

As filed with the Securities and Exchange Commission on April 12, 2023

UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 20-F

**ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d)
OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended: December 31, 2022

Commission file number: 001-15030

VALE S.A.

(Exact name of Registrant as specified in its charter)

Federative Republic of Brazil

(Jurisdiction of incorporation or organization)

Gustavo Duarte Pimenta, Executive Vice-President of Finance and Investor Relations

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Praia de Botafogo 186 – offices 1101, 1601, 1701 and 1801– Botafogo

22250-145 Rio de Janeiro, RJ, Brazil

(Address of principal executive offices)

Securities registered or to be registered pursuant to Section 12(b) of the Act:

Title of Each Class	Trading Symbol(s)	Name of Each Exchange on Which Registered
Common shares of Vale, no par value per share		New York Stock Exchange*
American Depositary Shares (evidenced by American Depositary Receipts), each representing one common share of Vale		
6.250% Guaranteed Notes due 2026, issued by Vale Overseas	VALE	New York Stock Exchange
3.750% Guaranteed Notes due 2030, issued by Vale Overseas	VALE/26	New York Stock Exchange
8.250% Guaranteed Notes due 2034, issued by Vale Overseas	VALE/30	New York Stock Exchange
6.875% Guaranteed Notes due 2036, issued by Vale Overseas	VALE/34	New York Stock Exchange
6.875% Guaranteed Notes due 2039, issued by Vale Overseas	VALE/36	New York Stock Exchange
5.625% Notes due 2042, issued by Vale S.A.	VALE/39	New York Stock Exchange
	VALE42	New York Stock Exchange

* Shares are not listed for trading, but only in connection with the registration of American Depositary Shares pursuant to the requirements of the New York Stock Exchange.

Securities registered or to be registered pursuant to Section 12(g) of the Act: None
Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act: None
The number of outstanding shares of each class of stock of Vale as of December 31, 2022, was:

4,778,889,251 common shares, no par value per share

12 golden shares, no par value per share

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes No

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934.

Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports) and (2) has been subject to such filing requirements for the past 90 days.

Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.010 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer Accelerated filer Non-accelerated filer Emerging growth company

If an emerging growth company that prepares its financial statements in accordance with U.S. GAAP, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report.

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements.

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b).

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP International Financial Reporting Standards as issued by the International Accounting Standards Board Other

If "Other" has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow.

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If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes No

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I. OVERVIEW

We are one of the largest metals and mining companies in the world, based on market capitalization, and one of the world's largest producers of iron ore and nickel. We also produce iron ore pellets and copper. Our nickel and copper concentrates contain by-products of platinum group metals ("PGMs"), gold, silver and cobalt. We are engaged in greenfield mineral exploration in six countries. We operate large logistics systems in Brazil and other regions in the world, including railroads, maritime terminals and ports, which are integrated with our mining operations. In addition, we have distribution centers to support the delivery of iron ore worldwide. Directly and through associates and joint ventures, we also have investments in the energy business.

In this report, references to "Vale" are to Vale S.A. References to "we," "us" or the "Company" are to Vale and, except where the context otherwise requires, its consolidated subsidiaries. References to our "ADSs" or "American Depositary Shares" are to our common American Depositary Shares (our "common ADSs"), each of which represents one common share of Vale. American Depositary Shares are represented by American Depositary Receipts ("ADRs") issued by the depositary.

Vale S.A. is a stock corporation, or *sociedade por ações*, that was organized on January 11, 1943, under the laws of the Federative Republic of Brazil for an unlimited period of time. Its head office is located at Praia de Botafogo 186 – offices 1101, 1601, 1701 and 1801 – Botafogo, 22250-145 Rio de Janeiro, RJ, Brazil, and its telephone number is 55-21-3485-5000.

Unless otherwise specified, we use metric units. References to "real," "reais" or "R\$" are to the official currency of Brazil, the *real* (singular) or *reais* (plural). References to "U.S. dollars" or "US\$" are to United States dollars. References to "€" are to Euros.

BUSINESS OVERVIEW

OPERATIONAL SUMMARY

The following table presents the breakdown of total net operating revenues attributable to each of our lines of business with continuing operations.

	Year ended December 31,					
	2022		2021		2020	
	US\$ million	% of total	US\$ million	% of total	US\$ million	% of total
<i>Iron solutions⁽¹⁾</i>						
Iron ore	28,188	64.3	38,324	70.3	27,123	68.6
Iron ore pellets	6,256	14.3	7,053	12.9	4,242	10.7
Other ferrous products and services	472	1.1	548	1.0	551	1.4
Iron solutions - total	34,916	79.7	45,925	84.2	31,916	80.7
<i>Energy transition metals⁽¹⁾</i>						
Nickel and other products ⁽²⁾	6,619	15.1	5,377	9.9	4,652	11.8
Copper ⁽³⁾	1,779	4.1	2,589	4.8	2,175	5.5
Energy transition metals - total	8,398	19.2	7,966	14.6	6,827	17.3
Other ⁽⁴⁾	525	1.1	611	1.1	802	2.0
Total net operating revenues from continuing operations	43,839	100	54,502	100	39,545	100

(1) In 2022 we renamed our main operating segments. The operating segment previously named "Ferrous Minerals" is now referred to as "Iron Solutions" while the "Base Metals" operating segment is now referred to as "Energy Transition Metals."

(2) Includes nickel co-products (copper) and by-products (cobalt, PGMs and other precious metals) and marketing activities.

(3) Does not include copper produced in our nickel operations.

(4) Includes manganese ferroalloy operations divested in January 2022.

Iron solutions

Iron ore. We operate three systems in Brazil for the production and distribution of iron ore:

- Northern System: fully integrated system consisting of three mining complexes and one maritime terminal.
- Southeastern System: fully integrated system consisting of three mines complexes, a railroad, a maritime terminal and a port.
- Southern System: consisting of two mining complexes and two maritime terminals.

Iron ore pellets. We currently have eight operational pellet plants in Brazil, and two in Oman.

Energy transition metals

Nickel. Our principal nickel operations are conducted through our wholly owned subsidiary Vale Canada Limited ("Vale Canada"), which has mines and processing plants in Canada and Indonesia, and controls and operates nickel refining facilities in the United Kingdom and Japan. We also have nickel operations at Onça Puma, located in the Brazilian state of Pará.

Copper. In Brazil, we produce copper concentrates at Sossego and Salobo operations, in Carajás, in the state of Pará. In Canada, we produce copper concentrates and copper cathodes in conjunction with our nickel mining operations at Sudbury (Ontario), Voisey's Bay (Labrador) and Thompson (Manitoba).

Cobalt, PGMs and other precious metals. Ore mined at our Sudbury nickel operations also yields cobalt, PGMs, silver and gold as by-products, processed at our refining facilities in Port Colborne, Ontario. In Canada, we also produce

refined cobalt at our Long Harbour facilities in Newfoundland and Labrador. We receive silver and gold as by-product credits from our copper operations at Salobo in Brazil.

BUSINESS STRATEGY

Our strategic guidelines are:

- Promote sustainable mining.
- Foster low carbon solution.
- Stay disciplined.

Promote sustainable mining

Our ambition is to be a sustainable and customer-centric materials company, with a balanced and resilient portfolio, recognized for using innovation to create solutions for our customers, being regionally diversified (with respect to assets and customers) and fostering partnerships. Below is a description of our plans and strategies to achieve these ambitions:

Benchmark in safety and dam management. We intend to continuously improve our processes for health, safety, environment and operational risk, prioritizing the use of technology to reduce risk, enhance controls and increase innovation to improve safety and dam management, and becoming a zero-fatality company.

- **Hazard Identification and Risk Assessment.** Our process safety program starts with the hazard identification and risk assessment (“HIRA”), by identifying the most critical process risks, and their respective controls. Monitoring the integrity of these controls has become part of our daily maintenance routine. For more information, see *Risk Management—Management of Specific Risks—Operational risks*.
- **Management Systems for Geotechnical Structures.** We intend to continuously enhance our Tailings and Dam Management System (“TDMS”), which is organized around four pillars: people, routine, performance and risk.
 - We are committed to the implementation of Global Industry Standard on Tailings Management (“GISTM”) in our operations. We expect to reach compliance with GISTM requirements: (i) in August 2023 for tailings storage facilities with extreme and very high consequence classification; (ii) in August 2025 for Tailings Storage Facilities (“TSF”) with high, significant, and low consequence classification, in compliance with the International Council on Mining and Metals (“ICMM”) timeline.
 - We are also implementing a Ground Control Management System (“GCMS”) which aims to improve the safety of geotechnical structures like waste dumps, open pits, and underground mines. We have defined strategic initiatives and Annual Incentive Payment goals related to the implementation of GCMS to engage the operational teams in initiatives like Geotechnical Review Boards and Integrated Operation Assessment.
 - We have also performed HIRA for all the TSFs and for critical dams, and the controls to reduce or mitigate the risks identified for the respective structures have been managed according to our risk management policy.
- **De-characterization of dams.** We are de-characterizing (according to Brazilian regulation) our upstream structures (including dams, dikes and drained piles) in Brazil. As of December 31, 2022, we had de-characterized 12 out of 30 upstream structures, of which five were de-characterized in 2022. For more information, see *Overview—Business overview—Our environmental, social and governance (“ESG”) framework* and *—Responses to the tailings dam collapse in Brumadinho*.

Best-in-class operator. We intend to be a reliable operator, by rigorous adherence to our management model principles know as Vale Production System (“VPS”), including greater production discipline, commitment to routine, adherence to plan and use of technology and best practices. We have been implementing our VPS, which integrates our processes and systems into one single framework, enabling us to work with unified objectives and in a standardized way. The VPS fosters the creation of a safer work environment and a more effective problem resolution process. It is composed of three dimensions: leadership, technical and method, which strengthen our organizational culture through people development, standardization of best practices, operational discipline and compliance with routine. With this, we will redefine the path to operational excellence as a more humane, safer and sustainable company. All our employees are being trained to support full engagement with VPS.

