half of the year.

Illustrating the improved management of the performance of the iron-ore line, Kumba cites the reopening of the line two days earlier than the two weeks it was estimated would be required to repair structural damage caused when a truck carrying an abnormal load collided with a railway bridge in November 2018.

Transnet chief business development officer Gert de Beer told online publication Miningmx.com in August 2018 that the disruptions on the Sishen–Saldanha line stemmed from a combination of train configurations, network failures on the portion of the line that had not yet been refurbished and some equipment failures.

De Beer told the publication that Transnet was refurbishing a tippler at the Saldanha port and would investigate opportunities to improve rail throughput. He added that Transnet hoped to increase iron-ore throughput to the port beyond 60-million tonnes a year, possibly to 66-million tonnes a year, through working smarter, as it had done with manganese tonnages.



Picture by Bloomberg





Picture by Kumba Iron Ore

MAJOR GLOBAL PRODUCERS

VALE

Brazil's diversified Vale mining group is the world's largest iron-ore miner, producing about 400-million tonnes a year, mainly for export to China. Its iron-ore operations in Brazil are organised into four systems: Northern, South-Eastern, Southern and Midwestern. The Northern and South-Eastern systems are fully integrated, consisting of mines, railways, maritime terminals and a port, while the Southern system comprises three mining complexes and two maritime terminals. The group also operates nine iron-ore pellet plants in Brazil. Outside its home country, it has two iron-ore pellet plants in Oman and 25% stakes in two pellet companies in China.

Vale's iron-ore asset portfolio will be boosted should its \$550-million acquisition of smaller Brazilian rival Ferrous Resources, announced in December 2018, be finalised in 2019, as expected. Ferrous produces about four-million tonnes of pellets a year from five iron-ore mines near Vale's operations in the state of Minas Gerais and another operation in the state of Bahia.

Operations at the diversified mining group's 50:50 Samarco joint venture (JV) with BHP have been suspended since November 2015, when a tailings dam collapsed, resulting in the spillage of 60-million cubic metres of waste, which engulfed villages – killing 19 people – and also contaminated rivers and caused massive destruction to flora and fauna. Another deadly dam failure in January 2019 at Vale's Córrego do Feijão mine, in Minas Gerais, which killed an estimated 300 people, will likely draw out any settlement for the Samarco disaster and a potential mine restart, which the JV partners had hoped would take place as early as 2020.

The Brazilian prosecutor leading negotiations to settle a lawsuit over the Samarco disaster told reporters in January 2019 that, depending on Vale's culpability in the new disaster, it might change how his task force handled the \$41-billion case against Samarco. A restart at Samarco depends on negotiations with prosecutors on building a new tailings dam system and a restructuring of the company's debt. Some analysts, including those at London-based research firm CRU, have said it is unlikely Samarco will resume production in 2020. Before the suspension of operations, Samarco produced 30.50-million tonnes of iron-ore pellets a year.

Vale produced 366.51-million tonnes in 2017, with output for the first nine months of 2018 totalling 283.65-million tonnes, 3.10% up on the corresponding period of the preceding year. Vale's iron-ore production totalled 384.60-million tonnes in 2018, largely as output ramp-up continued at the S11D Eliezer Batista Complex project. CEO Fabio Schvartsman, who offered his temporary resignation in March 2019, said in December 2018 that Vale forecast production of 400-million tonnes in 2019, a level that would be maintained until at least 2023 as the group focused on quality rather than volumes. As Vale decommissions upstream dams over the next three years, however, the group's iron-ore production will decline by about 40-million tonnes a year.

The ramifications of the Córrego do Feijão disaster will extend beyond curtailing production in the next three years. According to Moody's Investors Service, potential liabilities and sanctions related to the incident could have a negative impact on the liquidity of Vale, which the ratings agency rates as having a 'good' liquidity profile, with \$6.10-billion in cash and \$5-billion committed in credit facilities fully available.



In the immediate aftermath of the disaster, Moody's placed Vale's Baa3 rating on review for possible downgrade. It also placed the ratings on the debt issues of Vale Overseas and the Ba1 unsecured ratings of Vale Canada on review for downgrade.

To date, the courts in Brazil have entered into preliminary injunctions to block 11.80-billion reais of Vale's cash for possible penalties relating to the Córrego do Feijão mine disaster. The company has also been sued for another 350-million reais.

