

Big Mining's Downstream Steel Emissions

BHP and Rio Tinto Will Face Increasing Pressure
from Investors on Scope 3 Targets

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Key Findings

Large, diversified miners will not avoid growing investor pressure to act on their Scope 3 emissions that dwarf their Scope 1 and 2 impact.

Emissions from downstream steelmaking dominate most diversified miners' Scope 3 emissions. However, it is becoming increasingly clear that the steel technology transition away from coal is accelerating.

BHP and Rio Tinto do not have a measurable Scope 3 emissions target. Vale's target is inadequate while Fortescue clearly leads in Scope 3 emissions reduction ambition.

Investors will increasingly expect diversified miners to have responsible, as well as measurable and meaningful, Scope 3 emissions targets. That includes responsible managing down of coal mines rather than sales or spin-offs.



Executive Summary

BHP and Rio Tinto can expect to face growing investor pressure on their Scope 3 greenhouse gas (GHG) emissions. Neither company has a measurable Scope 3 emissions reduction target.

While Scope 1 and 2 emissions occur as companies carry out their operations, Scope 3 emissions result from customers using a company's products, or from suppliers making products that a company uses. Due to the highly emissions-intensive nature of blast furnace-based steelmaking, large, diversified miners that produce iron ore and metallurgical coal have high Scope 3 emissions that dwarf their Scope 1 and 2 emissions.

In July 2023, Sultan Al Jaber – president of COP28 and chief executive of the Abu Dhabi National Oil Company (Adnoc) – stated that companies must act to reduce all greenhouse gas emissions, including Scopes 1, 2 and 3.

All the companies covered in this report have a goal to reach net zero emissions by 2050 as well as measurable, shorter-term emissions reduction targets although some companies do not include their Scope 3 emissions in their goals and targets, only Scopes 1 and 2. Longer-term net zero emissions goals are different from measurable targets. BHP has defined the difference between emissions “targets” and “goals” as follows:

Target: “An intended outcome in relation to which we have identified one or more pathways for delivery of that outcome, subject to certain assumptions or conditions.”

Goal: “An ambition to seek an outcome for which there is no current pathway(s), but for which efforts will be pursued towards addressing that challenge, subject to certain assumptions or conditions.”

Table 1: Major Steel Supply Chain Miners' Scope 3 Emissions Targets

Company	Steelmaking Raw Materials Produced		Measurable Scope 3 Emissions Reduction Target	Net Zero Emissions Goal
	Iron Ore	Metallurgical Coal		
Rio Tinto	✓		None	Net zero by 2050 (Scope 1 & 2 only)
BHP	✓	✓	None	Net zero by 2050 (Scope 1, 2 & 3)
Fortescue	✓		Net Zero by 2040	Net zero by 2040 (Scope 1, 2 & 3)
Vale	✓		15% Reduction by 2035*	Net zero by 2050 (Scope 1 & 2 only)
Anglo American	✓	✓	50% Reduction by 2040**	Net zero by 2040 (Scope 1 & 2 only)

* Against a 2018 baseline. ** Against a 2020 baseline

Source: Company disclosures.

This report examines the Scope 3 emissions targets, 2050 goals and approaches of five large, diversified mining companies amid the accelerating steel technology transition. IEEFA finds that some of these iron ore producers have not yet adopted targets for their Scope 3 emissions in line with investors' increasing expectations:

- BHP and Rio Tinto have no measurable Scope emissions reduction targets despite the accelerating pace of the steel technology transition.
- Vale's Scope 3 emissions target will appear inadequate to many investors.
- Fortescue clearly leads in ambition, targeting net zero Scope 3 emissions by 2040.
- Rio Tinto, Vale and Anglo American do not include Scope 3 emissions in their 2050 net zero emissions goals.

Investor pressure on Scope 3 emissions is growing. Recently, companies including TotalEnergies, Woodside, Glencore, ExxonMobil and Chevron have been pressured by investors to do more on their Scope 3 emissions. This investor pushback in 2023 is only an indication of what is to come. Going forward, investors will increasingly expect action on companies' Scope 3 emissions and will demand measurable targets so they can judge company performance on reduction efforts.

Climate Action 100+, a collective engagement initiative backed by 700 global investors responsible for more than US\$68 trillion in assets under management, released its Net Zero Standard for Diversified Mining in August 2023. Four of the five companies covered in this report are included in the list of focus companies: Anglo American, BHP, Rio Tinto and Vale. The standard includes the expectation that companies have 1.5°C-aligned short, medium- and long-term Scope 3 emissions targets for their metallurgical coal activities and a Scope 3 emissions reduction target aligned with a 1.5°C pathway for their iron ore activities.

Commonwealth Bank of Australia's new lending rules for corporate finance, trade finance and bond facilitation require any existing customers who derive more than 15% of their revenue from the sale of oil, gas or metallurgical coal to have transition plans from 2025 that cover their Scope 1, 2 and 3 emissions. This is the first time the bank has specified that Scope 3 emissions must be covered.

Diversified miners often describe the steel industry as "hard-to-abate", proffering this as a reason for such little action on their iron ore and metallurgical coal Scope 3 emissions in the past. However, it is becoming increasingly clear that the steel technology transition away from coal is accelerating. Fatih Birol, Executive Director of the International Energy Agency (IEA), stated in an April 2023 column for the Financial Times that: "The project pipeline for producing steel with hydrogen rather than coal is expanding rapidly. If currently announced projects come to fruition, we could already have more than half of what we need in 2030 for the IEA's net zero pathway."

Funding and final investment decisions are now being made for direct reduced iron (DRI) installations that don't use coal, at commercial scale. In September 2023, H2 Green Steel announced

it had completed a €1.5 billion equity raising to finance the world's first industrial-scale DRI-based green steel plant utilising green hydrogen. The plant is planned to be operational from 2025.

In August 2023, BlueScope CEO Mark Vassella admitted that steel emissions reduction momentum is moving faster than he predicted just two years ago: "The technology is moving faster than we might have expected."

Technology transitions tend to be non-linear, and have a habit of happening faster than expected. With alternatives to coal-based steelmaking now clear and receiving investment at industrial scale, there is no longer an excuse for suppliers of raw materials to the steel industry not to have a measurable Scope 3 emissions reduction target.

Rio Tinto

Investors will be keen for Rio Tinto to avoid any further environmental, social and governance (ESG) entanglements at its Simandou iron ore project in Guinea as the project moves towards construction. However, the high-quality iron ore output of the project will further enable the company to supply low-carbon DRI-based steelmaking operations and reduce its Scope 3 emissions. The Simandou project is becoming more valuable to Rio now that the steel technology transition away from coal is accelerating.

In addition, Rio has recently stepped-up efforts to investigate the use of its Pilbara iron ore in DRI-based steelmaking as its June 2023 agreement with China Baowu attests. The company's own analysis finds that its iron ore-related Scope 3 emissions could drop 44% by 2035. Given all of this, investors will increasingly see that Rio Tinto is running out of reasons not to have a measurable Scope 3 emissions reduction target.

BHP

Now that BHP has joined Rio Tinto and Fortescue in examining steelmaking technology that can use Pilbara iron ore without metallurgical coal, the company has even less excuse not to have a measurable Scope 3 emissions target given the increasing speed of the global steel technology transition. BHP has noted that its transition risk increased during FY2023 due to growing societal expectations for decarbonisation by companies.

However, BHP is also backing carbon capture, utilisation and storage (CCUS) and states that its metallurgical coal mine portfolio has a strong future. The company's focus on CCUS – a technology that will increasingly be left behind by non-coal-based steelmaking technology – risks making BHP look like a technology and emissions laggard. An increasingly unlikely role for CCUS will see coal's role in steelmaking progressively supplanted by non-fossil alternatives, with green hydrogen leading the race. It won't happen in the short or medium term, but the clock is already ticking for metallurgical coal.

BHP received plaudits for its plan to manage down its Mt Arthur thermal coal mine and close it in 2030 rather than selling it to the highest bidder. In future, investors will increasingly expect BHP to

set a responsible, as well as measurable, Scope 3 target, that includes committing to managing down its existing metallurgical coal mines rather than selling them as it has begun to do with some of its operations.

Fortescue

Fortescue's Scope 3 emissions target clearly leads its peers for ambition despite it producing lower iron content ore on average than Vale, BHP, Rio Tinto and Anglo American.

Part of Fortescue's future involves the mining of magnetite iron ore in addition to hematite. Magnetite is easier to beneficiate to direct reduction-grade (DR-grade) for use in DRI-based steelmaking. Fortescue is already producing and shipping magnetite from its Iron Bridge mine containing more than 67% Fe, which meets DR-grade. Iron Bridge may only be the first of Fortescue's magnetite developments, which could increase the supply of DR-grade ore it produces for low-carbon steelmaking, helping it achieve its Scope 3 emissions target. In August 2023, new Fortescue Metals CEO Dino Otranto stated: "Iron Bridge is a premium grade magnetite product, not only broadening our portfolio of products and providing diversification opportunities, but is also critically important in the energy transition to make green iron."

With its net zero Scope 3 by 2040 target in place, investors will now be keen to see more detail on how Fortescue intends to meet it. Fortescue's new FY2023 Climate Change Report states: "We also have separate targets to eliminate emissions from our marine vessels by 2030 and achieve Net Zero Scope 3 emissions by 2040. We are presently developing our plans to meet these targets."

Vale

Vale's use of 2018 as the base year for its 2035 Scope 3 emissions target will appear unimpressive to many investors. By using the year before the Brumadinho tailings dam disaster – which led to a significant drop in iron ore production – as the base year, Vale virtually reached its 2035 target to reduce Scope 3 emissions by 15% target in 2022, highlighting how unambitious it is.

As the world's leading producer of high-grade iron ore, Vale should be leading the iron ore majors on Scope 3 emissions. Investors will increasingly expect meaningful Scope 3 emissions reductions targets and to see more ambition upon Vale's next review of its target in 2025, by which time the acceleration in the steel technology transition will be even more apparent.

Anglo American

Anglo American's target to reduce Scope 3 emissions by 50% by 2040 likely reflects its higher-quality iron ore and hence its positive outlook for DR-grade iron ore demand in the future. It also probably informs its view that there is an approaching end date for the company's metallurgical coal mining operations. However, investors are likely to become increasingly unimpressed with divestment as tool to reduce company Scope 3. Going forward, more investors will look for Anglo to manage down its metallurgical coal mine capacity, rather than offloading it as it did with its thermal coal mines.