Diversity, Equity and Inclusion. We intend to put people at the center and make people of various backgrounds feel welcome and guarantee they have support to perform to the fullest of their skills in the workplace. For our targets relating to diversity, equity and inclusion, see *Overview — Business overview — Our environmental, social and governance (“ESG”) framework—Social*.

Nature-positive; shared value. We intend to continuously make sustainability and social value embedded in our strategies and driving the decision-making, while exploring nature-based solutions, supporting the industry decarbonization, biodiversity initiatives and creating value to our communities. For our targets relating to emissions, see *Overview — Business overview — Our environmental, social and governance (“ESG”) framework—Environment*.

Foster low carbon solutions

We have the ambition to lead low carbon mining as the partner of choice with rich product-based portfolio suited to future uses and a flexible approach to adapt to evolving technologies.

Focus on high-quality products. We believe that energy transition is a great growth engine of the next mining cycle. We also believe that high-quality iron ore, nickel and copper are among the main demanded commodities. Our strategy consists of securing and developing high-grade ore feed and seeking to be among the nickel and copper producers with the lowest carbon emissions.

Iron solutions. Our plan is to lead the development of zero- and low-carbon emission solutions for ironmaking through a customer-centric approach, fast product development and customized business models, including by:

- Developing and guaranteeing iron ore concentration solutions.
- Optimizing product portfolio with higher-grade products.
- Fostering metallics hubs initiatives with partners, offering high quality agglomerates.

Energy transition metals. Our plan is to debottleneck the supply of sustainable energy transition metals through an agile project development and flexible approach to adapt to evolving technologies, including by:

- Expanding copper production to approximately 900 ktpy after 2030.
- Being the preferred nickel supplier to the electric vehicle industry, with 30% to 40% of our Class I nickel supplied to the electric vehicle market.
- Accelerating growth through our energy transition operations by seeking partnerships.
- Pursuing selective inorganic growth.

Circular mining. We expect to help solving mining’s huge waste generation issue by leading the promotion of new technologies and selectively engaging in circular economy, including by:

- Leveraging concentration technologies to reprocess iron ore tailing.
- Leading supplier of energy transition metals from slag, ponds, recycled e-waste and battery raw materials.
- Developing competitive outbound logistics.

Stay disciplined

We reaffirm our strong commitment to a sound balance sheet, a lean business portfolio and value creation for our stakeholders. Below is a description of our plans and strategies to achieve this ambition:

Efficient capital allocation. Our plan is to maximizing shareholders’ return by staying disciplined in capital allocation driven by cost discipline, an optimized balance sheet structure, and efficient capital allocation among projects (risk/return analysis). We plan to foster a culture of cost performance, seeking efficiency and best practice opportunities in production, maintenance, procurement and corporate activities.

Attractive cash returns to shareholders. We aim to be a strong cash generator and return excess to shareholders, based on our solid dividend policy and robust buyback program.

Strong balance sheet. Our plan is to constantly manage our liabilities, evaluate capital market opportunities, and seek to maintain our credit rating.

SIGNIFICANT CHANGES IN OUR BUSINESS

We summarize below major events in our business since the beginning of 2022.

Divestments

Divestments are in line with our strategic pillar of capital discipline, continued focus on our core businesses and commitment to a lean portfolio. Below is a summary of the divestments and agreements for sale of assets since the beginning of 2022:

Sale of interest in Companhia Siderúrgica do Pecém (“CSP”). On March 9, 2023, we and our joint venture partners concluded the sale of our entire equity interests in CSP to Arcelor-Mittal Brasil S.A. (“Arcelor-Mittal”). The purchase price was US\$ 2,194 million, which will be entirely used to prepay the outstanding net debt balance of approximately US\$2.3 billion. We had a 50% equity interest in CSP, a steelmaker plant with installed capacity of 3 million tons of steel slabs/year, located in the State of Ceará, Brazil.

Sale of Midwestern System assets. In July 2022, we concluded the sale of all the shares issued by Mineração Corumbaense Reunida S.A., Mineração Mato Grosso S.A., International Iron Company, Inc. and Transbarga Navegación Sociedad Anónima, which hold our iron ore, manganese ore and logistics assets in the Midwestern System, to J&F Mineração Ltda. (“J&F”). At closing, we received approximately US\$140 million, in addition to transferring to J&F obligations related to certain take-or-pay logistics contracts.

Nickel refinery. In July 2022, we sold our 25% indirect stake in Korea Nickel Corporation, which operates a nickel refinery in South Korea, through a treasury stock repurchase transaction. Korea Nickel Corporation used to produce finished nickel for the stainless-steel industry operations using intermediate products from Vale Nouvelle-Calédonie S.A.S. (“VNC”), but that ceased in 2021 in connection with the sale of our investment held in VNC. We received approximately US\$17.4 million at the closing of the transaction.

Sale of Coal Assets. In April 2022, we concluded the sale of our coal operations, consisting of Moatize mine and the Nacala Logistics Corridor (“NLC”) to Vulcan Resources (formerly Vulcan Minerals) for US\$270 million, plus a 10-year royalty agreement subject to certain mine production and coal price conditions.

Sale of ownership in California Steel Industries (“CSI”). In February 2022, we sold our 50% ownership interest in CSI to Nucor Corporation (“Nucor”), for approximately US\$437 million. Upon completion of the transaction, we recorded a gain of US\$292 million.

Sale of Ferroalloys and Manganese operations of Vale Manganês. In January 2022, we sold our ferroalloys operations in Barbacena and Ouro Preto and our manganese mining operations at Morro da Mina, in the state of Minas Gerais, to VDL Group (“VDL”) for a total consideration of US\$40 million, on a debt-free cash-free basis. In May 2022, we signed a binding agreement with Minas Ligas for a partial sale of the assets of the Simões Filho plant for US\$11 million, as a result, we no longer have manganese ferroalloys operations.

Sale of small hydroelectric plants. In 2022, we concluded the sale of the small hydroelectric plants of Glória and Nova Maurício, both located in Minas Gerais, for approximately US\$6 million.

Sale of Vale Nickel Dalian. In August 2022, we sold all of our shares in Vale Nickel Dalian Co., Ltd. to Dalian Xingbo Mechanical Co., Ltd. for US\$28 million plus certain VAT offset amounts.

Other developments

Vale Oman Pelletizing Company LLC (“VOPC”). In February 2023, OQ Group exercised its option to sell its 30% noncontrolling interest held in VOPC. Upon closing of the transaction, which is expected to take place in the second quarter of 2023, we will acquire the remaining interest for approximately US\$130 million. With the acquisition, we will own 100% of VOPC’s share capital.

Agreements to develop Mega Hubs in the Middle East. In October 2022, we entered into three non-binding memorandums of understanding and cooperation with local authorities and customers to jointly study the development of industrial complexes (“Mega Hubs”) in the Kingdom of Saudi Arabia, the United Arab Emirates, and the Sultanate of Oman to produce low-carbon products to the steelmaking industry. The parties are seeking to cooperate in the development of these Mega Hubs to produce hot briquetted iron (“HBI”) and steel products to supply both the local and seaborne markets, with significant reduction of CO₂ emissions. We intend to build and operate iron ore concentration and briquetting plants within the Mega Hubs, securing supply of high-grade agglomerated products. Local parties are expected to promote the construction of the required logistics infrastructure. Investors and/or clients are expected to construct and operate the HBI plants and be offtakers of the product to supply domestic markets or export. These Mega Hubs shall supply different markets across the globe supporting the decarbonization of the steelmaking industry.

Tecnored plant. In May 2022, we started the engineering works for Tecnored’s first commercial plant in Marabá, in the state of Pará. Tecnored is 100% owned by us and is focused on developing a low-carbon pig iron process by using alternative energy sources, such as biomass, syn-gas and hydrogen that emit less CO₂ than coal and coke, the traditional iron-making methods. The plant will initially have a production capacity of 250 thousand tons per year of green pig iron and may reach 500 thousand tons per year in the future. The start-up is planned for 2025 with an estimated investment of approximately US\$374 million.

Rio Tocantins railroad bridge. In March 2022, we approved the construction of a new railroad bridge over the Tocantins River, in the municipality of Marabá, state of Pará. This project will increase the Carajás railroad (“EFC”) capacity, improving rail traffic flow, as well as mitigating business risks, by duplicating the existing single line bridge. The project is expected to start up in 2027 with a total investment of US\$830 million and includes a second road bridge for automotive traffic that will enhance the link between the southeast of the state of Pará and the Brazilian northern coast. The current single bridge is part of the EFC railway, through which we ship all our iron ore production from the Northern System as well as the copper concentrate produced in the state of Pará.

Steelmaking decarbonization solutions. In 2022, we entered into a memorandum of understandings (“MoUs”) with different steelmakers to pursue ironmaking solutions focused on steelmaking decarbonization process. These MoUs contemplate joint studies and other initiatives with respect to the (i) usage of our green iron ore briquettes and direct reduction pellets in steelmaking, (ii) a briquette plant in Germany, (iii) the Tecnored technology, (iv) use of metallics solutions such as hot briquetted iron (“HBI”) and pig iron produced by Tecnored technology, and (ii) usage of our so-called green briquettes in ironmaking process and other lower carbon footprint products such as pellets.

For more information about our projects, see *Information on the Company—Capital expenditures*.

Consolidation of Energy Transition Metals Business in New Entity

In line with our energy transition strategy, we have been working on the carve-out of our energy transition metals business, which will be consolidated in a new company, with its own board of directors. We intend to enter into an agreement with a strategic partner to acquire a minority interest, which we believe will potentially accelerate the value creation agenda of the energy transition metals business.

OUR ENVIRONMENTAL, SOCIAL AND GOVERNANCE (“ESG”) FRAMEWORK

We are committed to fully integrating sustainability into our business through a comprehensive approach based on systematic planning and execution, prioritizing risk and impact management, and establishing a positive social, economic and environmental legacy in the places where we operate. Our practices related to ESG are evolving.