Vale dam licence cancelled

Iron-ore miner Vale reported in February 2019 that the Brazilian government had cancelled the provisional operating licence of its Laranjeiras dam and ordered the immediate suspension of operations at its Jangada mine.

Laranjeiras, one of eight dams subject to a court-ordered suspension, is used by the Bructus mine. Following its suspension, Vale declared force majeure on some iron-ore and pellet supply contracts. The suspension of operations at Bructus, Vale's largest mine in Minas Gerais state, will reduce Vale's yearly production by up to 30-million tonnes of iron-ore. The restart of the Bructus mine is conditional upon the reversal of the preliminary civil court ruling and securing an operating licence for the Laranjeiras dam. Further, the Jangada mine has not been operating since the production halt following the collapse of the tailings dam at the Córrego do Feijão mine in January 2019. The authorities contend that the two mines' operating licences are unified, which Vale is contesting.

Meanwhile, Vale was ordered in March 2019 to suspend operations at its 12.80-million-tonne-a-year Timpopeba iron-ore mine, in Minas Gerais, owing to safety concerns. The mining giant stated that it had also stopped using two other tailings dams in Minas Gerais at the request of government authorities. However, it added that the stoppages would not have a significant impact on mining operations, as the waste would be directed to other structures.

Spanish multinational banking and financial services group Banco Santander stated in a research report published in March 2019 that Vale would continue to face volatility in the short term related to continued stoppages in operations.

A further 40-million tonnes of Vale's iron-ore production will also be impacted on by its accelerated programme to decommission its remaining tailings dams. The company has announced that, in addition to the \$70-million to be spent on dam management in Brazil during 2019, it will invest \$390-million from 2020 on the implementation of dry-stacking disposal technology to reduce its reliance on tailings dams.

Source: Mining Magazine and Bloomberg

Vale dam fallout deepens

As mining group Vale continued to face continued backlash from the Brazilian authorities after a deadly dam collapse in January 2019, a court ordered the company in March 2019 to freeze one-billion reais (\$264-million) in funds as compensation for affected communities in the state of Minas Gerais.

During the previous week, prosecutors had sought guarantees of 50-billion reais for environmental restoration.

Source: Bloomberg

Vale's revenue from iron-ore fines totalled \$20.35-billion in 2018, from \$18.52-billion in 2017. Revenue from pellets amounted to \$6.65-billion (2017: \$5.65-billion).

Investment

During the past five years, Vale invested about \$20-billion in capacity creation in its iron-ore and pellets business. This included about \$14-billion for the development of the S11D operation, with a nominal capacity of 90-million tonnes a year of high-grade ore; \$5-billion for the creation of a combined 65-million tonnes a year of pellet feed and sinter feed capacity and \$1-billion for the installation of pelletisers, which means the group is now able to use all the pellet feed it generates.

Speaking at a media event in London, in the UK, in December 2018, Vale executives said a more limited investment programme was planned for the medium term, with the biggest approved capital expenditure (capex) being \$770-million for brownfield expansion at S11D to 100-million tonnes a year.

Vale has also approved a \$428-million project to recover about ten-million tonnes of iron-ore fines a year from the Gelado tailings dam, in the Northern system, until 2031. The tailings – grading 64.30% iron, 2% silica and 1.65% alumina – will be



Picture by Vale

Aerial view of the S11D Eliezer Batista Complex project



fed into the recently restarted São Luis pellet plant. The project has robust economics, as it will allow for the production of 9.70-million tonnes of iron-ore with zero transport distance, thus reducing operating expenditure. It will also reduce the mining rate at the existing Carajás mine, thereby avoiding sustaining capital associated with the replacement of trucks.

The Vale executives said the company planned to increase the production of high-grade pellet feed in the South-Eastern system by about 20-million tonnes a year through process optimisation, among other measures. They did not disclose the costs associated with these initiatives.

Vale also indicated that it intended to spend \$20-million on upgrading the entire production of Ferrous Resources into direct-reduction pellet feed.

In Oman, it plans to install another grinding mill at its pellet plant to increase production by two-million tonnes a year, while, in Malaysia, the capacity of the distribution and blending centre will be increased from 30-million tonnes to 40-million tonnes. The expansion is driven by cost considerations, as it will be more cost-effective for Vale to reach the small ports in China and South-East Asia than by doing cabotage in these countries.