Introduction

In July 2023, Sultan Al Jaber – president of COP28 and chief executive of the Abu Dhabi National Oil Company (Adnoc) – stated that companies must act to reduce all greenhouse gas (GHG) emissions, including Scopes 1, 2 and 3.¹

While Scope 1 and 2 emissions occur as companies carry out their operations, Scope 3 emissions result from customers using a company's products, or from suppliers making products that a company uses. Fossil fuel producers have very high Scope 3 emissions resulting from the burning of coal, gas and oil by their customers. Due to the highly emissions-intensive nature of blast furnace-based steelmaking, producers of iron ore have high Scope 3 emissions even if they are not producers of metallurgical coal. These emissions dwarf their operational, Scope 1 and 2 emissions.

Investor pressure on company Scope 3 emissions is increasing. In May 2023, more than 30% of TotalEnergies shareholders supported a resolution calling for the company to accelerate emissions reductions. The resolution was filed by activist shareholder group Follow This, which is particularly concerned with TotalEnergies' Scope 3 emissions.² Australia's Woodside is also under growing pressure over its climate strategy, including its lack of a Scope 3 emissions target.³

Also in May 2023, 30% of Glencore shareholders voted against the company's 2022 Climate Report. BlackRock – the world's largest investor with more than US\$8 trillion of assets under management – was among the shareholders that voted against the climate plan.⁴ Glencore includes Scope 3 emissions in its emissions reduction target, but there are investor concerns about its transparency.⁵ In addition, 29% of shareholders voted in support of a resolution asking for greater disclosure on how its coal mining plans are compatible with its climate targets. As a result, Glencore was forced into a mandatory consultation with shareholders. HSBC Asset Management and Legal & General Investment Management were among the investors that supported the resolution, which was also recommended by proxy advisors Glass Lewis and Institutional Shareholder Services.⁶

In the same month, Norway's oil fund – the world's largest sovereign wealth fund – backed resolutions that called for ExxonMobil and Chevron to introduce Scope 3 emissions reduction targets stating: "Exxon don't really believe in the value of setting Scope 3 targets. We think the company should do so."⁷ The fund pledged in December 2022 to become more aggressive and vocal on environmental, social and governance (ESG) issues. This followed a Norwegian finance ministry white paper released in 2022 making clear that: "Through active ownership, Norges Bank [the fund's

¹ Bloomberg. [COP28 President Finally Lays Down Big Agenda Items for Climate Summit](#). 13 July 2023.

² Financial Times. [TotalEnergies suffers investor revolt over climate goals](#). 27 May 2023.

³ Australian Financial Review. [Investors want Woodside directors held to account on climate](#). 15 March 2023.

⁴ Financial Times. [BlackRock breaks with Glencore over environment policy](#). 10 September 2023.

⁵ IEEFA. [No "traditional" coal mining at Wandoan but Glencore investors will still have concerns over coal emissions](#). 4 April 2023.

⁶ Financial Times. [Glencore shareholders push back against climate strategy](#). 27 May 2023.

⁷ Financial Times. [Norway's oil fund sides with climate activists against ExxonMobil and Chevron](#). 26 May 2023.

manager] will be a driving force for the companies in the portfolio to align their business models towards a long-term goal of global net zero emissions.”⁸

Climate Action 100+, a collective engagement initiative backed by 700 global investors responsible for more than US\$68 trillion in assets under management,⁹ released its Net Zero Standard for Diversified Mining in August 2023. Four of the five companies covered in this report are included in the list of focus companies: Anglo American, BHP, Rio Tinto and Vale.

The standard includes the expectation that companies have short, medium- and long-term Scope 3 emissions targets for their metallurgical coal activities, and that those targets align with a 1.5°C pathway. It equates this to a reduction in production plans for metallurgical coal of 30% by 2030 and 88% by 2050 compared with 2021. The standard also includes an expectation that companies develop a Scope 3 emissions reduction target aligned with a 1.5°C pathway for their iron ore activities. The standard also includes considerations on how miners approach the phase-out of coal mining – asking for commitments on just transition and rehabilitation.¹⁰

Scope 3 emissions are also now being considered by Australian banks in their fossil fuel lending policies. Commonwealth Bank of Australia's new lending rules for corporate finance, trade finance and bond facilitation require any existing customers who derive more than 15% of their revenue from the sale of oil, gas or metallurgical coal to have transition plans from 2025 that cover their Scope 1, 2 and 3 emissions.¹¹ This is the first time the bank has specified that Scope 3 emissions must be covered.

The investor pushback against companies on Scope 3 emissions in 2023 is only an indication of what is to come. Going forward, investors will increasingly expect action on companies' Scope 3 emissions and will demand measurable targets so they can judge company performance on reduction efforts.

Targets and Goals

All the companies covered in this report have a goal to reach net zero emissions by 2050 as well as measurable, shorter-term emissions reduction targets although some companies only include their Scope 1 and 2 emissions in their goals and targets, not Scope 3. Longer-term net zero emissions goals are different from measurable targets. BHP has defined the difference between emissions “targets” and “goals” as follows:

Target: “An intended outcome in relation to which we have identified one or more pathways for delivery of that outcome, subject to certain assumptions or conditions.”

⁸ Norges Bank. [Norges Bank's management of the Government Pension Fund Global](#). 3 May 2022.

⁹ Climate Action 100+. [Investor signatories](#). 2023.

¹⁰ Climate Action 100+. [Net Zero Standard for Diversified Mining](#). August 2023.

¹¹ Commonwealth Bank of Australia. [Climate Report 2023](#).

Goal: “An ambition to seek an outcome for which there is no current pathway(s), but for which efforts will be pursued towards addressing that challenge, subject to certain assumptions or conditions.”¹²

The Steel Technology Transition is Accelerating

Over the past 12-18 months, there have been clear indications that the steel technology transition away from coal has accelerated.

Aided by a meaningful carbon price, public funding and the EU's coming Carbon Border Adjustment Mechanism (CBAM), Europe is leading the way from coal-consuming blast furnaces towards direct reduced iron (DRI)-based steelmaking that does not use coal and can run on green hydrogen.¹³ Funding and final investment decisions are now being made for DRI installations at commercial scale.

German steelmaker ThyssenKrupp has commenced the progressive replacement of its blast furnaces with DRI shaft furnaces combined with a melting unit that will allow it to use blast furnace-grade iron ore in its DRI process.¹⁴ The plants will run on natural gas initially before shifting to green hydrogen as its cost declines. This is of particular relevance to Australian iron ore miners whose blast furnace-grade product, until now, was not of a high enough quality for DRI-based steelmaking.

In September 2023, H2 Green Steel announced it had completed a €1.5 billion equity raising to finance the world's first industrial-scale DRI-based green steel plant utilising green hydrogen. The plant is planned to be operational from 2025.¹⁵

Fatih Birol, Executive Director of the International Energy Agency (IEA), stated in an April 2023 column for the Financial Times that: “The project pipeline for producing steel with hydrogen rather than coal is expanding rapidly. If currently announced projects come to fruition, we could already have more than half of what we need in 2030 for the IEA's net zero pathway.”¹⁶

A key 2023 report from Agora Industry finds that carbon capture, usage and storage (CCUS) for coal-consuming blast furnaces will not play a major role in global steel decarbonisation, and that a phase-out of coal in the steel sector is technically feasible by the early 2040s.¹⁷ The phrase “hard-to-abate” is fast becoming out of date and will increasingly be eyed by investors as an excuse to delay action on emissions. The accelerating shift away from coal-based steelmaking clearly has long-term implications for metallurgical coal.¹⁸

¹² BHP. [Our GHG emission reduction targets and goals](#). August 2023.

¹³ IEEFA. [“Hard-to-abate” must not become code for delaying steel decarbonisation](#). 24 January 2023.

¹⁴ IEEFA. [German steel giant tech breakthrough to steer industry away from coal](#). 28 September 2022.

¹⁵ H2 Green Steel. [H2 Green Steel raises €1.5 billion in equity to build the world's first green steel plant](#). 7 September 2023.

¹⁶ Financial Times. [Clean energy is moving faster than you think](#). 14 April 2023.

¹⁷ Agora Industry. [15 Insights on the Global Steel Transformation](#). June 2023. Page 3.

¹⁸ IEEFA. [No, metallurgical coal is not a critical mineral...and carbon capture won't save it](#). 3 July 2023.

Iron ore and metallurgical coal miners are starting to notice this shift and opinions about how long the steel technology transition will take are shifting. As recently as October 2021, BHP CEO Mike Henry said that widespread hydrogen-based steelmaking was still 20-30 years away.¹⁹ In August 2022, South32 CEO Graham Kerr said that metallurgical coal has two decades before it faces replacement by green hydrogen.²⁰ Then in April 2023, Anglo American stated the steel technology transition was a 10-15-year process.²¹ In August 2023, BlueScope CEO Mark Vassella admitted that steel emissions reduction momentum is moving faster than he predicted just two years ago: “The technology is moving faster than we might have expected.”²²

Technology transitions tend to be non-linear, and have a habit of happening faster than expected.

With alternatives to coal-based steelmaking now clear and receiving investment at industrial scale, there is no longer an excuse for suppliers of raw materials to the steel industry not to have a measurable Scope 3 emissions reduction target.

Rio Tinto

Rio Tinto is one of the big four global producers of iron ore, producing 324 million tonnes (Mt) on a 100% basis in 2022. Previously also a producer of metallurgical coal, the company completed its divestment from all coal mining in 2018.²³ Rio has stated that it has “put the low-carbon transition at the heart of our new strategy”, and acknowledges that “an inevitable structural shift towards green steel is underway”.²⁴

Rio’s Scope 3 emissions totalled 584Mt carbon dioxide equivalent (CO₂e) in 2022, of which 549Mt resulted from downstream processing of the company’s products – mostly from iron ore and bauxite processing/aluminium smelting (**Figure 1**). Scope 3 emissions for 2022 were 4.6% higher than the prior year – emissions arising from downstream iron ore processing rose on the back of increased iron ore sold and changes in the product mix.²⁵

¹⁹ S&P Global. [Steelmakers must focus on decarbonising blast furnace use: BHP CEO](#), 7 October 2021.

²⁰ Bloomberg. [Hydrogen Could Replace Coking Coal in Two Decades, South32 Says](#), 25 August 2022.