In 2022, we launched our second Integrated Report, in accordance with the International Integrated Reporting Council (“IIRC”) as well as to Global Reporting Initiative (“GRI”) standards. The report presents a performance approach and an appendix – the ESG Databook, with indicators from the GRI; the Metals and Mining segment of the Sustainability Accounting Standard (“SASB”); the Task Force on Climate-related Financial Disclosures (“TCFD”); core metrics of the World Economic Forum (“WEF”) and Sustainable Development Goals (“SDGs”). It also presents our adherence to ICMM’s Mining Principles.

We have been increasing our engagement with socially responsible investors and key ESG stakeholders through webinars, roadshows and a dedicated website, our ESG Portal (www.vale.com/esg). The information in our ESG Portal is not incorporated by reference in this annual report on Form 20-F. Based on studies from leading ESG advisors, we have identified 63 major gaps with respect to ESG best practices. Based on this assessment, we mapped out an ESG action plan to address these gaps. By December 31, 2022, we had closed 57 gaps. After the collapse of the tailings dam in Brumadinho, we decided to strengthen our interactions with ESG stakeholders to discuss a range of strategy, risk and governance-related matters and accelerate our ESG initiatives. We are committed to eliminating our ESG gaps by 2030 (our “2030 Commitments”).

Below are the highlights of our main ESG accomplishments in 2022 and ongoing initiatives.

Environmental

Climate Change. We are committed to leading the transition towards a net-zero mining industry. We are also committed to contributing with solutions that will help limit the increase in the average global temperature to well below 2°C, as set forth in the Paris Agreement. We endorsed and we are aligned with the Task Force on Climate-related Financial Disclosures (“TCFD”) framework for risks and opportunities related to climate change. We published the 2021 Climate Change report, following TCFD recommendations and we assessed transition risks (possible impacts in our portfolio) and physical risks (mapped physical impacts for our operations). For more information, please see <https://www.vale.com/web/esg/climate-change>. Information in our website is not incorporated by reference in this annual report on Form 20-F.

We are focused on the decarbonization of our operations, and we plan to reduce our Scopes 1 and 2 absolute emissions by 33% by 2030, with 2017 as baseline, and to become Scope 1 and 2 net-zero emissions by 2050. We recognize that we can only lead the mining industry towards a low carbon economy if we lead our value chain in the same direction. Our Scope 3 emissions, annually calculated and verified by independent third parties, represent 98% of our total emissions and are not under our direct control. We are committed to reduce Scope 3 net emissions by 15% by 2035, with 2018 as baseline, which is based on development of new products, nature-based solutions, partnership and engagement with clients and suppliers. The Scope 3 target will be revised every five years, given the uncertainties regarding low carbon technologies and climate policies.

Scopes 1 and 2 decarbonization plan. We have built a roadmap, with clear milestones, to meet the reduction targets in Scopes 1 and 2. We plan to invest US\$4 to US\$6 billion until 2030 to develop low carbon solutions, such as biofuels use, electrification and renewable electricity generation. Our current portfolio of initiatives consolidates more than 40 projects, prioritizing the most cost-competitive initiatives to achieve the 2030 target, based on a Marginal Abatement Cost Curve (“MAC Curve”). All investment decisions are submitted to an analysis considering internal carbon price of US\$50 per ton of CO₂ equivalent. This practice not only encourages investments in greenhouse gas (“GHG”) emission reduction, but also prepares us for a scenario of more restrictive regulations. We intend to reduce GHG in our operations by increasing the processes’ energy efficiency, and by developing solutions based on replacing usual energy sources by low carbon and renewable alternatives. These initiatives include, among others, the use of biofuels replacing fossil

fuels, electrification of equipment and processes, use of alternative fuels, carbon capture technologies, and development of alternative processes.

Scope 3 decarbonization plan. More than 90% of our Scope 3 emissions relate to the processing of the iron ore in the steel industry. Scope 3 reduction is subject to the pace at which customers' CO₂ reduction roadmaps will be implemented. Our initiatives for Scope 3 reduction are: (i) portfolio differentiation, with high-quality products, biomass, and low CO₂ technologies and low carbon solutions such as Mega Hubs and green briquettes; and (ii) partnerships in shipping and in the steel sector. We can offset up to 20% of the target with high-integrity carbon credits.

Our goal is to increase the production of agglomerated products, briquettes and pellets, to supply high-quality products to the market and further develop low carbon footprint initiatives, as well as to provide green solutions to the market, such as Mega Hubs.

To provide low carbon solutions to the steel industry, we have signed MoUs with over 30 companies representing around 50% of our scope 3 emissions, in which the companies agreed to pursue opportunities to develop steelmaking solutions focused on reducing CO₂ emissions.

Additionally, we have signed an MoU addendum with Posco related to the development of ironmaking solutions with the intent to develop economic feasibility studies of potential investment in direct reduction plants to produce hot briquette iron ("HBI"), a low-carbon and eco-friendly raw material for steel production, and an MoU with XCMG Construction Machinery Limited to evaluate the potential supply of mining and infrastructure equipment, including zero-emission and autonomous equipment.

In 2022, we made progress on our Climate Agenda with new technologies being tested on ships that are used to transport our iron ore and iron ore agglomerate. Our EcoShipping initiative manages a roadmap of innovative technologies aligned with the International Maritime Organization targets, with projects on energy efficiency (e.g., rotor sails and air lubrication) and alternative fuels (e.g., multi-fuel tank). In July 2021, the first large ore carrier equipped with rotor sails arrived at the Tubarão port. The system will allow an energy efficiency increase of up to 8% per vessel per year. In August 2021, the first ore carrier with air-lubrication technology, which we estimate could reduce fuel consumption by around 5 to 8%, arrived at Ponta da Madeira port.

Since 2020 we have spent US\$810 million on the efforts to reduce greenhouse gas emissions and mitigate climate change, of which US\$543 million were spent in 2022.

Energy. The three pillars of our energy initiatives are: (a) renewable electricity, (b) energy efficiency and (c) energy matrix transformation. Our targets are to (i) achieve 100% renewable electricity consumption in Brazil by 2025, and globally by 2030, and (ii) improve by 5% the global energy efficiency indicator (specific consumption) in relation to the 2017 baseline by 2030. In 2022, we were close to reaching our goal of 100% renewable energy in Brazil, but due to the consumptions from Manganese and Midwestern system we reached 99.95% of our electricity consumption in Brazil and 86.67% globally came from renewable sources. By December 2022, we had concluded the implementation of nine of the 17 photovoltaic units in the Sol do Cerrado Solar Power Generation Project under operation, which we expect to supply 16% of our annual estimated demand for Brazil in 2025.

Water. The responsible management of water resources is present in our organizational culture. By means of four pillars (Governance, Monitoring and Control, Community Engagement and Water Risk Management), we endeavor to promote responsible water management in the regions where we operate. In this context, in 2018, we committed to reduce by 10% the use of natural water in our production processes by 2030. That goal was achieved and surpassed in 2021 (with a 20% reduction).

Forest conservation. Our ambition is to act as a global catalyst for forest conservation and reforestation. Currently, we help to protect approximately one million hectares of forest as compensation measures, voluntary initiatives and partnerships. By 2030, we intend to recover and protect 500,000 hectares beyond its borders. The target is broken down into two objectives. The first is to recover 100,000 hectares through production arrangements and social and environmental impact businesses. The second is to protect 400,000 hectares through partnerships to support public

protected areas and initiatives such as REDD+ projects (Reducing Emissions from Deforestation and Forest Degradation). In 2022, we recovered 1,214 hectares and protected 50,000 hectares.

Waste. In 2020, we approved our Mining and Metallurgical Waste Management Policy to encourage the transition of our waste management to a circular economy perspective. We believe that this transition would be possible through innovation. In addition, in 2022, we achieved 79.26% compared to 2021, when we achieved 70% of our iron ore production by dry processing method, in line with our goal of having at least 70% of our total production coming from dry processing. To sustain this target at an iron ore production level of 340-360 million metric tons per year ("Mtpy"), we are implementing several initiatives, such as our blending strategy, the expansion of Northern System to 240 Mtpy, the Capanema project implementation and the conversion of Plant 1 in Serra Norte to dry processing. In 2021, we announced the development of a commercial quality sand for civil construction applications – a sustainable alternative for the construction industry. These efforts are the result of seven years of research and approximately R\$50 million in investments.

Social

Social ambition. In the social dimension, we want to be a partner company in the development of resilient communities, engaged in issues relevant to humanity and committed to sustainable mining. The Brumadinho dam collapse forever changed the way in which we operate. We will never forget Brumadinho, nor will we ever stop working to fully repair its impact.

Human Rights. We are committed to the United Nations Guiding Principles on Business and Human Rights ("UNGPs"). Our Global Human Rights Policy, in place since 2009, reinforces the guidelines related to Human Rights management and allows for greater alignment with the UNGPs. Human Rights is part of our Global Risk Integrated Map and our operations register their human rights risk assessment, mitigation controls and action plans in our global risk management system.

We are committed to performing Human Rights Due Diligence ("HRDD") in all of our operations and critical projects in 3-year cycles. By the end of 2022, 76% of our operations had gone through human rights due diligence (including 100% of active operations in Brazil). The remainder are operations abroad that will be covered throughout 2023 and 2024. Our Human Rights department monitors the risk controls and the action plans of the external due diligence carried out.

Community engagement. Our operating model is guided by the following principles: transparency, active listening, social participation, engagement, social capacity, diversity and inclusion, adherence to international pacts and operational responsibility. We seek to establish structured dialogue spaces for the construction of Community Engagement Plans. Such plans are structured through a model of shared responsibilities between us, the community and other players for local development, and have as foundational principle the mobilization and social participation in the definition and prioritization of initiatives to be implemented in the territory.