RIO TINTO

Anglo-Australian diversified mining group Rio Tinto is the second-largest iron-ore miner, with its production concentrated on Western Australia, where it operates an integrated portfolio comprising 16 mines, a 1 700 km rail network, four port terminals and related infrastructure in the Pilbara region. Nine of the mines – Silvergrass, Nammuldi, Brockman 2, Brockman 4, Western Turner Syncline, Tom Price, Paraburdoo, Marandoo and Yandicoogina – are wholly owned through subsidiary company Hamersley. The rest are jointly owned with other parties. Rio Tinto also wholly owns the Koodaideri project, which the company's board approved for development at a cost of \$2.60-billion at its sitting in November 2018.

Rio Tinto is a 58.70% shareholder in Iron Ore Company of Canada (IOC), an 18-million-tonne-a-year iron-ore concentrate producer that it co-owns with Japan's Mitsubishi (26.20%) and Canada's Labrador Iron Ore Royalty Income Corporation (15.10%). In December 2018, Rio announced that it was preparing to take IOC public in early 2019 by dual-listing it in New York and Toronto and that it was targeting a valuation of about \$4-billion. In the past, Rio Tinto tried, and failed, to monetise IOC, while its attempts to sell its stake in 2012 and 2013 were unsuccessful.



Picture by Rio Tinto

Pilbara iron-ore mining operation

Rio Tinto is also a 45.05% shareholder in the 2.75-billion-tonne-reserve Simandou iron-ore project, in the West African country of Guinea, with the other shareholders being China's Chinalco (39.95%) and the government of Guinea (15%). A 2016 nonbinding agreement that would have resulted in Chinalco's acquiring Rio Tinto's interest lapsed in October 2018.

The Anglo-Australian group's Pilbara operations produced 329.80-million tonnes of iron-ore in 2017, with 2018 output increasing to 337.77-million tonnes as production at expanded operations ramped up. The increase was also attributable to minimal weather-related disruptions and continuing investment in productivity improvements throughout the year. Sales totalled 338.16-million tonnes, 2% up on the preceding year. Owing to disruptions caused by Tropical Cyclone Veronica in the early part of 2019, as well as a fire at the Cape Lambert A port facility, the mining major announced in April 2019 that shipments in 2019 would be at the lower end of the 338-million-tonne to 350-million-tonne guidance for the year.

Production at Rio Tinto's Pilbara operations in the next few years will be about 360-million tonnes on the back of productivity gains at existing mines and additional capacity from the new Silvergrass mine once it is fully ramped up. The mine, which came on line in August 2017, will add ten-million tonnes to yearly production.



Revenue from the group's iron-ore business totalled \$18.49-billion in 2018, an increase from the \$18.25-billion generated in 2017.

Meanwhile, in December 2018, Rio Tinto announced that it had successfully deployed its AutoHaul, establishing the world's first automated heavy-haul, long-distance rail network. Since completing the first autonomous haulage run in July 2018, the company has steadily increased the number of autonomous journeys, with more than 1.60-million kilometres covered.

Investment

Rio Tinto and Japanese companies Mitsui and Nippon Steel & Sumitomo Metal announced in October 2018 that they had approved a \$1.55-billion investment to sustain production at two operations that form their Robe River JV. This comprises \$967-million to develop the Mesa B, C and H deposits at Robe Valley and \$579-million to develop deposits C and D at the West Angelas operation. Construction on both projects will start during 2019, with first ore expected in 2021. As a 53% shareholder in the Robe River JV, Rio Tinto has committed to investing \$820-million in the two projects, and this amount forms part of the replacement capital guidance of \$2.70-billion for the period 2018 to 2020.

The wholly owned Koodaideri mine, the development of which was approved in November 2018, will be Rio Tinto's most technologically advanced iron-ore operation. Construction will start in 2019 and the mine, which will be connected to the existing rail network by a 166 km line, is expected to start production in late 2021, delivering the Pilbara Blend, Rio Tinto's flagship iron-ore product. At full capacity, Koodaideri will produce 43-million tonnes of iron-ore a year, helping to sustain the group's production capacity by replacing depletion at other operations in the Pilbara.