²¹ Anglo American. [Sustainability Performance Update: Q&A Transcript](#), April 2023.

²² Australian Financial Review. [BlueScope to spend \\$1.15b on old-school steelmaking](#), 21 August 2023.

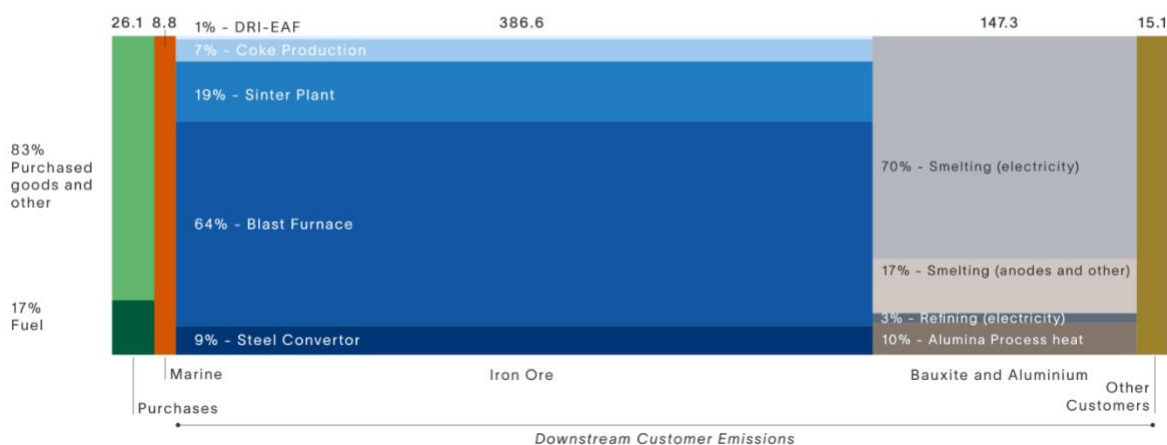
²³ Rio Tinto. [Rio Tinto completes sale of remaining coal assets](#), 1 August 2018.

²⁴ Rio Tinto. [Climate Change Report 2022](#).

²⁵ Rio Tinto. [Climate Change Report 2022](#).

Figure 1: Rio Tinto 2022 Scope 3 Emissions by Category and Source (Equity Basis)

583.9Mt CO₂e



Source: Rio Tinto Climate Change Report 2022.

The company has committed to finding a low-carbon solution for its Australian aluminium production by 2030.²⁶ This will address its Scope 1 and 2 emissions but could also impact its Scope 3 emissions resulting from its bauxite and alumina sales if similar solutions are implemented by its customers.

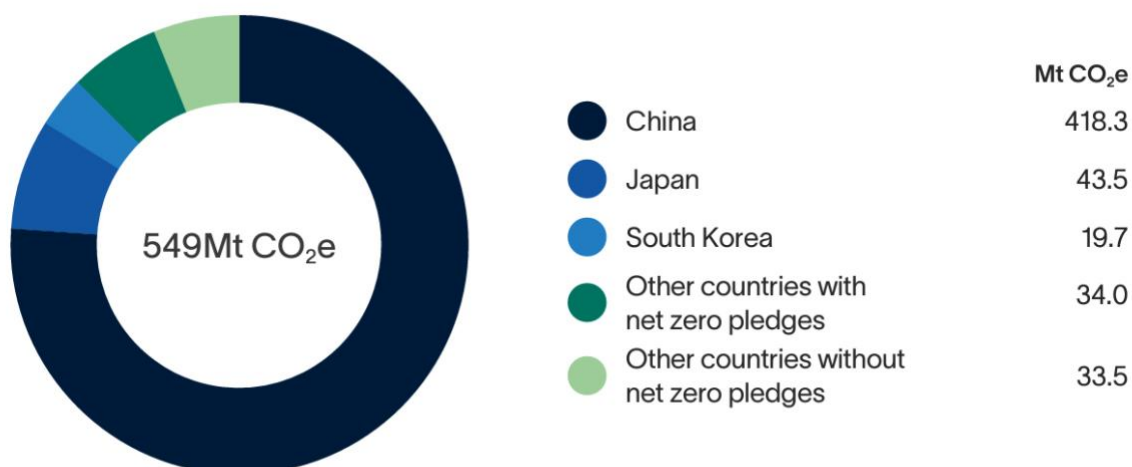
Despite this, and the accelerating technology transition in the iron and steel sector, Rio Tinto does not have a measurable Scope 3 emissions target. Furthermore, its 2050 net zero emissions goal only covers Scope 1 and 2 emissions (**Table 1**). The company maintains that the 2018 divestment of its coal mines limits its ability to set a measurable target as “reducing our Scope 3 emissions by shifting our portfolio away from fossil fuels or the natural depletion of coal mines is not an option for us”.²⁷

The lack of a measurable target comes despite the fact that 94% of the company’s 2022 downstream processing Scope 3 emissions of 549Mt CO₂e arose in China (which has pledged to reach net zero emission by 2060), Japan, South Korea and other nations that have committed to reach net zero emissions by 2050 (**Figure 2**). In addition, 50% of Rio’s iron ore customers have committed to reach net zero emissions by 2050; this is up from 28% in 2021.²⁸

²⁶ Australian Financial Review. [Rio Tinto puts five-year deadline on low carbon aluminium fix](#). 1 August 2023.

²⁷ Rio Tinto. [Climate Change Report 2022](#).

²⁸ Rio Tinto. [Climate Change Report 2022](#).

Figure 2: Rio Tinto 2022 Scope 3 Emissions from Product Processing by Country

Source: Rio Tinto Climate Change Report 2022.

The company has performed its own analysis of how much its Scope 3 emissions might drop under certain scenarios. Under the Net Zero Steel Initiative's NZSI Tech Moratorium 2022 scenario, Rio finds that its iron ore-related Scope 3 emissions would drop 44% by 2035. This projection accounts for iron ore production growth in the Pilbara region of Western Australia, Canada and Guinea.²⁹

Rio's efforts to lower its Scope 3 emissions are already well underway, with some demonstrating the accelerating pace of the steel technology transition. In the medium-to-long term, Rio sees the steel industry shifting towards DRI-based production and it is working on ways to beneficiate its Pilbara iron ores up to DRI standard. A key issue faced by Pilbara miners is that the majority of ores there are below direct reduction-grade (DR-grade), suitable for use in DRI-based processes, which requires an iron (Fe) content of around 67%. Most of the Pilbara's commercial deposits contain between 56% and 62% Fe.³⁰

The company is also working with steelmakers on technology combinations that would allow the use of lower, blast furnace-grade iron ore in DRI-based processes.

Rio Tinto has been investigating the use of a melting step that could see Pilbara iron ore used in DRI-based steelmaking with Australian steelmaker BlueScope since 2021.³¹ According to BlueScope, the

²⁹ Rio Tinto. [Climate Change Report 2022](#).

³⁰ Minerals Research Institute of Western Australia. [Western Australia's Green Steel Opportunity](#). 19 June 2023.

³¹ Rio Tinto. [Rio Tinto and BlueScope to explore low carbon-steelmaking pathways](#). 29 October 2021.

study of the DRI-melter-basic oxygen furnace (BOF) concept has been completed and the next stage includes trials and a potential pilot program.³²

Rio and BlueScope are far from the only companies looking at combining DRI with a melting step that can deal with the higher impurities found in lower-grade iron ore. ArcelorMittal – the world's second largest steelmaker – is looking at a similar combination. Meanwhile, Thyssenkrupp has already made a final investment decision on a similar technology combination and is now beginning to progressively replace its blast furnaces with a DRI-melter-BOF combination that will be able to use blast furnace-grade iron ore. The first plant is expected to be operational from 2026³³ – the same year that BlueScope's relined blast furnace will come online.³⁴

Rio Tinto also signed a Memorandum of Understanding (MoU) in June 2023 with China Baowu – the world's largest steelmaker – to investigate steel emissions reduction. Rio and Baowu will investigate the use of lower-grade Pilbara iron ores in DRI-based steelmaking in China and also the possibility of low-carbon iron production in Australia.³⁵ China Baowu is aiming to ensure its emissions peak in 2023 and are cut 30% by 2035 before reaching carbon neutrality by 2050.³⁶ This goes beyond the Chinese government's targets of peak steel emissions by 2030 and net zero emissions by 2060.³⁷

Rio will also supply iron ore to customers that are already planning green steel operations at industrial scale. In August 2023, Rio Tinto announced a multi-year agreement to supply DR-grade iron ore pellets to H2 Green Steel in Sweden, which aims to produce low-carbon steel using green hydrogen from 2025.³⁸ This will be supplied from Rio's Canadian iron ore operations. Rio's Iron Ore Company of Canada produces a significantly higher grade of iron ore than its Pilbara operation. The deal will also see Rio buy and on-sell green iron produced by H2 Green Steel.³⁹

The company is also developing an iron-making process it calls Biolron in which biomass is used as a reductant instead of metallurgical coal, and microwave energy is used to convert Pilbara iron ore into iron. Rio has proven the process in a small-scale pilot, and now intends to scale up the technology.⁴⁰

Lower-grade Pilbara iron ore dominates Rio's production but its iron ore quality profile looks set to change significantly in the coming years, putting it in a significantly better position to supply low-carbon steelmaking operations and address its Scope 3 emissions.

³² BlueScope. [FY2023 Financial Results Presentation](#). 21 August 2023.

³³ IEEFA. [German steel giant tech breakthrough to steer industry away from coal](#). 28 September 2022.

³⁴ Australian Financial Review. [BlueScope to spend \\$1.15b on old-school steelmaking](#). 21 August 2023.

³⁵ Rio Tinto. [China Baowu and Rio Tinto extend climate partnership to decarbonise the steel value chain](#). 12 June 2023.

³⁶ Reuters. [China's top steelmaker Baowu Group vows to achieve carbon neutrality by 2050](#). 21 January 2021.

³⁷ Bloomberg. [Rio Tinto, China Baowu to Jointly Explore Green Steel Projects](#). 12 June 2023.

³⁸ H2 Green Steel. [H2 Green Steel raises €1.5 billion in equity to build the world's first green steel plant](#). 7 September 2023.

³⁹ Rio Tinto. [Rio Tinto and H2 Green Steel partner to accelerate the green steel transition](#). 9 August 2023.