The Engagement Plans are monitored by the community engagement teams, which have a systematic routine of participatory meetings to monitor the execution of actions, evaluating the adherence and effectiveness of the results with the community. In 2022, we mapped out 1,532 local relationship communities - 1,156 in Brazil, 82 in Canada, 2 in Wales, 51 in Peru, 1 in Chile, 28 in Oman, 206 in Indonesia and 6 in Malaysia. In Brazil, 165 communities are considered very high or high priority for engagement. Currently, 78% of the high and very high priority communities have implemented an Engagement Plan, and we expect to have 100% of priority communities with plans by 2026.

Indigenous Peoples and Traditional Communities. We are committed with all relevant international standards, such as the International Council on Mining and Metals ("ICMM") position statement on Mining and Indigenous Peoples, Convention No. 169 of the International Labor Organization ("ILO"), and the United Nations Declaration on the Rights of Indigenous Peoples. In the past years, we have entered into agreements with indigenous groups in Brazil, including Xikrin do Cateté, Kayapó, Gavião (Parkatejê, Kykatejê, Akrantikatejê), in Pará State. These agreements reflect our social share value proposition and provide for a better neighborhood relationship between our operations and the indigenous lands.

Grievance Mechanism. We make available for our stakeholders of several listening channels (Hello Railway – toll free number, Reparation Call Center, Contact Us and Community Engagement Team). These mechanisms are based on the UNGPs, on the guiding principles of the ICMM. In 2022, we registered 11,085 interactions with communities, of which 99.36% were answered and 84.22% of the demands were attended. Of this total, 43.54% were complaints related to improvement and accesses, roads and pathways, dust control and weeding/pruning requests.

Socioeconomic Contribution. We are committed to positively impacting society, by investing in socioeconomic actions and projects focused on community development. We are investing in actions that contribute to the development and improvement of urban infrastructure and mobility, traditional communities, education, culture, health, and work and income generation in the regions where we operate. We spent US\$1.61 billion on social initiatives in 2022, of which 14% was spent on voluntary and mitigating programs, 6% on Brazilian-tax-exempted programs, and 80% on mandatory programs.

Diversity, Equity and Inclusion (“DEI”). DEI are strategic and connected to our sustainability principles as it directly impacts our ability to innovate and be more attractive to diverse talents. Our goal is to have 26% of women in the workforce by 2025. In 2022, we achieved 22.1% representation of women, a 5.4% increase in the total number of women in Vale compared to 2021. We also achieved 22.6% of women in senior leadership (executive manager positions and above), a 11.5% increase in the representation of women these positions compared to 2021. Our goal is to achieve 40% of our leadership roles in Brazil composed with black employees by 2026. In 2022, we reached 32.1%, an increase of 11.1% compared to 28.9% in 2021.

Health and Safety. We are committed to improving the health and safety of our workers, consistent with our pillar of promoting sustainable mining. Our long-term goals are: (i) no recordable injuries with potential for fatality or life-altering injuries, (ii) 50% reduction in the exposure of employees to the top 10 health risks by 2025 and (iii) reduction or elimination of the most significant risk scenarios by 2025.

Community Safety. In 2022, there were 95 events with community members that resulted in 17 fatalities and 84 non-fatal injuries related to our activities (whether in areas under our responsibility or in external areas that are in the course of production or related support activities), which represented an 8.7% reduction in the number of events in 2022 when compared to 2021, against our original goal of a 10% reduction. The number of fatalities reduced 32% in 2022, compared to 2021. In 2023, we will keep our goal to reduce the occurrence of community events with injury (fatal and non-fatal) by 10% in relation to the 2022 results.

Governance

Corporate Governance. Since 2017, we have been listed on the *Novo Mercado* segment, the highest level of governance of B3. We have been investing in improving our corporate governance, benchmarking against national and international best practices, and developing our understanding of investors’ perspective on these matters.

Our governance model aims to establish clearly defined principles and roles, transparency, and stability to guide our actions. We seek to build strong and lasting relationships with our stakeholders, invest in mitigating the effects of our activities, work with high ethical standards, practice transparent management, and actively contribute to advances in relation to the environment, biodiversity and sustainable development.

The general guidelines and policies that guide our business activities are established by our Board of Directors, which monitors the implementation of these initiatives through reports provided by our executive officers. Our Board of Directors receives support from the Advisory Committees, whose mission is to advise the Board, including proposing improvements related to its area of activity to facilitate greater efficiency and quality in decisions made by the Board of Directors and to ensure that our activities are carried out in compliance with current legislation, the principles of ethics and internal controls. The Fiscal Council is a permanent, supervisory body, independent from the Executive Committee and the Board of Directors, which is responsible, through the principles of transparency, equity and accountability, to supervise the management’s activities and verify the compliance with the bylaws and their legal duties.

In December 2022, we restructured our Advisory Committees to further improve our governance. As a result, (i) the Audit Committee, originally established in 2020, was renamed to “Audit and Risks Committee,” had its scope expanded to oversight risk matters, and it now must be composed entirely of independent board members; (ii) the Nominating Committee’s scope was expanded to include the oversight of the company’s governance, and was renamed “Nomination and Governance Committee;” (iii) the “People, Remuneration and Governance Committee had the governance component removed from its scope and was renamed “People and Compensation Committee”, (iv) the Finance Committee was renamed “Capital Allocation and Projects Committee”, to better reflect its scope and responsibilities; (v) the Operational Excellence and Risk Committee was dissolved and discontinued, and risk matters were incorporated by the Audit and Risks Committee; and (vi) the Innovation Committee, originally created in 2021, became a non-statutory and non-permanent body to better match the current challenges faced by our business. For more information, see *Management and Employees—Management—Board of Directors* and *—Other Advisory Committees to the Board of Directors*.

Compensation. We are committed to align our compensation programs to our business strategy and the goal of being a safer company. We implemented a number of changes, such as the adoption of a *malus* clause and a clawback policy under which, upon the occurrence of events of exceptional severity, the Board of Directors may reduce variable compensation of executives or require that executives return amounts received, and the implementation of new share ownership guidelines for executive officers. Since 2020, we are following and reviewing standards for executive officers compensation: for short-term compensation, at least 30% of performance goals must be ESG-driven and directly related to safety, risk management and sustainability targets; and, with respect to long-term compensation, from 2022 at least 25% of performance goals must be based on ESG metrics. Overall, 12% of total remuneration must be linked to ESG metrics.

Risk Management. We have five risk executive committees that advise our management concerning each of these risks categories: (i) operational risks, (ii) geotechnical risks, (iii) strategy, finance and cyber risks, (iv) compliance, institutional relations and communication risks and (v) sustainability.

We also have five advisory committees to our Board of Directors, one of them with major roles in advising the Board on and monitoring our risks: the Audit and Risks Committee, which evaluates, and monitors matters related to risks of the Company, including operational and geotechnical risks (after the Operational Excellence and Risk Committee was discontinued), and the effectiveness and sufficiency of our controls and risk management system. The Audit and Risks Committee advises the Board of Directors regarding the risk management strategy, including the analysis of corporate policies on this topic and risk appetite guidelines, as well as our integrated risk map, in addition to advice on the assessment of the efficacy and sufficiency of controls and risk management systems, and follow the implementation, among other attributes defined in each committee’s internal regulation.

Cultural transformation

Cultural transformation is part of our strategy with people, and we have as an objective to become even more talent-oriented. In 2019, we began a deep process of cultural transformation which seeks to promote culture as a facilitator of our strategy. We work continuously to be recognized as a company that seeks operational excellence, leads the transition to a low-carbon economy and generates social and economic progress.

RESPONSES TO THE TAILINGS DAM COLLAPSE IN BRUMADINHO

On January 25, 2019, a tailings dam collapsed at our Córrego do Feijão mine, in the city of Brumadinho, state of Minas Gerais. The collapse of the dam released a flow of tailings residue, which submerged our administrative area at the Córrego do Feijão mine and reached parts of the communities of Córrego do Feijão and Parque da Cachoeira outside of Brumadinho, and the nearby Paraopeba River. The dam collapse resulted in 270 fatalities, including two pregnant women, and three victims that are still missing, and caused extensive property and environmental damage in the region.

We will never forget Brumadinho. We reaffirm our respect for the victims and their families, prioritizing the fair and agile reparation of Brumadinho. As we move forward on our path to make our business better, valuing people, safety

and reparation, we stand firm in our commitment to become one of the safest and most reliable mining companies in the world.

Reparation and remediation efforts

Immediate assistance. We have provided humanitarian assistance to victims and their families since the very first moments.

Integral Reparation Agreement. In 2021, we entered into the Integral Reparation Agreement, with multiple public authorities, under which we agreed to implement several socio-economic and socio-environmental reparation projects.

- The estimated economic value of the Integral Reparation Agreement is R\$37.7 billion, including: (i) disbursements made prior to the settlement date and with scope similar to the agreement, in an amount of R\$7.8 billion; (ii) disbursements required for the implementation of projects and to be managed by the authorities, in a total specified amount of R\$19.2 billion; (iii) estimated costs of the socio-economic reparation projects to be directly implemented by us, subject to a cap of R\$5.7 billion; and (iv) estimated costs of R\$5 billion for certain environmental recovery projects (*Plano de Reparação Ambiental*) to be implemented by us, which commitments are not subject to a cap.
- This Integral Reparation Agreement settles the majority of the requests made in certain public civil actions in which public authorities sought damages and a wide range of injunctive measures against us as a result of the Brumadinho dam collapse.
- We have executed 58% of the commitments set out in the Integral Reparation Agreement and by December 31, 2022 we had incurred over R\$23.7 billion to pay for compensation to impacted people, infrastructure works and environmental and socioeconomic reparation actions. As of December 31, 2022, we had advanced 77% of our obligations to provide funds, amounting to R\$16.7 billion and 7% of our obligations to perform certain actions, corresponding to R\$700 million.

Other agreements related to Brumadinho dam collapse. We have been actively seeking alternatives and entering agreements to promote a more expedited reparation and remediation to the impacted people and to settle the various legal proceedings relating to the Brumadinho dam collapse. Below is a summary of additional settlement agreements with public authorities to, among other things, establish the framework for individual indemnification of the victims.