The new mine will feature, among others, autonomous trucks, trains and drills; a digital replica of the processing plant, accessible in real time by workers in the field; fully integrated mine automation and simulation systems; advanced automation, including an automated workshop; and numerous data analytics capabilities and control loops to optimise production and reduce downtime. The project will help deliver a safer and more productive mine that will be Rio Tinto's lowest-cost contributor to Pilbara Blend production.

Much of the project's approved capital of \$2.60-billion is included in Rio Tinto's \$2.70-billion replacement capital for 2018 to 2020, with the expenditure to be incurred during 2021 outside the current guidance.

Meanwhile, the group has approved a prefeasibility study into Phase 2 of the Koodaideri project, to expand production capacity

to 70-million tonnes a year and beyond. A final investment decision will be determined by the study outcome and Rio Tinto's value-over-volume approach.

Rio Tinto's post-Koodaideri ore-replacement options are expected to involve low capital intensity and leverage existing infrastructure.

BHP

Diversified mining group BHP is the world's third-largest iron-ore miner, with its iron-ore business focused on Western Australia's Pilbara region, where its Western Australia Iron Ore (WAIO) business unit operates an integrated portfolio of four processing hubs, five mines and two port facilities through JVs with Japan's Mitsui and Itochu. The WAIO unit owns 85% of the four main JVs – Mt Newman, Yandi, Mt Goldsworthy and Jimblebar – with the balance of the shareholding belonging to Mitsui and Itochu.

On a 100% basis, the WAIO operations produced 275-million tonnes, on a 100% basis, in the 12 months to June 30, 2018, a 3% increase on the preceding year, with the guidance for the year to June 30, 2019, being between 273-million tonnes and 283-million tonnes.

BHP's iron-ore division generated \$14.81-billion in revenue for the 12 months to June 30, 2018, up from the preceding year's \$14.62-billion, while revenue for the six months to December 31, 2018, totalled \$7.42-billion, compared with \$7.22-billion for the corresponding period in the 2017/18 financial year.



Western Australia Iron Ore operations



BHP is an equal partner with Vale in Brazil-based Samarco, where operations have been suspended since a tailings dam burst in November 2015 that killed 19 people and left a trail of destruction. The mine had a total capacity of 30.50-million tonnes of iron-ore pellets a year before the suspension of operations.

Investment

Construction on BHP's new South Flank iron-ore mining project began in July 2018, following the granting of approval by the Western Australia state government. The \$3.61-billion project will entail the development of an 80-million-tonne-a-year mine to replace production from the Yandi mine, which is expected to reach the end of its operating life by the mid-2020s. Crucially for BHP, South Flank's 62%- to 63%-iron-content product will replace Yandi's 56%-iron-content ore, boosting the average grade of BHP's iron-ore from the Pilbara by one percentage point to 62%. Chinese iron-ore buyers, in particular, are paying premiums for higher-grade iron-ore because of the ongoing drive to clean up the country's polluting steelmaking industry.

The project, designed to expand on the existing Mining Area C hub, is being developed in collaboration with JV partners Mitsui and Itochu. Initial production is expected to start in 2021, with ramp-up set to coincide with the production ramp-down at the Yandi mine. The new mine has an estimated life-of-mine (LoM) of 25 years.

BHP intends to automate parts of the South Flank mine using fully automated drills and eventually trucks, boosting operational efficiency and worker safety.

FORTESCUE METALS GROUP

The world's fourth-largest iron-ore mining company, Fortescue Metals Group (FMG), owns and operates an integrated supply chain in Western Australia's Pilbara region comprising four mines, 620 km of railway network and a five-berth export facility in Port Hedland. The four mines are the Kings and Firetail mines, which comprise the Solomon Hub, and the Cloudbreak and Christmas Creek mines, which comprise the Chichester Hub. FMG is developing a fifth mine, Eliwana, in the Western Hub, and, together with its JV partners, plans to establish an additional mine called Iron Ridge.

In April 2019, the company's board approved the development of the \$2.60-billion Iron Bridge magnetite project, which it co-owns with Taiwan's Formosa Steel. First delivery of 67%-iron-content ore is scheduled for the first half of 2022, with ramp-up to full production of 22-million tonnes a year expected to take

place over 12 months. Five offtake agreements – accounting for 5.30-million tonnes a year – have been concluded. FMG has a 69% shareholding in the project, with the balance held by Formosa.