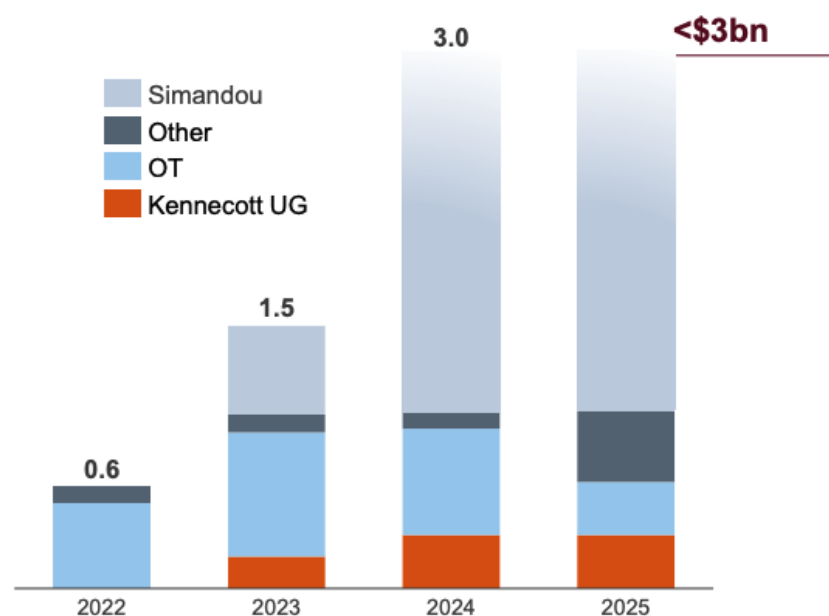
⁴⁰ Rio Tinto. [Rio Tinto's Biolron proves successful for low-carbon iron-making](#). 23 November 2022.

Simandou

Rio Tinto controls half of the highly significant Simandou iron ore deposit in Guinea, West Africa, along with its project partners Aluminium Corporation of China (Chinalco) and steelmaking giant China Baowu, with the other half controlled by a consortium of Chinese and Singaporean companies (SMB-Winning). Rio Tinto, Chinalco and China Baowu's half could potentially produce 100Mt of high-grade iron ore per year. Taking SMB-Winning's share into account, Simandou could produce 200Mt per annum of high-grade, 65%-66% Fe ore by the end of the decade (if the projects proceed smoothly), making it the most significant development globally for increasing supply of high-grade iron ore.

In the coming years, Guinea looks set to become the third-largest iron ore producer in the world after Australia and Brazil, with a quality significantly higher than Australia's. The projects require a major transport infrastructure buildout, which has been delayed for many years but now looks set to proceed.⁴¹

Figure 3: Rio Tinto's Planned Growth Capital Expenditure is Dominated by the Simandou Project (US\$bn)



Source: Rio Tinto 2023 Half Year Results.

Rio Tinto has stated that the deposit has an estimated 40% of high-quality iron ore resources that are “well suited to meet DRI specification, which could be processed via the lower-carbon DRI-EAF

⁴¹ Rio Tinto. [Agreements reached on trans-Guinean infrastructure in milestone for Simandou iron ore project](#). 11 August 2023.

[direct reduced iron-electric arc furnace (DRI-EAF)] route”.⁴² As such, Simandou could add significantly to the global supply of ore already suitable for processing into green iron and lowering the steel industry's carbon emissions.

However, Simandou already has a troubled history and Rio's investors will be keen to see that it does not become an ESG nightmare in the wake of the Juukan Gorge debacle, which led to the resignations of the company's former CEO⁴³ and Chairman.⁴⁴

Simandou has already caused ESG headaches for Rio. In 2016, the company reported itself to the U.K.'s Serious Fraud Office (SFO), the U.S. Department of Justice and the Australian Federal Police over a payment made to a consultant with links to then Guinean president Alpha Condé. Rio also fired two senior executives over the payment.⁴⁵ The following year, the SFO launched an investigation into “suspected corruption in the conduct of business in Guinea” by Rio.⁴⁶

In March 2023, Rio agreed to pay US\$15m to settle a U.S. investigation into the matter by the Securities and Exchange Commission (SEC). A company statement noted: “Without admitting to or denying the SEC's findings, Rio Tinto has agreed to pay a \$15 million civil penalty for violations of the books and records and internal controls provisions of the Foreign Corrupt Practices Act.”⁴⁷ In August 2023, the SFO dropped the investigation into Rio Tinto stating it was “not in the public interest to proceed with a prosecution in the UK”, but noting that “The Australian Federal Police maintains a live investigation into this matter and we continue to support their ongoing case.”⁴⁸

However, Rio's difficulties in Guinea extend further back. Following its discovery of high-grade iron ore in Simandou, the government then led by Lansana Conté, who took control in a 1984 military coup, stripped Rio of half its mining rights in 2008 and handed them to Beny Steinmetz Group Resources (BSG Resources), which later agreed to sell a share of those rights to Vale for US\$2.5bn. In 2014, Rio Tinto unsuccessfully sued BSG Resources, its owner Beny Steinmetz and Vale over alleged misappropriation of its mining rights.⁴⁹ In the same year the Guinean government revoked the mining concession controlled by the BSG Resource-Vale joint venture.⁵⁰ Beny Steinmetz was found guilty of corruption by a Swiss court in 2021 over the granting of the Simandou rights.⁵¹

In September 2021, Condé was overthrown by a military coup and Guinea is now led by Colonel Mamady Doumbouya.

⁴² Rio Tinto. [Climate change report 2022](#). Page 25.

⁴³ ABC. [Rio Tinto boss Jean-Sebastien Jacques quits over Juukan Gorge blast](#). 11 September 2020.

⁴⁴ ABC. [Rio Tinto chairman Simon Thompson to resign over Juukan Gorge destruction but first nations leaders and investors say more heads should roll](#). 3 March 2021.

⁴⁵ Reuters. [Rio Tinto fires two top executives over Guinea payments](#). 17 November 2016.

⁴⁶ Financial Times. [Rio in talks with SFO over bribery probe deal](#). 29 July 2020.

⁴⁷ Rio Tinto. [Rio Tinto resolves legacy U.S. Securities Exchange Commission FCPA investigation](#). 6 March 2023.

⁴⁸ Reuters. [UK drops probes into Kazakh miner ENRC, Rio Tinto](#). 25 August 2023.

⁴⁹ Reuters. [Timeline: The battle for Simandou](#). 23 January 2021.

⁵⁰ Vale. [Vale on arbitration award related to Simandou](#). 4 September 2019.

⁵¹ Reuters. [Swiss court upholds corruption ruling against mining magnate Steinmetz](#). 4 April 2023.

Summary

Investors will be keen for Rio to avoid any further ESG entanglements at Simandou as the project moves towards construction. However, the high-quality iron ore output of the project will further enable the company to supply DRI-based low-carbon steelmaking operations and lower its Scope 3 emissions. The Simandou project is becoming more valuable to Rio now that the steel technology transition away from coal is accelerating.

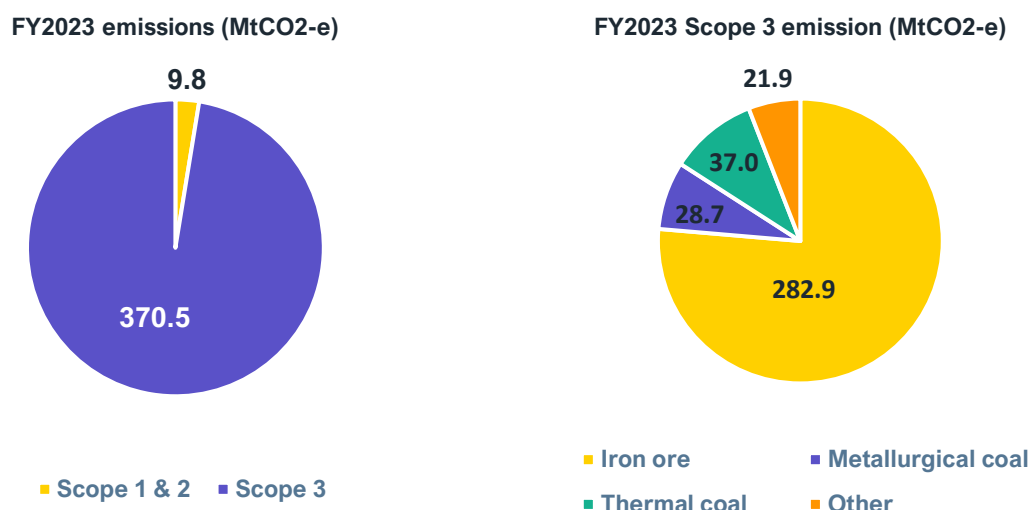
In addition, Rio has recently stepped up efforts to investigate the use of its Pilbara iron ore in DRI-based steelmaking, as its June 2023 agreement with China Baowu attests. Rio's own analysis finds that its iron ore-related Scope 3 emissions could drop 44% by 2035. Given all of this, investors will increasingly see that Rio Tinto is running out of reasons not to have a measurable, meaningful and responsible Scope 3 emissions reduction target.

BHP

As well as being one of the big four global iron ore miners (producing 257Mt in FY2023), BHP is also the world's largest exporter of metallurgical coal. These steelmaking raw materials dominate the company's Scope 3 emissions, which totalled 370Mt CO₂e in FY2023 (**Figure 4**). BHP's Scope 3 emissions dropped nearly 8% in FY2023 following the merger of its oil and gas operations with Woodside.

In June 2023, BHP hosted an investor presentation outlining its plans to reduce operational (Scope 1 and 2) emissions, but these make up less than 3% of the company's total emissions with Scope 3 emissions making up 97% (**Figure 4**). In a typical coal-based blast-furnace-basic oxygen furnace steelmaking process, the iron-making step produces by far the most carbon emissions, with mining processes such as drilling, blasting, excavating and hauling contributing a tiny fraction of the total (**Figure 5**).

Figure 4: BHP's FY2023 Emissions by Scope and Scope 3 by Product



Source: BHP Annual Report 2023.