- **February 2019 preliminary settlement agreement.** In February 2019, we entered into a preliminary settlement agreement with the state of Minas Gerais and other public authorities pursuant to which we committed to make monthly emergency aid payments to residents of Brumadinho and certain communities located downstream of the dam from January 2019 through October 2021. The total amount paid as emergency aid was approximately R\$2.3 billion, and these amounts were recognized within the R\$37.7 billion Integral Reparation Agreement. Also under the Integral Reparation Agreement, we provided R\$4.4 billion to the income transfer program that has replaced the monthly emergency aid payments. This program is administered and operated by the public prosecutor's office and the public defender's office of the state of Minas Gerais.
- **April 2019 preliminary settlement agreement with Minas Gerais state public defenders.** In April 2019, we entered into an agreement with the public defenders' office of the state of Minas Gerais to establish the framework for out-of-court settlement agreements for damage claims for property and other economic and moral damages (*danos morais*). As of December 2022, we had entered into more than 5,418 indemnification agreements, with over 11,087 individuals affected by the dam collapse and evacuations, providing for payments in the aggregate amount of approximately R\$2.0 billion. These standards were also used to determine indemnification payments in other municipalities where evacuations occurred as result of the elevation of the emergency level of certain dams.
- **Settlement agreement with public labor prosecutors and labor unions.** In July 2019, we entered into a settlement agreement with the public labor prosecutors to indemnify relatives of the victims of the dam collapse. As of December 2022, we had entered into more than 1,478 indemnification agreements with individuals or groups pursuant to this settlement agreement, providing for payments to at least one member of the family of each of 250 deceased workers, in the aggregate amount currently exceeding R\$1.16 billion. In March 2020, we entered into a settlement agreement with labor unions, setting forth the indemnification amount to be paid

to survivor workers and workers based on the Córrego do Feijão and Jangada Mines. As of December 2022, we had entered into more than 780 indemnification agreements with individuals or groups pursuant to this settlement agreement, providing for payments in the aggregate amount of approximately R\$106 million. In July 2021, we entered into a settlement agreement in which we committed to pay indemnification to the family units of deceased employees in connection with the extinction of their employment contracts. The settlement was also extended to provide indemnification to the family units of deceased outsourced workers.

- **Agreement with Minas Gerais state public defenders (Nova Lima).** In March 2021, we signed an agreement (*termo de compromisso*) with the public defender's office of the state of Minas Gerais, to regulate and establish comprehensive criteria for the payment of indemnification to the people that were impacted by the evacuation that occurred in the community of São Sebastião das Águas Claras (Macacos) in the municipality of Nova Lima, due to the rise in the emergency level of B3/B4 dam.
- **Agreement with Indigenous Communities.** In September 2022, we signed two indemnity agreements with indigenous groups within the "Pataxó e Paraxó Hã Hã Hãe" community, that were affected by the Brumadinho dam collapse. The agreements establish the measures to be adopted by us to repair, indemnify and fully compensate these indigenous communities for the damages caused to them, both from collective and individual perspectives. The two agreements were ratified by the 12th federal civil court of Belo Horizonte. In March 2023, federal prosecutors (*Ministério Público Federal*—"MPF") appealed the decisions in both proceedings. We are currently waiting for the notification to present our counterarguments and the decision on the appeals is pending.
- **Agreement with Minas Gerais state public defenders (Itabira).** In June 2022, we signed an agreement (*termo de compromisso*) with the public defender's office of the state of Minas Gerais, to regulate and establish comprehensive criteria for the payment of indemnification to the people that were impacted by the "loss of stability" and consequent increase in the risk of collapse of the Pontal Dam and its dikes, located in the municipality of Itabira.

Other settlement agreements. We have entered into other settlement agreements with public authorities, in addition to individual settlement agreements. We have entered into other agreements with authorities to cover specific topics, such as support to the municipalities in providing public services and infrastructure, emergency payments to the indigenous communities, specific remediation and compensation measures, external audits and asset integrity studies, provision of technical support for the authorities, with measures to review and reinforce structures and suspension of operations. For additional information on legal settlements, proceedings and investigations relating to the Brumadinho dam collapse continue, see *Additional Information — Legal proceedings*.

Other Repair and remediation efforts. We have concluded work on two pipelines for water withdraw on the Pará River and another one, on the Paraopeba River, as part of the construction of new water supply systems to serve the population of Pará de Minas and the metropolitan area of Belo Horizonte. We have more than 450 water collection, supply and treatment ongoing civil works in 31 municipalities, including the hydrographic basins: Paraopeba, Velhas and Doce.

Dam safety measures

We have implemented several initiatives to enhance our tailings and dam management process and improve dam safety.

De-characterization of upstream dams. Our key initiative is the de-characterization of all our upstream structures in Brazil, including dams, dikes and drained piles. An upstream structure is a structure raised using the upstream raising method, in which the body of the structure is built using the thick tailings deposited in the reservoir, by successively layering them up and in the direction opposite to the water flow (upstream). This is the same construction method as the Brumadinho dam. The term "de-characterization" means functionally reintegrating the structure and its contents into the environment, so that the structure no longer serves its primary purpose of acting as a tailing's containment. In 2022, we spent a total of US\$349 million in connection with the de-characterization of dams. As of December 31, 2022, we had a provision of US\$3,378 million recognized in our balance sheet for the de-characterization of upstream structures.

Currently, 18 geotechnical structures built by the upstream raising method remains in our de-characterization plan. We concluded the de-characterization of 12 of the original 30 upstream structures between 2019 and 2022, completing 40% of the structures.

- In 2022, we concluded the de-characterization of five structures: dikes 3 and 4 of Pontal, Auxiliar Dike of B5 MAC, Baixo João Pereira and Ipoema dams (all of which are waiting the certification by the regulatory agency).
- In 2021, we concluded the de-characterization of Pondes de Rejeitos dam, Fernandinho dam and the de-characterization of dike 5 of Pontal (the later waits for validation from the regulatory agency).
- In 2020, we concluded the de-characterization of Rio do Peixe, II Kalunga and III Kalunga dikes.
- In 2019, we concluded the de-characterization of the 8B dam in the city of Nova Lima.

Our plan also includes the construction of containment structures (back-up dams) for certain dams, to retain tailings in case of dam collapse, protecting the area downstream from the potential failure of these dams during the de-characterization works. Between 2020 and 2021, we concluded the construction of three downstream back-up dams, one for the Sul Superior dam, one for B3/B4 dam, and one for Forquilha I, Forquilha II, Forquilha III, Forquilha IV and Grupo dams. In 2022, we completed the construction of ECJ Coqueirinho, a back-up dam for Minervino and Cordão Nova Vista dikes, in the Pontal Dam, in Itabira, currently at Emergency Level 1. We are currently working on defining the solutions to implement others downstream back-up dams that may be necessary.

The engineering projects for our structures are under different stages of development. In the ones in the conceptual engineering phase, our provision was measured in accordance with market practices, taking into consideration the high degree of uncertainty in the definition of the total expenditures to execute the dam de-characterization projects.

The de-characterization process is important for the long-term risk reduction of the upstream tailing's facilities, but the works required for the de-characterization process may impact the geotechnical stability of certain upstream tailings facilities, increasing the of risk of collapse of these structures especially during the first phases of this process. To mitigate this risk, we have evacuated the downstream zones of the critical dams and we are building big physical barriers (back-up dams) to contain the tailings in case of failure. To mitigate the risk of life losses, we are considering alternatives to perform the works in these critical dams with remotely operated equipment and the design is being reviewed with proper redundancy levels.

In 2022, B3/B4 Dam, for example, was removed from the most critical safety condition classification, as a result of the lowering of the emergency level of such dam from 3 to 2 in 2022, due to the progress of the dam de-characterization, with the removal of more than 50% of the tailings, which improved the stability conditions of the dam. Also, improved safety conditions were achieved for eight geotechnical structures in Brazil that received stability condition declarations in 2022, with the emergency level removed.

We also operate tailings dams in Canada, including compacted outer shell upstream dams. We are not planning to de-characterize these upstream dams for the time being, since there are no safety, technical or regulatory reasons for doing so. All of our dams in Canada have been built in accordance with engineering standards of the Canadian Dam Association. Legacy dams that pre-date these standards are being upgraded accordingly through a comprehensive program of dam rehabilitation and buttressing.

Our joint venture Samarco Mineração S.A. ("Samarco") owns two upstream tailings dams, both inactive and in compliance with the currently approved design. After the collapse of Samarco's Fundão dam in 2015, emergency works were performed, in order to ensure the stability required and comply with the applicable regulation. In February 2022, Samarco entered into an agreement (*termo de compromisso*) with the state of Minas Gerais, regulatory agencies and state and federal public prosecutors, establishing a new schedule and reinforcing its commitment to eliminate upstream structures in Brazil. Samarco is gradually reviewing its closure plan and long-term monitoring, defined as part of the de-characterization of both structures, which will be carried out in accordance with applicable regulations.

Our investee Mineração Rio do Norte S.A. owns 24 tailings dams and two small sediment dams, of which 18 tailings dams are active and six are inactive, and two small sediment dams are inactive. The two upstream dams in such portfolio (SP-6 and SP-2/3) are inactive and have ongoing de-characterization plans, as well as TP-1, SP-1 and SP-9A reservoirs.

Governance measures – Independent Ad Hoc Advisory Committee to the Board of Directors. In April 2021, the Independent Ad Hoc Consulting Committee for Dam Safety (“CIAE-SB”), created immediately after the dam collapse, completed its work, and provided its final report to our Board of Directors. We continue with our work on dam safety, now conducted by the Independent Tailings Review Board (“ITRB”), composed by the former CIAE-SB members, among others, in line with the best international practices and with the Global Standard of the Tailings Management Industry. We have developed action plans to address all CIAE-SB recommendations, which are regularly assessed in a multiple layer system and delays must be justified and approved by senior leadership. We completed 82% of the actions plans and are planning to complete the other 18% until 2024.