The company shipped 170-million tonnes of iron-ore in the 12 months to June 2018, the same as the preceding year's volumes, amid broadly flat demand in China, the main consumer of the ferrous ore. Shipments for the period July to December 2018 – the first half of the 2018/19 financial year – totalled 82.70-million tonnes, a 2% year-on-year decline.

While shipped volumes remained unchanged in 2017/18, FMG's revenue for that financial year was 18% lower, at \$6.89-billion (2017: \$8.45-billion), owing to low-grade ore trading at substantially lower average prices in China, where high steel mill profitability incentivised the use of ore with a higher iron-ore content to maximise production. However, owing primarily to recent reductions in Chinese steel mill margins, which has increased demand for FMG's low-iron-content ore, revenue for the first half of the 2018/19 financial year, at \$3.54-billion, represented a 10% increase on the preceding half-year's \$3.21-billion.

Meanwhile, the miner has launched a new 60%-iron-content product, with the first consignment having been shipped to China in December 2018. An estimated five-million tonnes to ten-million tonnes of the new product, named West Pilbara Fines, will be produced during the 2018/19 financial year by blending higher-iron-content, low-alumina-content ore from the western pits at the Cloudbreak mine with ore from the Firetail mine. The production capacity for West Pilbara Fines is expected to gradually ramp up to 40-million tonnes a year after the completion, in



Picture by FMG

Iron-ore mining at Cloudbreak mine



December 2020, of the \$1.27-billion Eliwana mine and rail project, which gained board approval in May 2018.

FMG expects to export 165-million tonnes to 173-million tonnes of iron-ore during the 2018/19 financial year, with tonnages in the second half of the year forecast to be higher than the 85.20-million tonnes shipped in the first half, owing to the inclusion of eight-million tonnes to ten-million tonnes of West Pilbara Fines.

Investment

FMG's capex increased from \$716-million in the 2016/17 financial year to \$890-million in 2017/18, including \$507-million in sustaining capital, \$167-million in development expenditure and \$149-million for ore carrier construction. An amount of \$67-million was spent on exploration.

The largest project FMG is undertaking is the Eliwana project, entailing the laying of 143 km of railway line and the development of an openpit mine with a 30-million-tonne-a-year dry ore processing facility.

The development cost of \$1.27-billion will be divided into \$165-million, to be spent in the 2018/19 financial year; \$760-million, to be spent in 2019/20; and \$350-million, to be spent in 2020/21. This will be financed from FMG's operating cash flows at a capital intensity of \$42/t.

The 24-year LoM project, for which approval processes for environmental permits and a mining proposal are under way, will replace the almost depleted Firetail mine. Its higher-quality ore of close to the benchmark 62% iron content will lift the grade of FMG ore and thus meet the demands of Chinese steel mills while ensuring that the company maintains yearly production of about 170-million tonnes for more than two decades. The new mine will also help maintain FMG's low-cost position.

Others

Diversified mining company Anglo American is also a significant iron-ore producer, with its iron-ore assets comprising mines owned by its subsidiary, Kumba Iron Ore, in South Africa, and the Minas Rio mine, in Brazil. The group previously intended to dispose of its iron-ore business but has since decided to retain it.

Acquired for about \$5.50-billion at the height of the commodities boom about a decade ago, Minas-Rio, in the south-east of Brazil, comprises openpit mines, a beneficiation plant, a 529 km slurry pipeline, a filtering plant and an export terminal at the Atlantic

Port of Açú, in Rio de Janeiro state. It was initially expected to start producing at its full capacity of 26.50-million tonnes a year, but it experienced delays, resulting in this production goal being postponed to 2021.

Production at Minas-Rio was halted in March 2018, following the discovery of leaks in the 529 km slurry pipeline that conveys iron-ore slurry from the mine to the Port of Açú. The suspension of operations was intended to facilitate the replacement of a 4 km stretch where the leaks had been discovered and several individual sections where minor anomalies below the threshold for intervention had been detected.

Operations resumed in December 2018, and Anglo reported that the suspension of production had resulted in the mine posting an underlying loss of \$320-million for the year.