Despite the company's strategy of positioning itself for "megatrends shaping the world", including decarbonisation, BHP has no measurable Scope 3 target beyond its goal to reach net zero emissions by 2050. However, BHP says of the Scope 3 element its 2050 target that "achievement of this goal is uncertain".⁵²

Instead, BHP states that it is working with steelmaking customers to develop solutions to reduce emissions. It aims to support the industry to develop technologies that are "capable" of a 30% reduction in emissions intensity, not absolute emissions. In its latest annual report, BHP notes that it has collaborative partnerships with steelmakers that represent 19% of global steel production – China Baowu, ArcelorMittal, JFE Steel, HBIS Group, POSCO, Tata Steel and Zenith Steel.⁵³

BHP is less convinced about the steel industry's shift away from blast furnaces than other major iron ore producers, a position likely influenced by it being the world's largest metallurgical coal exporter. In its latest annual report, BHP states: "We believe a wholesale shift away from blast furnace steelmaking, which uses metallurgical coal, is still decades in the future and as a result metallurgical coal will remain an essential input...over the coming decades."⁵⁴ The company is seeking approval for a new coal mine that would operate for 90 years.⁵⁵

⁵² BHP. [Annual Report 2023](#). Page 49. 22 August 2023.

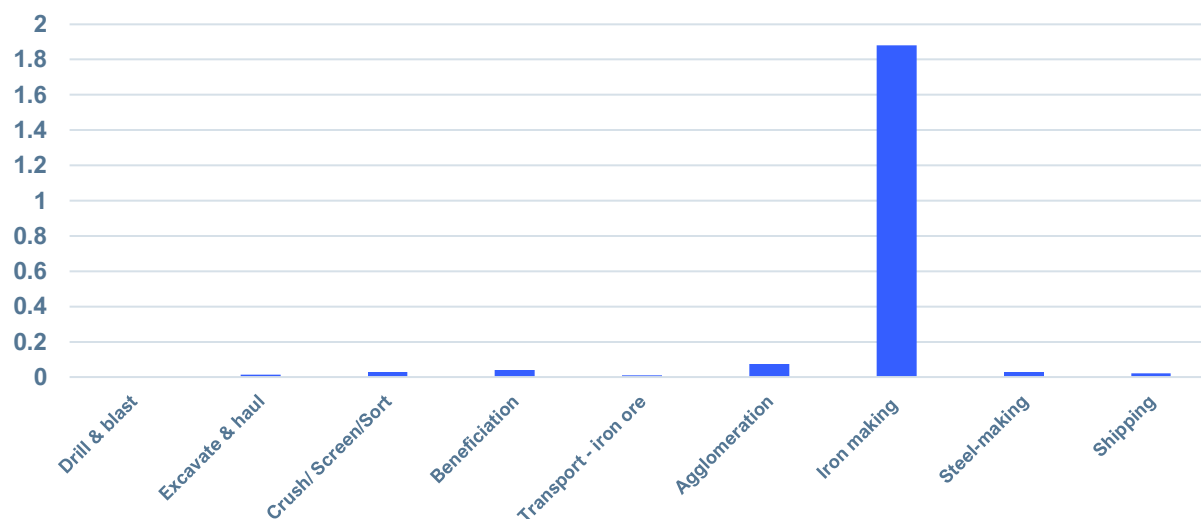
⁵³ Ibid.

⁵⁴ BHP. [Annual Report 2023](#). Page 8.

⁵⁵ Australian Financial Review. [BHP asks to mine Queensland coal for 90 years](#). 11 August 2022.

Hand in hand with this, BHP appears to be more convinced than other miners of steelmaking raw materials that CCUS will play a major role in decarbonising the industry and allowing continued use of its metallurgical coal.

Figure 5: GHG Emissions Output for a Typical Coal-Based Blast Furnace-Basic Oxygen Furnace Process (tonnes CO₂/tonne of product)



Source: Minerals Research Institute of Western Australia, GHD Analysis

Carbon Capture, Utilisation and Storage

BHP states: “We see the blast furnace with carbon capture, utilisation and storage route, which would require metallurgical coal as an input, as an important part of the journey towards the end-state objective of widespread ‘near zero emission steel’ production.”⁵⁶

The company is continuing to partner with steelmakers on CCUS projects. In October 2022, BHP announced a collaboration with Mitsubishi Heavy Industries and ArcelorMittal for a trial of carbon capture technology at the latter’s Ghent steel plant.⁵⁷ In March 2023, BHP signed an agreement with HBIS Group for a carbon capture trial in China.⁵⁸ And in July 2023, BHP, China Baowu and Monash University announced an Industry Knowledge Centre that will aim to accelerate the deployment of technology capable of reducing steel emissions. The focus of the work will be carbon abatement

⁵⁶ BHP. [Annual Report 2023](#), Page 52.

⁵⁷ BHP. [Carbon capture in the steel industry: ArcelorMittal, Mitsubishi Heavy Industries Engineering, BHP and Mitsubishi Development sign collaboration agreement](#), 27 October 2022.

⁵⁸ BHP. [BHP signs Carbon Capture and Utilisation pilot agreement with China’s HBIS Group](#), 27 March 2023.

technologies for the blast furnace steelmaking route, not on alternative routes that do not require coal.⁵⁹ Rio Tinto is also investigating carbon capture in the steel sector.⁶⁰

This is despite it looking increasingly unlikely that CCUS technology will play a major role in steel decarbonisation.

This should not be much of a surprise. IEEFA research has highlighted that CCUS has a long history of significant underperformance and failure in other sectors.⁶¹ If anything, successful CCUS implementation in the steel sector seems even less likely than in other sectors. An integrated, blast furnace-based steel plant emits carbon dioxide (CO₂) at multiple stages of the steelmaking process and at differing concentrations, making the retro-fitting of CCUS to such plants complicated and expensive.

ArcelorMittal has inaugurated its “flagship” carbon capture and utilisation (CCU) demonstration plant at its Ghent plant. However, the €200m project will capture just 125,000 tonnes of carbon per year, equivalent to around 2%-3% of the total emissions from the plant if running at full capacity.⁶²

Another key question is where the captured carbon would be stored in the event of a major roll-out of CCUS across the global steel industry. Blast furnaces tend to be located close to centres of steel demand rather than near suitable underground storage sites. This suggests carbon would often need to be transported long distances to storage sites, an additional expense that further erodes the viability of CCUS for steel.

CCUS technology is already being left behind by alternative steelmaking technology that does not use coal. According to research by Agora Industry, the 2030 project pipeline of DRI plants has reached 84Mt of capacity globally while commercial-scale CCUS stands at only 1Mt.⁶³ Many of these industrial-scale DRI projects will use gas initially but will be built hydrogen-ready so they can switch to green hydrogen as it becomes available.

Although 84Mt is only around 5% of global steelmaking capacity, more than 70% of global capacity will reach a reinvestment decision prior to 2030. As such, it can be expected that the pipeline of non-coal-based DRI steelmaking projects will increase much further while CCUS is left behind again, just as it was in the power sector by wind and solar.

The story of carbon capture technology being left standing at the start line by alternative, non-fossil fuel-based technologies is a familiar one. Any steelmaker or iron ore producer relying on CCUS in its long-term decarbonisation pathways will face a growing number of questions from investors.

⁵⁹ BHP. [BHP, China Baowu and Monash University launch an Industry Knowledge Centre](#). 16 July 2023.

⁶⁰ Rio Tinto. [Rio Tinto and Shougang Group to explore steel decarbonisation solutions](#). 22 September 2022.

⁶¹ IEEFA. [Carbon capture has a long history. Of failure](#). 2 September 2022.

⁶² ArcelorMittal. [ArcelorMittal and LanzaTech announce first ethanol samples from commercial flagship carbon capture and utilisation facility in Ghent, Belgium](#). 14 June 2023.

⁶³ Agora Industry. [15 Insights on the Global Steel Transformation](#). June 2023. Page 33.

Recent Developments

The company's Climate Transition Action Plan from 2021 discusses at length how difficult a steel industry transition away from coal will be. However, even two years ago, BHP noted that: "The commitment to enable swifter decarbonisation pathways in the steel sector is gathering momentum."⁶⁴

BHP's latest annual report states: "Our exposure to transition risks increased over FY2023 due to greater societal expectations for accelerated decarbonisation by companies and significant regulatory developments across the globe...", citing the EU's CBAM, the U.S. Inflation Reduction Act and Australia's updated Safeguard Mechanism.⁶⁵

This chimes with the IEA chief Fatih Birol's April 2023 comments on the accelerating steel technology transition,⁶⁶ and the August 2023 remarks by BlueScope CEO Mark Vassella in which he admitted that steel emissions reduction momentum is moving faster than he predicted just two years ago.⁶⁷

The phrase "hard-to-abate" appears numerous times in BHP's 2023 Annual Report and 2021 Climate Transition Action Plan. However, given the growing speed of the steel technology transition over the last two years, this should no longer be used as an excuse to delay action on emissions reduction or dispense with measurable Scope 3 emissions targets.⁶⁸

The company has begun selling off lower-quality metallurgical coal mines. It offloaded its 80% holding in metallurgical coal producing BHP-Mitsui Coal in May 2022.⁶⁹ This is in contrast to its Mt Arthur thermal coal mine which BHP has kept and will manage down to closure in 2030.⁷⁰ It is now in the process of divesting its Daunia and Blackwater metallurgical coal mines. It has also stated that it has no growth capital allocated to metallurgical coal.⁷¹ The company has blamed this decision on the Queensland government's new progressive coal royalty rates, which will see miners pay higher royalties for use of the state's resources during periods of very high prices and super-profits.

In its 2022 annual report, BHP disclosed that it had increased its closure and rehabilitation provision by US\$750m in recognition that the end of operations at its remaining metallurgical coal mines "may be earlier than previously anticipated". BHP puts this down to both the new Queensland royalty rates

⁶⁴ BHP. [Climate Transition Action Plan 2021](#). Page 17.

⁶⁵ BHP. [Annual Report 2023](#). Page 76.

⁶⁶ Financial Times. [Clean energy is moving faster than you think](#). 14 April 2023.

⁶⁷ Australian Financial Review. [BlueScope to spend \\$1.15b on old-school steelmaking](#). 21 August 2023.

⁶⁸ IEEFA. ["Hard-to-abate" must not become code for delaying steel decarbonisation](#). 24 January 2023.

⁶⁹ BHP. [BHP completes the divestment of its BMC interest](#). 3 May 2022.