Monitoring and precautionary measures. We have been closely monitoring our active and inactive dams. Among other measures to improve our Tailings and Dam Management System (“TDMS”), we have dedicated teams with enhanced governance and revised processes and standards. We have created three Geotechnical Monitoring Centers (“GMC”) since 2019, to continuously monitor the dams and to collect information for better decision making. These three GMCs are responsible for monitoring all the critical structures in Ferrous and Energy transition metals Brazil operations 24 hours per day and 7 days per week. We have implemented the most advanced technologies to monitor our Tailings Storage Facilities (“TSF”) in the last years and now we are working to make the systems and infrastructure more robust and reliable.

Under applicable Brazilian federal regulations, we must submit to the authorities a certification of stability (Stability Condition Statement or “DCE”) from an independent expert for each of our dams. For 97 of our geotechnical structures and back-up dams, the DCE must be submitted semi-annually, on March 31 and September 30 of each year. The engineer of record is responsible for issue both DCEs as part of the Dam Safety Inspection process. In case we are unable to comply with safety requirements for issuance of the DCE of a certain dam, we need to take certain emergency actions based on the Emergency Action Plan for Mining Dam for such dam, which may include the suspension of related operations, evacuation of the area surrounding the dam and removal of communities. The engineer of record is a licensed professional engineer employed by an engineering firm and supported by a team of professionals, and that oversees all aspects of a dam or TSF including construction, operation, design expansions or modifications and performs periodic inspections to confirm that the structure or facility is performing and being operated according to the design intent.

As of September 2022, our engineers of record had issued positive DCEs for 74 structures (67 structures in our iron solutions operations and seven in our energy transition metals operations), of a total of 97 structures currently covered by Brazilian legal policy. We did not obtain positive DCEs for 23 structures (all of them in our iron solutions operations). We have a plan to reduce the number of structures without positive DCEs, including, in some cases, improving the discharge capacity of the spillway, improving the geotechnical knowledge of the structure and its foundation and the TSF de-characterization plan. We have also improved our Geotechnical Design Governance Model requiring mandatory design review, internal technical gates and risk analysis for projects according to its classification in terms of severity, complexity and investment.

Additional information on the status of DCEs and emergency levels of our structures is available on our ESG Portal, at www.vale.com/esg. Information in our website is not incorporated by reference in this annual report on Form 20-F.

RESPONSES TO THE COLLAPSE OF SAMARCO'S TAILINGS DAM IN MINAS GERAIS

In November 2015, the Fundão tailings dam owned by our joint venture Samarco collapsed, releasing tailings downstream, flooding certain communities and causing impacts on communities and the environment along the Doce river. The collapse resulted in 19 fatalities and caused property and environmental damage to the affected areas. Samarco is a joint venture equally owned by us and BHP Billiton Brasil Ltda. ("BHP Brasil").

In June 2016, Samarco, us and BHP Brasil, in agreement with public authorities, created Fundação Renova, a not-for-profit private foundation, to develop and implement (i) social and economic remediation and compensation programs and (ii) environmental remediation and compensation programs in the region affected by the dam collapse. Fundação Renova has been implementing 42 remediation programs established under the settlement agreements entered into with public authorities, following the governance mechanisms established in these settlement agreements. Fundação Renova must be funded by Samarco, but to the extent that Samarco is unable to fund, BHP Brasil and we must ratably bear the funding requirements under the Framework Agreement.

As of December 2022, more than 409 thousand people along the Doce River basin received R\$13.6 billion in total indemnities and Emergency Financial Aid paid from Fundação Renova. Of this total, more than 74 thousand people along the Rio Doce basin received R\$9.1 billion in compensation paid via the Simplified Indemnity System, which was implemented in 2020 and extended through a court decision to all locations along the Rio Doce and impacted estuarine regions.

In 2022, following a court order, Fundação Renova resumed the payments of emergency subsistence aids and created a negotiating table to resolve disputes in the reparation process and advance the agenda of the basic environmental plan with proper consultation and participation of the communities in the decision-making process related to issues that impact their lives, beliefs, institutions, spiritual values and land. On December 1, 2022, even after the execution of an agreement by Fundação Renova approved by the court and which had been fulfilled by Fundação Renova, based on public demonstrations of dissatisfaction by the indigenous communities of Espírito Santo, a conciliation hearing was held to address the issues related to the indigenous communities, during which the court decided that we and the indigenous communities would start a renegotiation process, scheduling conciliation hearings mediated by the judicial expert chosen. The next conciliation hearing is expected happen in May 2023.

For a discussion of the funding of Fundação Renova and the impact on our financial statements, see *Operating and Financial Review and Prospects—Overview—Fundação Renova and Samarco Funding*. For a discussion of the legal proceedings resulting from the collapse of Samarco's tailings dam, the settlement agreements we entered into with public authorities and the creation of Fundação Renova, see *Additional Information—Legal proceedings*. For further information on the actions taken by Fundação Renova, see <http://www.vale.com> (under English Version/Investors/ESG Portal/Reparation/Renova Foundation). Information on our website is not incorporated by reference in this annual report on Form 20-F.

Since the collapse of the Fundão dam, Samarco has been subject to extensive litigation and in a situation of financial distress. Samarco has defaulted under some of its financing agreements and, in April 2021, Samarco filed for Judicial Reorganization with the 2nd State Court for Corporate Matters of Belo Horizonte, to restructure, among other debts, its financial debt.

In June 2021, Samarco filed its first reorganization plan. From February 2022 through March 2023, other reorganization plans were submitted, but none of them has been approved by creditors. We expect that a creditors' meeting to vote on an alternative reorganization plan will occur on the second quarter of 2023. See *Overview—Risk factors—Legal, Political, Economic, Social and Regulatory Risks— Legal proceedings and investigations could have a material adverse effect on our business* and *Information on the Company— Lines of Business—Other Investments—Samarco*.

FORWARD-LOOKING STATEMENTS

This annual report contains statements that may constitute forward-looking statements. Many of those forward-looking statements can be identified by the use of forward-looking words such as “anticipate,” “believe,” “could,” “expect,” “should,” “may,” “will,” “plan,” “intend,” “estimate,” “target,” “ambition,” “potential,” among others. Those statements appear in a number of places and include statements regarding our intent, belief or current expectations with respect to:

- trends in commodity prices, supply and demand for commodities;
- the future impact of competition and regulation;
- the exploration of mineral reserves and resources and development of mining facilities;
- the depletion and exhaustion of mines and mineral reserves and resources;
- the impact of the collapse of the tailings dam in Brumadinho in 2019, the collapse of Samarco’s tailings dam in 2015, and related remediation measures on our operations, cash flows and financial position;
- the implementation of our dam de-characterization plan;
- the outcome of the various investigations, regulatory, governmental, uncertain tax treatments and legal proceedings in which we are involved;
- the impact of the ongoing war in Ukraine and the economic sanctions imposed on Russia, and their impact on the global economy, which are highly uncertain and difficult to predict;
- our direction and future operations;
- the implementation of our financing strategy and capital expenditure plans;
- the payment of dividends or interest on shareholders’ equity;
- compliance with financial covenants;
- industry trends, including the direction of prices and expected levels of supply and demand;
- the implementation of our principal operating strategies, including our potential participation in acquisition, divestiture or joint venture transactions or other investment opportunities;
- our ability to comply with our ESG targets and commitments;
- the implementation of new technologies to mitigate operational risks or achieve our ESG targets and commitments;
- other factors or trends affecting our financial condition or results of operations; and
- the factors discussed under *Overview—Risk factors*.

We caution you that forward-looking statements are not guarantees of future performance and involve risks and uncertainties. Actual results may differ materially from those in forward-looking statements as a result of various factors. These risks and uncertainties include factors relating to (i) economic, political and social issues in the countries in which we operate, (ii) the global economy, (iii) commodity prices, (iv) financial and capital markets, (v) the mining and metals businesses, which are cyclical in nature, and their dependence upon global industrial production, which is also cyclical, (vi) regulation and taxation, (vii) operational incidents or accidents, and (viii) the high degree of global competition in the markets in which we operate. For additional information on factors that could cause our actual results to differ from expectations reflected in forward-looking statements, see *Overview—Risk factors*. Forward-looking statements speak only as of the date they are made, and we do not undertake any obligation to update them in light of new information or future developments. All forward-looking statements attributed to us or a person acting on our behalf are expressly qualified in their entirety by this cautionary statement, and you should not place undue reliance on any forward-looking statement.

RISK FACTORS

FINANCIAL RISKS

Lower cash flows, resulting from suspension of operations or decreased prices of our products, may adversely affect our credit ratings and the cost and availability of financing.

The suspension of operations or a decline in the prices of our products may adversely affect our future cash flows, credit ratings and our ability to secure financing at attractive rates. It may also negatively affect our ability to fund our capital investments, including disbursements required to remediate and compensate damages resulting from the dam collapse in Brumadinho, provide the financial assurances required to obtain licenses in certain jurisdictions, pay dividends and comply with the financial covenants in some of our long-term debt instruments. See *Operating and Financial Review and Prospects—Liquidity and capital resources*.

The prices for our products are subject to volatility, which may adversely affect our business.

Global prices for metals are subject to significant fluctuations and are affected by many factors, including actual and expected global macroeconomic and political conditions, regional and sectorial factors, levels of supply and demand, the availability and cost of substitutes, inventory levels, technological developments, regulatory and international trade matters, investments by commodity funds and others and actions of participants in the commodity markets. Sustained low market prices for the products we sell may result in the suspension of certain of our projects and operations, decrease in our mineral reserves and resources, impairment of assets, and may adversely affect our cash flows, financial position and results of operations. The price of our products could be subject to volatility in 2023 in case of measures taken by the Chinese government to control the COVID-19 pandemic, the withdrawal of governmental benefits and relief measures, geopolitical risk, and other macroeconomic factors.