Meanwhile, Anglo American also announced in December 2018 that it had been granted regulatory approval pertaining to the Step 3 licence area at Minas-Rio. Access to this area will provide greater operational flexibility and allow for the mining of higher-grade ore to support an increase in production towards the operation's design capacity of 26.50-million tonnes a year. Previously, Anglo stated that it expected to produce 16-million tonnes to 19-million tonnes of iron-ore (on a wet basis) during 2019. However, owing to the granting of the Step 3 licence, the figure has been increased to between 18-million tonnes and 20-million tonnes at a unit cost of \$28/t to \$31/t, compared with a previous guidance of \$30/t to \$33/t.

Steelmaking giant ArcelorMittal also has a significant portfolio of iron-ore mining assets located in the US, Canada, Mexico, Brazil, Liberia, Bosnia, Ukraine and Kazakhstan. In 2017, the group's mines and strategic contractors produced 57.40-million tonnes of iron-ore, down from 62.90-million tonnes in the previous year.

Meanwhile, ArcelorMittal's South African subsidiary secured full control of Kumba's mothballed Thabazimbi mine, in Limpopo, in October 2018. The mine was previously owned jointly by the two companies and supplied all its production to ArcelorMittal South Africa (AMSA), which blended it with ore from Kumba's Sishen mine. After a pit wall failure in 2015, Kumba decided to close the mine. In February 2017, AMSA, which was responsible for rehabilitating the mothballed mine, agreed to take over its assets and liabilities for R1 and to assume responsibility for the 63 people working on rehabilitation at the site.

Concurrent with the rehabilitation work, funded by money in a secure trust, AMSA will extract 1.30-million tonnes of ore from stockpiled material using a small, relatively cheap modular plant. The company has said it is assessing the prospects of restarting the mine in the long term using part of the existing pit and moving into fresh sources of ore.





Picture by FMG

OUTLOOK

The tailings dam collapse at Brazilian diversified mining group Vale's Córrego do Feijão mine in January 2019 is expected to have a far-reaching impact on the seaborne iron-ore industry. Soon after the disaster, Vale announced it would halt 40-million tonnes a year of iron-ore production over the next three years as it decommissioned tailings dams built using the 'upstream' construction method, which was also used at Córrego do Feijão. With the subsequent government-enforced suspensions of operations at other Vale operations, iron-ore volumes to be taken out of the market will be much higher. In March 2019, Vale estimated selling up to 75-million tonnes less iron-ore in the year. Vale CFO Luciano Siani said at the time that under the most optimistic scenario, 2019 sales would decline by about 50-million tonnes.

The supply shock emanating from the developments at Vale, coupled with a recent increase in Chinese demand for lower-iron-content ore, has already resulted in a surge in prices for the ferrous ore, which is heading towards \$100/t, up almost 50% from a few months ago.

Although it is unusual for lower-grade iron-ore to lead a price rally, some market watchers believe that this is because there has been a relaxation of steel production restrictions over the Chinese winter. Steel production in the country reached 928.30-million tonnes in 2018, about 6.60% up on 2017 production, but pollution restrictions and concerns about slower Chinese economic growth resulted in steel production's slowing towards the end of the year. In December 2018, for example, environmental restrictions intended to improve air quality restricted steel production to 76.12-million tonnes, the smallest monthly production since March 2018.

Many commentators speculate that the environmental restrictions will be reversed as the Chinese government becomes more concerned about slowing economic growth. Further, the declining profitability of Chinese steel mills is expected to reduce their preference for higher-grade iron-ore and boost the demand for cheaper, lower-grade ores, thus raising their prices.

According to an analytical piece published on Australian investment website Small Caps in February 2019, although iron-ore prices are surging on the back of the supply shocks in Brazil and Chinese mills' new preference for lower-grade ore, the prices will eventually moderate, even if they remain at elevated levels for some time. The author of the analysis believes that this is because, as Chinese steel mills ramp up production after the Chinese New Year holiday – February 5, 2019 – and before stricter seasonal pollution controls, demand for ore, including lower-grade ore, might continue to strengthen.

The Small Caps analysis contends that iron-ore prices will need to decline to about \$75/t for the Chinese steel mills to attain a positive margin.

Although it concurs that the Brazilian supply shock and the dynamics playing out in the Chinese steelmaking industry support predictions for a near-term increase in iron-ore prices to \$100/t, the China Iron and Steel Association believes that the market overreacted to the supply interruptions caused by the tailings dam burst at Córrego do Feijão and suspensions of some of Vale's mines. They contend that loss of shipments from these mines can easily be offset by flows from elsewhere and that it will be difficult to sustain prices at their current high levels. It adds that there is a surplus of iron-ore in China currently, with high holdings at ports, amid low seasonal steel demand.