⁷⁰ BHP. [Coal divestment review update – BHP to retain New South Wales Energy Coal](#). 15 June 2022

⁷¹ BHP. [Financial results for the year ended 30 June 2023: Presentation and speech](#). 22 August 2023.

and an assessment of the long-term outlook for metallurgical coal, which reflects drivers of supply and demand including “climate-related announcements from key market countries”.⁷²

Meanwhile, BHP has begun working on steelmaking technology that does not use coal. The company became the last of the big three Australian iron ore producers looking into technology that can use the Pilbara's blast furnace-grade iron ore in DRI-based processes when it announced a project collaboration with Hatch in March 2023.⁷³

BHP also remains committed to Samarco, the high-grade Brazilian iron ore miner that the company owns with Vale in a 50:50 joint venture.⁷⁴ Samarco's production is still ramping back up after the 2015 Mariana tailings dam disaster that killed 19 people and has been described as the industry's worst ever environmental disaster.⁷⁵ Samarco was among iron ore miners that highlighted plans for increased DR-grade iron ore production at 2023's Iron Ore Forum in Stockholm, which emphasised that DRI-based steelmaking remains the most viable medium-term solution for the reduction of miner's Scope 3 emissions.⁷⁶

Summary

Now that BHP has joined Rio Tinto and Fortescue in examining steelmaking technology that can use Pilbara iron ore without metallurgical coal, the company has even less excuse not to have a measurable Scope 3 emission target given the increasing speed of the global steel technology transition. BHP has noted that its transition risk increased during FY2023 due to growing societal expectations for decarbonisation by companies.

However, BHP is also backing CCUS and saying that its metallurgical coal mine portfolio has a strong future. The company's focus on CCUS – a technology that will increasingly be left behind by non-coal-based steelmaking technology – risks making BHP look like a technology and emissions laggard. An increasingly unlikely role for CCUS will see coal's role in steelmaking progressively supplanted by non-fossil alternatives, with green hydrogen leading the race. It won't happen in the short or medium term, but the clock is already ticking for metallurgical coal.

BHP received plaudits for its plan to manage down its Mt Arthur thermal coal mine and close it in 2030 rather than selling it to the highest bidder.⁷⁷ Going forward, investors will increasingly look for BHP to set a responsible, as well as measurable Scope 3 target, that includes committing to managing down its existing metallurgical coal mines rather than selling them, as it has begun to do with some of its operations.

⁷² BHP. [Annual Report 2022. Page 159.](#)

⁷³ BHP. [BHP and Hatch commence design study for an electric smelting furnace pilot.](#) 23 March 2023.

⁷⁴ Bloomberg. [World's Biggest Miner Reviews Newly Acquired Brazilian Assets.](#) 1 September 2023.

⁷⁵ Australian Financial Review. [Lawyers behind BHP class action warn of investor risk.](#) 15 May 2023.

⁷⁶ Fastmarkets. [Four key takeaways from the 27th International Iron Ore forum.](#) 15 May 2023.

⁷⁷ Australian Financial Review. [Labor's former coal miner MP backs BHP's early mine closure.](#) 8 August 2022

Fortescue

Until relatively recently Fortescue was a pure-play iron ore miner, producing 192Mt of iron ore in FY2023. Despite recently branching out into clean energy development, steel manufacturing unsurprisingly dominates Fortescue's Scope 3 emissions profile. Total FY2023 Scope 3 emissions were 268Mt CO₂e with steel manufacturing based on Fortescue's iron ore making up 98% of this total. Scope 3 emissions rose 5% in FY2023 on the back of higher iron ore sales. Scope 1 and 2 emissions amounted to just over 2.5Mt CO₂e in FY2023.⁷⁸

Fortescue has committed to reach net zero Scope 3 emissions by 2040, by far the most ambitious target among its peers. With an ambitious and measurable target in place, questions turn to how this will be achieved. Fortescue is one of the big four global iron ore producers but, with CCUS unlikely to play a major role in steel decarbonisation, the company will need to be selling virtually no iron ore to blast furnace-based steelmaking operations by 2040 to meet its target.⁷⁹ Fortescue has ruled out the use of carbon offsets to reduce Scope 1 and 2 emissions – citing concerns about their quality and additionality – but they remain an option to achieve net zero Scope 3 emissions.

With Fortescue increasing production of high-grade iron ore suitable for non-coal-based steelmaking, developing low-emissions steelmaking technology that can use Pilbara iron ore, exploring copper and lithium options, and developing clean energy projects globally, the company will look very different in 2040.

Latest Developments

Part of Fortescue's future involves the mining of magnetite iron ore in addition to hematite. Magnetite is easier to beneficiate to DR-grade for use in DRI-based steelmaking. Fortescue is already producing and shipping magnetite containing more than 67% Fe, which meets DR-grade.⁸⁰ Former Fortescue Metals CEO Fiona Hick stated in July 2023 that, though the output from the Iron Bridge mine may be blended with lower-grade ore in the future, the intention for now is to sell it as a separate high-grade product, for which interest from customers has been high.⁸¹

Iron Bridge may only be the first of Fortescue's magnetite developments, which could increase the supply of DR-grade ore it produces for low-carbon steelmaking, helping it achieve its Scope 3 emissions target.⁸² In August 2023, new Fortescue Metals CEO Dino Otranto stated: "Iron Bridge is a premium grade magnetite product, not only broadening our portfolio of products and providing

⁷⁸ Fortescue. [FY23 Climate Change Report](#).

⁷⁹ IEEFA. [No, metallurgical coal is not a critical material...and carbon capture won't save it](#). 3 July 2023.

⁸⁰ Fortescue. [Fortescue ships first magnetite product from Iron Bridge](#). 24 July 2023.

⁸¹ Australian Financial Review. [Fortescue aims for fifth consecutive export record](#). 27 July 2023.

⁸² Australian Financial Review. [Why magnetite matters more to Fortescue in the green iron era](#). 7 May 2023.

diversification opportunities, but is also critically important in the energy transition to make green iron.”⁸³

Otranto also noted: “We also focused on unlocking the potential value of the Belinga Iron Ore Project in Gabon where we have a major exploration drilling campaign underway. Geological mapping and sampling programs continue to show that the Belinga Project has the potential to be of significant scale and grade.”⁸⁴

Fortescue signed a Mining Convention in February 2023 with Gabon for the Belinga Iron Ore Project in the north-east of the country.⁸⁵ The Belinga project is on course to deliver the first shipment of iron ore before the end of 2023. Hick stated in 2023 that “every indication we have, shows the project has the potential to be significant scale and very high-grade”⁸⁶, and that “initial indications are that it could be similar in scale and size to Simandou in Guinea”⁸⁷.

Belinga has the potential to further increase Fortescue’s iron ore output suitable for non-coal-based steelmaking. However, a military coup in Gabon in late August 2023 may now cast doubt on the project’s timetable.⁸⁸

In addition to increasing its high-grade iron ore output, projects to develop steelmaking technology that can use lower-grade Pilbara hematite are also underway. Fortescue is working with voestalpine, Mitsubishi Corp and Primetals Technologies on the use of its iron ores in the latter’s HYFOR DRI process for net zero carbon ironmaking. The partnership is looking at combining HYFOR with electric smelting technology to allow the use of lower-grade iron ores in DRI-based processes.⁸⁹

In June 2023, Fortescue entered into a MoU with China Baowu to work together on reducing iron and steel emissions. The partnership will investigate low-carbon steelmaking using green hydrogen and Fortescue’s iron ore as well as iron ore beneficiation research. Hick said at the time: “We firmly believe that collaboration and partnerships such as this will be integral to developing the technologies required to deliver on our ambitious target of net zero Scope 3 emissions by 2040.”⁹⁰

The company has also said it will be progressing a study on the potential for green iron production in Australia at the Boodarie Strategic Industrial Area in Port Hedland.⁹¹ Green iron – made via DRI and exported as hot briquetted iron (HBI) – is now being considered for import by major global

⁸³ Fortescue. [FY23 Investor and Analyst Call Transcript](#). 28 August 2023.

⁸⁴ Fortescue. [FY23 Investor and Analyst Call Transcript](#). 28 August 2023.

⁸⁵ Fortescue. [Mining Convention signed for the Belinga Iron Ore Project](#). 8 February 2023.

⁸⁶ Fortescue. [World Mining Congress speech](#). 28 June 2023.

⁸⁷ Australian Financial Review. [After years of fruitless drilling, Fortescue is ready to change tactic](#). 17 May 2023.

⁸⁸ Australian Financial Review. [Gabon military coup sparks concern at Fortescue](#). 31 August 2023.

⁸⁹ Fortescue. [Fortescue, Primetals Technologies, and voestalpine to jointly evaluate groundbreaking green ironmaking plant](#). 20 December 2022.

⁹⁰ Fortescue. [Fortescue partners with world’s largest steel maker to reduce emissions across iron and steel making](#). 14 June 2023

⁹¹ Fortescue. [FY23 Climate Change Report](#).

steelmakers instead of importing both iron ore and green hydrogen, as part of decarbonisation plans for an industry currently based on the import of iron ore and metallurgical coal.^{92,93}

In its assessment of options for Western Australia's iron ore industry to position itself for a decarbonising steel sector, the Minerals Research Institute of Western Australia (MRIWA) found that: "Pathways which involve the development of intermediate iron products, such as HBI, are the most prospective for Western Australia." The MRIWA noted that shifting towards green iron (HBI) production "represents the greatest economic opportunity" for Western Australia when it comes to positioning the iron ore industry for a low-carbon future.⁹⁴

A shift to green iron and steel will require a supply of green hydrogen, which Fortescue is planning to be able to supply itself. During FY2023, the company completed the construction of the Gladstone Electrolyser Manufacturing Centre. Fortescue Energy also plans to bring five green hydrogen/green ammonia projects to final investment decision. The projects are globally spread across the U.S., Australia, Kenya, Norway and Brazil.⁹⁵

Fortescue is also piloting a renewable energy-powered chemical electrolysis process to produce iron without coal or hydrogen. The pilot plant has processed 150kg of Pilbara iron ore and Fortescue is now looking to scale up the technology. The technology has an advantage over its electrochemical iron ore reduction competitors in the market due to its low temperature process.⁹⁶ It would also allow the production of green iron regardless of the quality of the iron ore used.

Summary

Fortescue's Scope 3 emissions target clearly leads its peers for ambition despite it producing lower iron content ore on average than Vale, BHP, Rio Tinto and Anglo American.