Demand for our iron ore and nickel products depends on global demand for steel. Iron ore and iron ore pellets, which together accounted for 80% of our 2022 net operating revenues from continuing operations, are used to produce carbon steel. Nickel, which accounted for 15% of our 2022 net operating revenues from continuing operations, is used mainly to produce stainless and alloy steels. The prices of different steel products and the performance of the global steel industry are highly cyclical and volatile, and these business cycles in the steel industry affect demand and prices for our products. In addition, vertical backward integration of the steel and stainless-steel industries and the use of scrap could reduce the global seaborne trade of iron ore and primary nickel. The demand for copper is affected by the demand for copper wire, and a sustained decline in the construction industry could have a negative impact on our copper business. Copper products accounted for 4% of our 2022 net operating revenues from continuing operations.

We are mostly affected by movements in iron ore prices. For example, a price reduction of US\$1 per dry metric ton unit (“dmt”) in the average iron ore price would have reduced our operating income for the year ended December 31, 2022, by approximately US\$279 million. Average iron ore prices significantly changed in the last five years, from US\$69.49 per dmt in 2018, US\$93.40 per dmt in 2019, US\$108.87 per dmt in 2020, US\$159.49 per dmt in 2021 and US\$120.16 per dmt in 2022, according to the average Platts IODEX (62% Fe CFR China). On January 21, 2023, the year-to-date average Platts IODEX iron ore price was US\$121.69 per dmt. See *Operating and Financial Review and Prospects—Overview—Major factors affecting prices*.

Changes in exchange rates for the currencies in which we conduct operations could adversely affect our financial condition and results of operations.

A substantial portion of our revenues, trade receivables and debt are denominated in U.S. dollars, and given that our functional currency is the Brazilian *real*, changes in exchange rates may result in (i) losses or gains on our net U.S. dollar denominated indebtedness and accounts receivable and (ii) fair value losses or gains on currency derivatives we use to stabilize our cash flow in U.S. dollars. In 2022, we had net foreign exchange losses of US\$398 million vs. net foreign exchange gains of US\$408 million in 2021. In addition, changing values of the Brazilian *real*, the Canadian dollar, the

Indonesian rupiah, the Chinese *yuan* and other currencies against the U.S. dollar affects our results since a relevant portion of our costs of goods sold is denominated in currencies other than the U.S. dollar, principally the *real* (42.3% in 2022) and the Canadian dollar (5.7% in 2022), while our revenues are mostly U.S. dollar denominated. We expect currency fluctuations to continue to affect our financial income, expense and cash flow generation.

As of April 3, 2023, the U.S. dollar commercial selling rate published by the Central Bank was R\$ 5.0762 per US\$1.00, which represents a 2.7% decrease as compared to the selling rate of R\$5.2177 per US\$1.00 as of December 31, 2022. Significant volatility in currency prices, among other factors, may also result in disruption of foreign exchange markets, which could limit our ability to transfer or to convert certain currencies into U.S. dollars and other currencies for the purpose of making timely payments of interest and principal on our indebtedness. The central banks and governments of the countries in which we operate may institute restrictive exchange rate policies in the future and impose taxes on foreign exchange transactions.

Higher energy costs or energy shortages would adversely affect our business.

Costs of fuel oil, gas and electricity are a significant component of our cost of production, representing 6.8% of our total cost of goods sold in 2022. To fulfill our energy needs, we rely on the following sources: oil by-products, which represented 36.7% of total energy needs in 2022, coal (14.1%), electricity (30.2%), natural gas (16%) and other energy sources (3%).

Electricity costs represented 3% of our total cost of goods sold in 2022. If we are unable to secure reliable access to electricity at acceptable prices, we may be forced to curtail production or may experience higher production costs, either of which would adversely affect our results of operations. We face the risk of energy shortages in the countries where we have operations and projects, due to stress of infrastructure, high demand or weather conditions, such as floods or droughts. Future shortages, and government efforts to respond to or prevent shortages, may adversely impact the cost or supply of electricity for our operations.

GEOTECHNICAL RISKS

The collapse of a dam or other geotechnical structure may cause severe damages, including personal, property and environmental damages.

We own a significant number of dams and other geotechnical structures. Some of our tailing's storage facilities were built using the upstream raising method, which may present higher stability risks, especially related to liquefaction. The collapse of any of these structures could cause loss of life and severe personal, property and environmental damages, as well as negative social impact, and could have adverse effects on our business and reputation, as evidenced by the consequences of the dam collapse in Brumadinho and Samarco's dam collapse in Mariana. Some of our joint ventures and investees, including Samarco and Mineração Rio do Norte S.A., also own dams and similar structures, including structures built using the upstream raising method.

Brazilian laws and regulations require us to de-characterize all our upstream dams on a specified timetable. We are still determining the appropriate measures for the de-characterization of certain upstream dams in Brazil. The works related to the de-characterization process may impact the geotechnical behavior of certain upstream tailings facilities, affecting the risk of collapse of these structures. In extreme cases, this process, when associated with other conditions, may contribute to the collapse of structures. The evacuation of the downstream zones of the critical dams, the construction of physical barriers (back-up dams) to contain the tailings in case of failure and other safety measures we take may not be sufficient to prevent damages and impact on communities.

As of the date hereof, we have concluded approximately 40% of our de-characterization plan. The elimination of 100% of the dams in the de-characterization program is expected to be achieved by 2035, given the dams technical characteristics, such as volumes of tailings contained. The implementation of the de-characterization plan will require significant expenditures, and the de-characterization process may take a long time. As of December 31, 2022, our provision for the conclusion of the de-characterization plan of our structures is US\$3,378 million and of Samarco's

structure is US\$197 million, and additional provisions may be recognized as a result of adjustments to the de-characterization projects.

The collapse of our tailings dam in Brumadinho has adversely affected our business, financial condition and reputation, and the overall impact of the dam collapse on us is still uncertain.

In January 2019, the dam collapse in Brumadinho resulted in 270 fatalities, in addition to personal, property and environmental damages. See *Overview—Business overview—Responses to the tailings dam collapse in Brumadinho*. This event has adversely affected and will continue to adversely affect our operations.

- **Liabilities and legal proceedings.** We continue to be a defendant in a number of legal proceedings and investigations related to the dam collapse, including criminal investigations in Brazil and securities litigation in the United States. Additional proceedings and investigations may be initiated in the future. Adverse results in these proceedings may have a material adverse effect on our business and financial condition. See *Overview—Business overview—Responses to the Tailings Dam Collapse in Brumadinho* and *Additional Information—Legal proceedings*.
- **Impact on our financial performance.** The dam collapse had a significant impact on our financial performance, which included reduced revenues due to the suspension of operations, increased expenditures for assistance and remediation, impairments of fixed assets, provisions for costs of de-characterization, restoration and recovery, and provisions for legal proceedings. See *Operating and Financial Review and Prospects—Overview—Tailings Dam Collapse in Brumadinho*.
- **Increase in production costs and capital investments.** We have made investments and adjustments in our operations and may need to make additional investments and adjustments to production processes, mitigate the impact of suspended operations or comply with additional safety requirements. We may also have to use alternative disposal methods to continue operating certain mines and plants, particularly those that rely on tailings dams. These alternative methods may be more expensive or require significant capital investments in our mines and plants. As a result, we expect our costs to increase, which may have a material adverse effect on our business and financial condition.
- **Additional regulation and restrictions on mining operations.** Rules on mining activities and ancillary activities, such as dam safety, have become stricter following the dam collapse in Brumadinho. Additional rules may be approved. The licensing process for our operations has become longer and subject to more uncertainties. Also, external experts may be reluctant to attest to the stability and safety of our dams, as a result of increasing risks of liability. If any of our dams is unable to comply with the safety requirements or if we are unable to obtain the required certification for any of our dams, we may need to suspend operations, evacuate the area surrounding this dam, relocate communities and take other emergency actions. These measures are costly, may adversely impact our business and financial condition and may cause further damage to our reputation.
- **Additional environmental impacts.** The entire environmental consequences of the dam collapse in Brumadinho remain uncertain, and additional damages may be identified in the future. Also, failure to implement our de-characterization plan and measures to prevent further accidents could also lead to additional environmental damages, additional impacts on our operations, and additional claims, investigations and proceedings against us.
- **Reserves and resources.** New regulations applicable to dam licensing and operations have caused, and may further cause, decreases in our reported reserves and resources or reclassification of proven reserves as probable reserves.
- **Increased cost of insurance.** Our cost of insurance may rise, and we may not be able to obtain insurance for certain risks.
- **Settlement Agreements.** Under the Integral Reparation Agreement and other settlement agreements, we have agreed to establish a set of programs and activities to repair and compensate the damages caused by the dam collapse in Brumadinho. These settlement agreements do not establish cap on our indemnification obligations, and the frameworks for individual or group indemnifications do not prevent individuals or groups from seeking alternative measures. For more information, see *Additional Information—Legal Proceedings—Legal Proceedings Related to the Dam Collapse in Brumadinho*.

OPERATIONAL RISKS

Our projects are subject to risks that may result in increased costs or delay in their implementation.

We are investing to maintain and further increase our production and logistics capabilities. We regularly review the economic viability of our projects. As a result of this review, we may decide to postpone, suspend or interrupt the implementation of certain projects. Our projects are also subject to a number of risks that may adversely affect our growth prospects and profitability, including the following:

- We may not be able to obtain financing at attractive rates.
- We may encounter delays or higher than expected costs in obtaining the necessary equipment or services and in implementing new technologies to build and operate a project.
- Our efforts to develop projects on schedule may be hampered by a lack of infrastructure, including reliable telecommunications services and power supply.
- Suppliers and contractors may fail to meet their contractual obligations to us.
- We may face unexpected weather conditions or other force majeure events.
- We may fail to obtain or renew the required permits and licenses to build a project, or we may experience delays or higher than expected costs in obtaining or renewing them.
- Changes in market conditions or regulations may make a project less profitable than expected at the time we initiated work on it.
- There may be incidents during project implementation.
- We may face shortages of skilled personnel.

Operational problems could materially and adversely affect our business and financial performance.