MAIN SOURCES

ABC. Fortescue Metals profit drops 58pc; lower China demand and cheaper iron-ore (August 20, 2018).

African Rainbow Minerals. Integrated annual report 2018.

Afrimat. Integrated annual report 2018.

Assore. Integrated annual report 2018.

Assore. Provisional reviewed results for the year ended June 30, 2018.

Assore. Results for the half-year ended December 31, 2018.

Australian Department of Industry, Innovation and Science. Resources and Energy Quarterly – December 2018 (December 22, 2018).

BHP. Annual report 2018.

BHP. Report for the year ended June 30, 2018.

BHP. Operational review for the half-year ended December 31, 2018.

BHP. Report for the half-year ended December 31, 2018.

Bloomberg. China's at 'peak steel' right now, top iron-ore shipper says (October 2, 2018).

Bloomberg. BHP can't rescue iron-ore market after Brazil dam disaster (February 19, 2019).

Bloomberg. Vale dam fallout deepens with mine closure and blocked funds (March 19, 2019).

Bloomberg. Iron-ore thunders higher as mine dams closed, exports collapse (April 3, 2019).

Bloomberg. World's largest iron-ore port expects more exports post-Vale (April 4, 2019).

Business Day. Kumba Iron Ore looks to consolidation and technology to keep growing (May 22, 2018).

Business Day. ArcelorMittal sees strategic value in mothballed Thabazimbi mine (October 15, 2018).

Business Day. India set for record iron-ore production (January 28, 2019).

Business Day. Brazil dam disaster may delay Samarco mine settlement (January 29, 2019).

Business Times. Growth in demand turns India into net importer of iron, steel in Apr-Sept (November 6, 2018).

China Daily. Steel sector to remain resilient in 2019, expert says (January 15, 2019).



Datamar News. Brazil's iron-ore exports rise 25.4% in 2018 (January 3, 2019).

Diamond Field Advertiser. NC mine aims to create jobs (February 2, 2018).

Financial Review. Iron-ore spotlights shift to Rio Tinto after BHP and FMG's recent mine approvals (June 17, 2018).

Financial Review. Rio Tinto plans to list Canadian iron-ore unit in early 2019 (December 25, 2019).

Fortescue Metals Group. FY19 half-year results (February 20, 2019).

Financial Times. Vale to cut iron-ore production by 10% after Brazil disaster (January 30, 2019).

GlobalData Energy. Chinese steel policy shifts to flatten out the iron-ore boom by 2022 (September 28, 2018).

Hellenic Shipping News. China won't come to the rescue in global iron-ore supply crisis (February 19, 2019).

Minerals Council South Africa. Facts and Figures Pocketbook 2018.

Mining.com. Fortescue goes ahead with \$1.3bn iron-ore project in Western Australia (May 28, 2018).

Mining.com. South Africa's iron-ore railway to be shut down for annual maintenance (September 12, 2018).

Mining.com. Global iron-ore market well supplied, growth in production ahead – reports (November 23, 2018).

Mining Magazine. Brazil authority cancels Vale licences (February 7, 2019).

Miningmx. Transnet CEO relaxed despite qualified accounts, looming suspension (August 20, 2018).

Mining News. Sishen: a flagship game changer (October 29, 2018).

Mining Technology. BHP begins construction on \$3.61bn South Flank iron-ore project (July 26, 2018).

Mining Weekly. South Africa's newest iron-ore mine comes on stream (May 12, 2017).

Mining Weekly. Chinese group buys auctioned Mapochs mine (September 15, 2017).

Mining Weekly. New iron-ore mine for the Northern Cape (January 31, 2018).

Mining Weekly. Transnet rejects claim of no significant mining-linked rail and port investment in 15 years (March 9, 2018).

Mining Weekly. Fortescue to develop \$1.27bn Eliwana project (May 28, 2018).

Mining Weekly. Afrimat sets sights on midtier mining niche as it eyes bulk commodities (June 8, 2018).

Mining Weekly. Drone tech first for Kumba Iron Ore a 'game changer' at Sishen mine (July 3, 2018).