With its net zero Scope 3 by 2040 target in place, investors will now be keen to see more detail on how Fortescue attempts to meet it. Fortescue's new FY2023 Climate Change Report states: "We also have separate targets to eliminate emissions from our marine vessels by 2030 and achieve Net Zero Scope 3 emissions by 2040. We are presently developing our plans to meet these targets."⁹⁷

⁹² POSCO. [POSCO promotes the preemptive acquisition of low-carbon steel raw materials in Australia](#). 7 March 2023.

⁹³ Australian Financial Review. [World's biggest steel maker looks to WA for massive green investment](#). 12 May 2023.

⁹⁴ IEEFA. [Australia faces growing green iron competition from overseas](#). 1 September 2023.

⁹⁵ Fortescue. [FY23 Climate Change Report](#).

⁹⁶ Australian Financial Review. [Fortescue lab succeeds in turning iron ore into green iron](#). 23 March 2023.

⁹⁷ Fortescue. [FY23 Climate Change Report](#).

Vale

Vale is one of the big four global iron ore miners, with production of 308Mt in 2022. Previously also a miner of metallurgical coal, the company divested its coal operations in Mozambique in 2021.⁹⁸

The company's Scope 3 emissions were 478Mt CO₂e in 2022 (**Figure 6**). Scope 3 emissions make up 98% of Vale's total emissions (Scopes 1, 2 and 3), with steelmaking contributing the great majority of the 97% of total Scope 3 emissions that are downstream in the value chain. Vale's 2022 Integrated Report stated: "The mining sector will have to focus on decarbonization initiatives that also address Scope 3 emissions."⁹⁹

Vale has a target to reach net zero emissions by 2050 but this does not include Scope 3. It has a target to reduce Scope 3 emissions by 15% by 2035. In 2022, Vale's Scope 3 emissions had reduced 14%, almost meeting the target, measured against the base year of 2018 (adjusted for divestments including the metallurgical coal operations). Vale has noted that it expects its Scope 3 emissions to rise in the shorter term in line with increasing iron ore output and sales. The company will review its target in 2025 and every five years thereafter.¹⁰⁰

Figure 6: Vale's Scope 3 Greenhouse Gas Emissions



Source: Vale Integrated Report 2022.

Base year 2018 Scope 3 emissions reduced from 585Mt of CO₂e to 553Mt CO₂e, due to divestments in coal and ferroalloys assets, manganese operations (except Simões Filho plant), Centro-Oeste System and Vale Nickel (Dalian) Co., carried out in 2022.

Vale's 14% drop in Scope 3 emissions is largely a result of it choosing 2018 as its base year – the year before the Brumadinho tailings dam disaster, which killed 270 people.¹⁰¹ The disruption

⁹⁸ Vale. [Vale announces the sale of its coal assets](#). 21 December 2021.

⁹⁹ Vale. [Integrated Report 2022](#).

¹⁰⁰ Vale. [Integrated Report 2022](#).

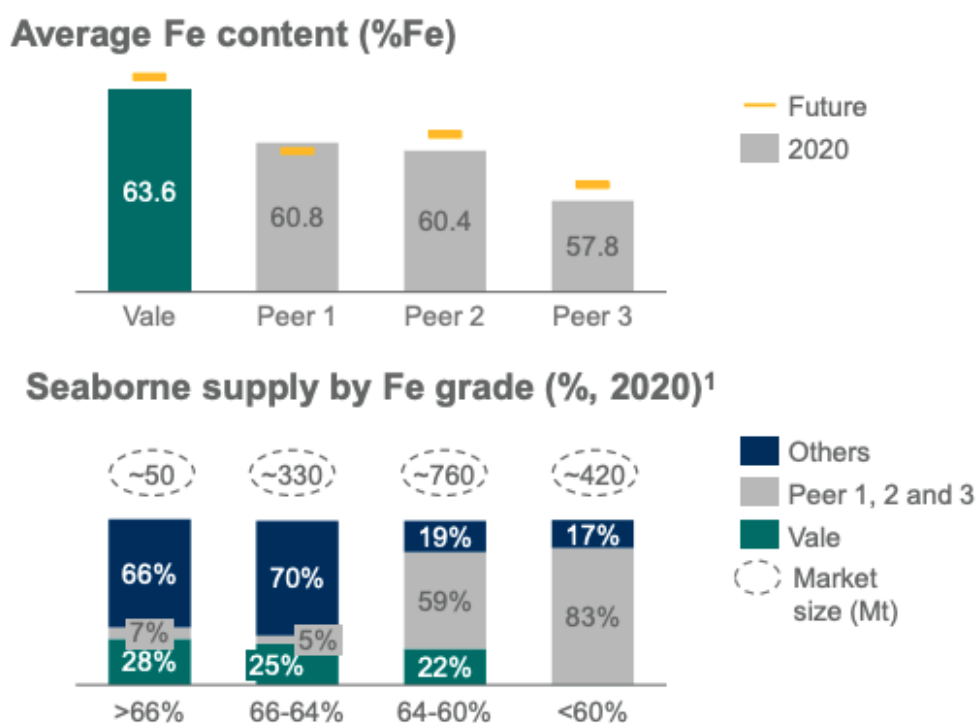
¹⁰¹ BBC. [Vale dam disaster: \\$7bn compensation for disaster victims](#). 4 February 2021.

to operations caused by the disaster led to a significant fall in iron ore sales, and consequently, a significant drop in Scope 3 emissions.¹⁰²

In this context, Vale’s target to reduce Scope 3 emissions by 15% by 2035 against a 2018 base looks unambitious and unimpressive. Vale is the world’s leading producer of high-grade iron ore, putting it in a better position to supply low-carbon DRI-based steelmaking operations than its peers (**Figure 7**). The company should be a leader in steel supply chain Scope 3 emissions reduction efforts.

Vale considers that it has an advantage over the other major iron producers when it comes to the steel technology transition towards DRI-based steelmaking. Its DR-grade ore can be used in standard and well-established DRI-EAF operations without the need for an additional melting furnace step required to enable blast furnace-grade ore in DRI processes.¹⁰³

Figure 7: Average Iron Content of Vale vs. its Peers (BHP, Rio Tinto and Fortescue)



Source: Vale.

¹ Considering final products’ sales grade, including blended products. Does not include Chinese domestic production.

¹⁰² Vale. [Vale’s production and sales in 4Q19 and 2019](#).

¹⁰³ Vale. [Iron Solutions webinar Decarbonization of steel and impacts in iron ore supply](#). 14 April 2023.

Latest developments

Vale's approach to reducing Scope 3 emissions is based on three pillars: high-quality iron ore production; partnerships with its customers and suppliers; and a willingness to use carbon credits for up to 20% of its 2035 target.

Vale – the world's leading producer of DR-grade iron ore – projects that by 2030, global DRI/HBI production will increase 55% to 200 million tonnes per annum (Mtpa), and demand for seaborne DR-grade iron ore will more than double to 110Mtpa. Vale sees DR-grade ore demand continuing to rise beyond 2030 and that demand for benchmark 62% (blast furnace-grade) iron ore has now entered permanent decline.¹⁰⁴

Vale forecasts that a DR-grade demand-supply gap of around 70Mtpa could emerge by 2030 and it is intending to fill much of that gap, with the company focusing more on raising the quality of its iron ore output than the quantity. Vale is following three major strategies to fulfil this.

The first is focused on increasing concentration capacity, aiming to produce a greater quantity of iron ore concentrate to supply agglomeration plants. Major plans include tailings filtration, dry concentration, utilisation of third-party concentration facilities, and ore concentration in its Northern System mining area in Brazil. These initiatives are aimed at providing high-quality feedstock to agglomeration plants.¹⁰⁵

Secondly, Vale is increasing the capacity of high-grade agglomerates via an innovative briquetting solution. Iron ore briquettes will be produced from the agglomeration of high-grade iron ore at low temperatures. The company's target is to triple the production of high-grade iron ore pellets and briquettes to 100Mt after 2030.¹⁰⁶

Creating "Mega Hubs" in high-potential regions is the third strategy. The concept behind these Mega Hubs is to transport Vale's high-grade iron ore fines to strategically located centres in the Middle East, Brazil and potentially the U.S., where they are processed and agglomerated into pellets or briquettes. The pellets and briquettes will be supplied to DRI-based operations located within the hubs for the production of HBI. The resulting HBI will be either supplied to EAF operations within the hubs for processing into steel or transported to external customers.¹⁰⁷ In 2022, the company signed agreements to create Mega Hubs in Saudi Arabia, UAE and Oman. Vale will build and operate iron ore concentration and briquetting plants within the hubs.¹⁰⁸

The suitability of Brazil's high-grade iron ore for the type of low-carbon DRI-based iron and steelmaking that will become increasingly prevalent is already being demonstrated. In May 2023,

¹⁰⁴ Vale. [Iron Solutions webinar Decarbonization of steel and impacts in iron ore supply](#). 14 April 2023.

¹⁰⁵ Vale. [Iron Solutions webinar Decarbonization of steel and impacts in iron ore supply](#). 14 April 2023.

¹⁰⁶ Vale. [Vale begins load tests in the first iron ore briquette plant in Brazil](#). 31 August 2023.

¹⁰⁷ Vale. [Iron Solutions webinar Decarbonization of steel and impacts in iron ore supply](#). 14 April 2023.

¹⁰⁸ Vale. [Integrated Report 2022](#).

Vale announced it had signed a MoU with GravitHy to jointly evaluate a hydrogen-based DRI plant in France. The intention is to begin production as soon as 2027, with Vale supplying the DR-grade iron ore. The DRI produced is planned to be used directly or traded globally as HBI.¹⁰⁹

In August 2023, H2 Green Steel – which is aiming to produce steel using green hydrogen from 2025 – agreed a multi-year deal with Vale that will see it supply the steelmaker with DR-grade iron ore pellets.¹¹⁰ Following this, in September 2023 it was announced that Vale and H2 Green Steel will together examine the development of green industrial hubs in Brazil and North America in which green hydrogen and green iron would be produced using Vale's iron ore.¹¹¹ China Baowu has also reportedly held talks with Vale about future cooperation on mineral resources and low-carbon metallurgical technology.¹¹²

In September 2023, Vale signed an agreement with the Port of Açú to investigate development of a Mega Hub in Brazil that will HBI via gas-based DRI that could later switch to green hydrogen. Vale CEO Marcello Spinelli stated: “We believe that Brazil has great potential to be a hub for low-carbon steelmaking. We have high-quality iron ore, abundant natural gas reserves and the potential to develop green hydrogen. As a Brazilian company, Vale seeks to partner with ventures that contribute in this direction. We want to be the driving force behind Brazil's ‘neo-industrialization’, which will be based on green industry.”¹¹³

Summary

Vale's use of 2018 as the base year for its 2035 Scope 3 emissions target will appear unimpressive to many investors. The company foresees that its Scope 3 emissions will increase going forward as its iron ore output increases, but using the year before the Brumadinho disaster as the base year means that Vale virtually reached its 2035 target to reduce Scope 3 emissions by 15% in 2022, highlighting how unambitious it is.

As the world's leading producer of high-grade iron ore, Vale should be leading the iron ore majors on Scope 3 emissions. Investors will increasingly expect meaningful Scope 3 emissions reductions targets and to see more ambition upon Vale's next review of its target in 2025, by which time the acceleration in the steel technology transition will be even more apparent.

¹⁰⁹ Vale. [Vale and GravitHy sign MoU to develop a plant dedicated to direct reduction iron ore briquettes production](#). 9 May 2023.

¹¹⁰ H2 Green Steel. [H2 Green Steel and Vale in agreement for the supply of direct reduction iron ore pellets](#). 9 August 2023.

¹¹¹ Vale. [Vale and H2 Green Steel sign agreement to study the development of green industrial hubs in Brazil and North America](#). 6 September 2023.

¹¹² Reuters. [China Baowu wants new models of cooperation with Vale](#). 4 August 2023.

¹¹³ Vale. [Vale and Port of Açú sign agreement to develop a Mega Hub for the decarbonisation of steelmaking](#). 26 September 2023.

Anglo American

Anglo American mines both iron ore and metallurgical coal. With iron ore production of 59Mt from operations in South Africa and Brazil in 2022, it is not at the same scale as the big four iron ore miners. Coal production totalled 15Mt (including 1.6Mt of thermal coal) and the company is the third largest exporter of metallurgical coal globally.¹¹⁴

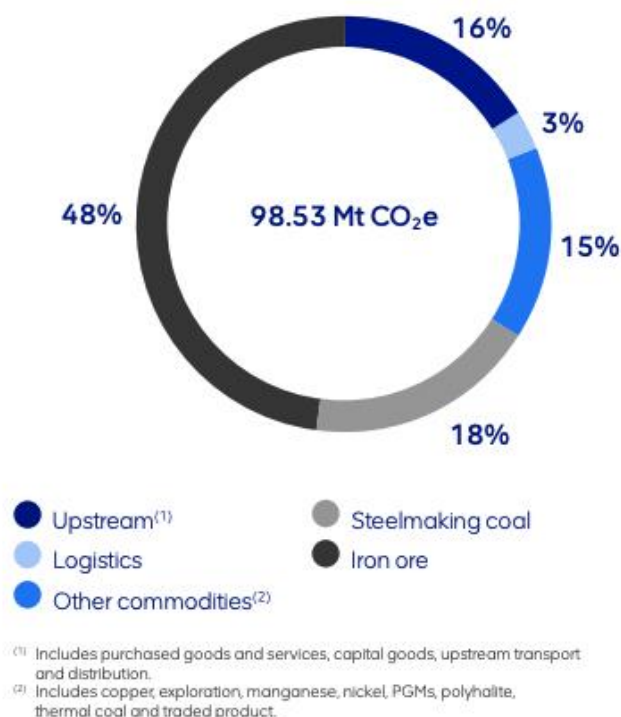
Despite being a significantly smaller miner of iron ore compared with the big four, downstream steelmaking emissions arising from its iron ore and metallurgical coal sales still dominate its Scope 3 emissions (**Figure 8**). Scope 3 emissions totalled 98.5Mt CO₂e in 2021, a 14% drop on the previous year (Anglo American reports Scope 3 emissions on a one-year lag). This drop was primarily due to an increase in the proportion of its iron ore sold to DRI-based steelmaking operations (~20% in 2021 vs ~10% in 2020), which are significantly less carbon-intensive than blast furnaces, even when run on gas rather than green hydrogen.¹¹⁵

Anglo American has a target to cut its Scope 3 emissions by 50% by 2040, though its 2050 net zero target applies only to Scope 1 and 2. The company's higher interim ambition compared with others will be assisted by its relatively high grade of iron ore production.

¹¹⁴ Anglo American. [Integrated Annual Report 2022](#).

¹¹⁵ Anglo American. [Climate Change Report 2022](#).

Figure 8: Anglo American's 2021 Scope 3 Emissions



Source: Anglo American Climate Change Report 2022.

Anglo's Minas-Rio operation in Brazil produces iron ore with a 67% Fe content, a grade high enough to supply lower-carbon DRI-based steelmaking customers. Anglo's Kumba Iron Ore operations in South Africa also produce a higher grade of iron ore than Pilbara operations (**Figure 9**). Kumba Iron Ore is one of the largest iron ore miners globally that beneficiates its product before sale.¹¹⁶

The company expects that steelmakers' shift towards DRI-based steelmaking to cut carbon emissions will "rapidly grow demand for higher quality iron ore pellet feed". As a result, Anglo is intending to increase the proportion of its iron ore output that is suitable for DRI.¹¹⁷ The company foresees that DRI production could grow very significantly, potentially quadrupling by 2050 and boosting demand for DR-grade iron ore by 400Mt.¹¹⁸

Since 2021, Anglo American signed MoUs with three key steelmaking customers that account for 20% of its iron ore sales – Saltzgitter, Thyssenkrupp and Nippon Steel – to partner in developing low-carbon steel technology solutions.¹¹⁹

¹¹⁶ Kumba Iron Ore. [Climate Change Report 2022](#).

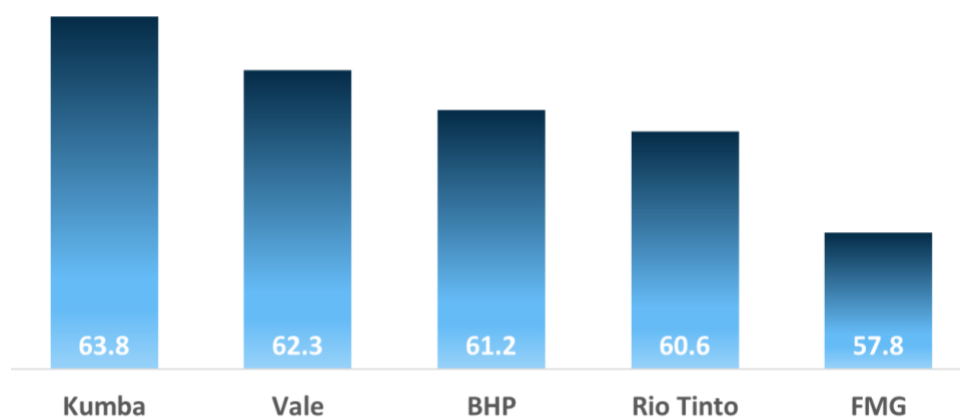
¹¹⁷ Anglo American. [Climate Change Report 2022](#).

¹¹⁸ Kumba Iron Ore. [Climate Change Report 2022](#).

¹¹⁹ Anglo American. [Climate Change Report 2022](#).

In April 2023, the company announced another MoU with H2 Green Steel, which is planning to start producing steel using green hydrogen from 2025.¹²⁰ The agreement will see ore from Anglo American's South African and Brazilian operations trialed in H2 Green Steel's DRI process in Sweden.¹²¹

Figure 9: Kumba Iron Ore Fe% vs the Big Four Iron Ore Producers



Source: Kumba Iron Ore.

¹ Vale excludes pellets.

Metallurgical Coal

Anglo also highlights that it produces high-quality metallurgical coal, which allows blast furnaces to operate with lower emissions. However, its long-term outlook for this product has started to change over the last couple of years. In 2021, former CEO Mark Cutifani said that metallurgical coal would still be needed over the next 15-20 years, though he also noted that: “I don't think we are going to be a significant producer beyond 2035-40 to be frank.”¹²²

Since then, Anglo's view on how long the technology transition away from coal-consuming blast furnaces will take appears to have shortened. In April 2023, in response to a question about Anglo's commitment to metallurgical coal mining, its current CEO Duncan Wanblad said that the company's position had not changed but he shortened Anglo's expectation on the timeframe for the steel industry's technology transition to 10-15 years.¹²³ The company's 2022 Climate Change Report highlights the risk that limited CCUS development could increase the technology shift away from blast furnaces to DRI-based steelmaking.¹²⁴

¹²⁰ H2 Green Steel. [H2 Green Steel raises €1.5 billion in equity to build the world's first green steel plant](#). 7 September 2023.

¹²¹ Anglo American. [Anglo American partners with H2 Green Steel to advance low carbon steelmaking](#). 4 April 2023.

¹²² Australian Mining. [Anglo American talks up met coal future](#). 20 May 2021.

¹²³ Anglo American. [Sustainability Performance Update](#). April 2023.

¹²⁴ Anglo American. [Climate Change Report 2022](#).

When it comes to Anglo American's long-term metallurgical coal exit, and its subsequent reduction in Scope 3 emissions, investors will increasingly be seeking a responsible plan. The company exited thermal coal mining via a sale to Seriti Resources¹²⁵ and a spin-off of its export-focused South African mines into Thungela Resources¹²⁶, a company that has been bullish on the outlook for thermal coal.¹²⁷

Summary

Anglo American's target to reduce Scope 3 emissions by 50% by 2040 likely reflects its higher-quality iron ore and hence its positive outlook for DR-grade iron ore demand in the future. It also likely informs its view that there is an approaching end date for the company's metallurgical coal-mining operations.

However, investors are likely to become increasingly unimpressed with divestment as tool to reduce company Scope 3 emissions given that such a move has no impact on overall global emissions and may even increase them if an asset's new ownership targets greater or longer mining production. Going forward, investors will look for responsible, meaningful and measurable emissions reduction targets, and the expectation for Anglo to manage down its metallurgical coal mine capacity, rather than offloading it as it did with its thermal coal mines, will grow.

¹²⁵ Anglo American. [Anglo American completes sale of Eskom-tied thermal coal operations in South Africa](#). 1 March 2018.

¹²⁶ Anglo American. [Anglo American completes demerger of Thungela thermal coal business](#). 7 June 2021.

¹²⁷ IEEFA. [A move into Australian coal mining doesn't change long-term outlook for Thungela](#). 6 March 2023.

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