Mining Weekly. Kumba lowers FY sales, production guidance (July 19, 2018).

Mining Weekly. Sedibeng Iron Ore DMS plant to feature Industry 4.0 technologies (July 20, 2018).

Mining Weekly. Kumba 'very bullish' on exploration prospects (July 25, 2018).

Mining Weekly. Fortescue has its best quarter with 46.5Mt shipped (July 26, 2018).

Mining Weekly. New iron-ore mine showing profitability (July 27, 2018).

Mining Weekly. Fortescue profit hit by China demand, 60% iron content product to be launched in FY19 (August 20, 2018).

Mining Weekly. Manganese star performer, more stability in iron-ore prices – Assore (September 6, 2018).

Mining Weekly. Rio Tinto says \$1.3bn Simandou sale lapses (October 29, 2018).

Mining Weekly. Anglo restarts Brazil iron-ore mine (December 21, 2018).

Mining Weekly. India mulling higher iron-ore import duty (January 17, 2019).

Mining Weekly. Iron-ore train derailment, copper outages hit BHP bottom line (January 22, 2019).

Mining Weekly. Anglo American delivers solid Q4 performance (January 24, 2019).

Mining Weekly. Dam collapse will have profound impact on Vale – Moody's (February 1, 2019).

Mining Weekly. Vale disaster could see Brazil's iron-ore competitive edge slip away (February 12, 2019).

Mining Weekly. Kumba meets 2018 production, sales guidance (February 19, 2019).

Mining Weekly. Price premiums boosting quality-focused Kumba Iron Ore (February 19, 2019).



Mining Weekly. Fortescue interim profit jumps, special dividend declared (February 20, 2019).
Mining Weekly. Brazil iron-ore tragedy brings home reality of mining risk – Kumba (March 1, 2019).
Mining Weekly. Vale slashes iron-ore sales estimates after dam burst (March 28, 2019).
Mining Weekly. Cyclone hits Rio Tinto's iron-ore guidance (April 1, 2019).
Mining Weekly. Fortescue green-lights Iron Bridge (April 2, 2019).

Moneyweb. Afrimat half-year revenue driven by iron-ore (January 28, 2019).

Recycling Today. Iron-ore imports to China dip in 2018 (January 15, 2018).

Reuters. Anglo American expects to obtain permit for Minas Rio mine by June 2019 (August 16, 2018).
Reuters. Ramp-up for Anglo American's Minas Rio mine likely delayed to 2021 (October 16, 2018).

Rio Tinto. Iron-ore site visit: Pilbara, Western Australia (June 18, 2018).
Rio Tinto. Chartbook 2018 (August 2018).
Rio Tinto. Rio Tinto approves investment to sustain Pilbara iron-ore production capacity (October 1, 2018).
Rio Tinto. Rio Tinto and Hancock Prospecting open new mine at Hope Downs (October 5, 2018).
Rio Tinto. Rio Tinto approves \$2.6-billion investment in Koodaideri iron-ore mine (November 29, 2018).
Rio Tinto. Fourth-quarter operations review (January 18, 2019).
Rio Tinto. 2018 full-year results (February 27, 2019).

Seeking Alpha. BHP not expecting Samarco mine to restart in 2019 (August 21, 2018).

Small Caps. Rising iron-ore prices pointing to Chinese stimulus (January 30, 2019).
Small Caps. Iron-ore price plays into Australia's 2019 federal election (February 16, 2019).

SP Global. Australia's FMG launches new medium-grade iron-ore fines product (September 21, 2018).

The Economic Times. Tata Steel to sell off stake in South African iron-ore mine to Swiss firm (October 23 (2018)).

US News. Vale's Brazil disaster to prompt buyers to take more Australian iron-ore (January 30, 2019).

Vale. Annual Report 2017.
Vale. Vale's production and sales report Q3 (October 15, 2018).
Vale. Vale Day 2018 (December 6, 2018).
Vale. Vale performance in 2018.

worldsteel. Short range Outlook (October 16, 2018).

<http://www.angloamericankumba.com>
<http://www.aquilaresources.com>
<http://www.bhp.com>
<http://corporate.arcelormittal.com>
<http://www.fmgl.com.au>
<http://www.riotinto.com>
<http://www.vale.com>





IRON-ORE 2019

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