Ineffective project management and operational breakdowns might require us to suspend or curtail operations, which could generally reduce our productivity. Operational breakdowns could entail failure of critical plant and machinery. There can be no assurance that ineffective project management or other operational problems will not occur. Any damage to our projects or delays in our operations caused by ineffective project management or operational breakdowns could materially and adversely affect our business and results of operations.

Our business is subject to a number of operational risks that may adversely affect our results of operations, such as:

- Unexpected weather conditions or other force majeure events.
- Adverse mining conditions delaying or hampering our ability to produce the expected quantity of minerals and to meet specifications required by customers, which can trigger price adjustments.
- Accidents or incidents involving our mines, industrial facilities and related infrastructure, such as dams, plants, railway and railway bridges, ports and ships.
- Delays or interruptions in the transportation of our products, including with railroads, ports and ships.
- Tropical diseases, viral outbreaks such as the coronavirus, and other contagious diseases in regions where some of our operations or projects are located, which pose health and safety risks to our employees.
- Labor disputes that may disrupt our operations from time to time.
- Changes in market conditions or regulations may affect the economic prospects of an operation and make it inconsistent with our business strategy.
- Failure to obtain the renewal of required permits and licenses, or delays or higher than expected costs in obtaining them.
- Disruptions to or unavailability of critical information technology systems or services resulting from accidents or malicious acts.
- Modern slavery, child labor, and child sexual exploitation among other human rights violations related to our activities or supply chain may also affect our business and operations.

Our business could be adversely affected by the failure or unavailability of certain critical assets or infrastructure.

We rely on certain critical assets and infrastructure to produce and to transport our products to our customers. These critical assets include mines, industrial facilities, ports, railways, roads and bridges. The failure or unavailability of any critical asset, whether resulting from natural events or operational issues, could have a material adverse effect on our business.

Substantially all of our iron ore production from the Northern System is transported from Carajás, in the Brazilian state of Pará, to the port of Ponta da Madeira, in the Brazilian state of Maranhão, through the Carajás railroad (“EFC”). Any interruption of the Carajás railroad or of the port of Ponta da Madeira could significantly impact our ability to sell our production from the Northern System. With respect to the Carajás railroad, there is particular risk of interruption at the bridge over the Tocantins River, in which the trains run on a single line railway. In the port of Ponta da Madeira, there is particular risk of interruption at the São Marcos access channel, a deep-water channel that provides access to the port. Also, any failure or interruption of our long-distance conveyor belt used to transport our iron ore production from the S11D mine to the beneficiation plant, could adversely impact our operations at the S11D mine.

We may not have adequate insurance coverage for some risks.

Our businesses are generally subject to a number of risks and hazards, which could have impact on people, assets and the environment. The insurance we maintain against risks that are typical in our business may not provide adequate coverage. Insurance against some risks (including liabilities for environmental damages, damages resulting from dams breaches, spills or leakage of hazardous substances and interruption of certain business activities) may not be available at a reasonable cost, or at all. Even when it is available, we may self-insure where we determine that is more cost-effective to do so. As a result, accidents or other negative developments involving our mining, production or transportation facilities may not be covered by insurance and could have a material adverse effect on our operations.

Labor disputes may disrupt our operations from time to time.

A substantial number of our employees, and some of the employees of our subcontractors, are represented by labor unions and are covered by collective bargaining or other labor agreements, which are subject to periodic negotiation. Strikes and other labor disruptions at any of our operations could adversely affect the operation of facilities and the timing of completion and cost of our capital projects. For more information about labor relations, see *Management and Employees—Employees*. Moreover, we could be adversely affected by labor disruptions involving unrelated parties suppliers that may provide us with goods or services.

STRATEGIC RISKS

Geopolitical tensions and military hostilities, including the ongoing military conflict between Russia and Ukraine, and the economic sanctions imposed as a result of such conflicts may materially adversely impact our business.

Our business is subject to external risk factors related to our global operations and the global profile of our client portfolio and supply chains. U.S. and global markets are experiencing volatility and disruption following the escalation of geopolitical tensions, in particular, in connection with the military conflict between Russia and Ukraine.

The resulting economic sanctions imposed by the United States, the European Union, the UK and other countries as a direct consequence of this conflict may continue to significantly impact supply chains, lead to market disruptions including significant volatility in commodities’ prices, and bring heightened near-term uncertainty to the global financial system, including through instability of credit and of capital markets. These factors may have impacts on our production and sales, result in additional costs and expenses, and eventually adversely impact our financial conditions or results of operations.

Any further escalation of the Russia-Ukraine conflict could lead to other additional impacts which may adversely affect our business, such as disruption of international trade flows, extreme market pricing volatility, with particular impact on the energy sector, industrial and agricultural supply chains, shipping, and regulatory and contractual uncertainty, and increased geopolitical tensions around the world. These factors could disrupt the global markets in ways that are difficult to predict and estimate in advance as to their potential impact on our business, financial position, or operational results.

Our business is exposed to the cyclicity of global economic activity and requires significant investments of capital.

As a mining company, we are a supplier of industrial raw materials. Industrial production is cyclical and volatile, which affects demand for minerals and metals. At the same time, investment in mining requires a substantial amount of funds in order to replenish reserves and resources, expand and maintain production capacity, build infrastructure, preserve the environment, prevent fatalities and occupational hazards and minimize social impacts. Sensitivity to industrial production, together with the need for significant long-term capital investments, are important sources of risk for our financial performance and growth prospects.

We may not be able to adjust production volume in a timely or cost-efficient manner in response to changes in demand. Lower utilization of capacity during periods of weak demand may expose us to higher unit production costs since a significant portion of our cost structure is fixed in the short-term due to the capital intensity of mining operations. In addition, efforts to reduce costs during periods of weak demand could be limited by labor regulations or previous labor or government agreements. Conversely, during periods of high demand, our ability to rapidly increase production capacity is limited, which could prevent us from meeting demand for our products. We may be unable to complete expansions and greenfield projects in time to take advantage of rising demand for iron ore, nickel or other products. When demand exceeds our production capacity, we may meet excess customer demand by purchasing iron ore fines, iron ore pellets or nickel from third parties processing and reselling it, which would increase our costs and narrow our operating margins. If we are unable to satisfy excess customer demand in this way, we may lose customers. In addition, operating close to full capacity may expose us to higher costs, including demurrage fees due to capacity restraints in our logistics systems.

Adverse economic developments in China could have a negative impact on our revenues, cash flow and profitability.

China has been the main driver of global demand for minerals and metals over recent decades. In 2022, Chinese demand represented 75% of global demand for seaborne iron ore, 59% of global demand for nickel and 54% of global demand for copper. The percentage of our net operating revenues attributable to sales to customers in China was 50% in 2022. Therefore, any contraction of China's economic growth or change in its economic profile, or changes in the political or sanctions environment globally could result in lower demand for our products, leading to lower revenues, cash flow and profitability. Underperformance in the Chinese real estate and infrastructure sectors, the largest consumer of carbon steel in China, would also negatively impact our results. COVID-19-related and other pandemic control measures, such as shutdowns resulting from localized outbreaks, could potentially impact the industrial activity and supply chain.

Development of new battery technologies using less nickel may impact the demand of our nickel products.

Global demand for metal for batteries is subject to evolving battery chemistry technologies, which are affected by many factors, including cost, performance, safety, material availability, and consumer preferences, as well as governmental regulation. Sustained production and consumption of non-nickel battery chemistries from end-use demand markets could result in lower nickel demand, reduced prices, postponements of certain projects, and a decrease in production levels. Competitive products in the market have existed for years and with end-use customers, particularly electric vehicle original equipment manufacturer, increasingly adopting a broad and efficient portfolio of battery chemistries. New battery technologies could overtake current technologies, including nickel-based chemistries, having a negative impact in our nickel business.

Development of low carbon emission technologies that reduce or dismiss the usage of high-quality ores may increase the demand for low grade iron ore and could impact the value of our iron ore products.

Decarbonization requires reducing CO₂ emissions. New technologies in iron and steel sector are being developed to reduce and deliver net zero emissions. Due to their characteristics, such technologies can demand a variety of iron ore grades according to each process. Technologies that can allow the competitive use of lower grade iron ores could reduce the relative value in use of our higher-grade portfolio and have a negative impact on the demand and premium

of our iron ore products. We continue to monitor disruptive technologies and market trends to deliver appropriate supply answers.

Our business could be adversely affected by the performance of our counterparties, contractors, joint venture partners or joint ventures we do not control.

Customers, suppliers, contractors, financial institutions, joint venture partners and other third parties may fail to perform existing contracts and obligations, which may unfavorably impact our operations and financial results. The ability of these third parties to perform their obligations may be adversely affected in times of financial stress and economic downturn.

Important parts of our iron ore, pelletizing, nickel, copper, energy and other businesses are held through joint ventures. This may reduce our degree of control, as well as our ability to identify and manage risks. Our forecasts and plans for these joint ventures and consortia assume that our partners will observe their obligations to make capital contributions, purchase products and, in some cases, provide skilled and competent managerial personnel. If any of our partners fails to observe its commitments, the affected joint venture or consortium may not be able to operate in accordance with its business plans, or we may have to increase the level of our investment to implement these plans.

Some of our investments are controlled by partners or have separate and independent management. These investments may not fully comply with our standards, controls and procedures, including our health, safety, environment and community standards. Failure by any of our contractors, partners or joint ventures to adopt adequate standards, controls and procedures could lead to higher costs, reduced production or environmental litigation, health and safety incidents or accidents, which could adversely affect our results and reputation.

HEALTH, SAFETY, ENVIRONMENTAL AND SOCIAL RISKS

Our business is subject to environmental, health, safety and human rights incidents.

The viability of our business is intrinsically connected to the well-being of the environment, workers and communities in which we operate.

Our activities involves the use, handling, storage, discharge and disposal of hazardous substances into the environment and the use of natural resources, resulting in significant risks and potential adverse impacts on people and the environment, including fire, explosion, toxic gas leaks, spilling or seepages of polluting substances or other hazardous materials, rockfalls, incidents involving dams, failure of other operational structures, as well as activities involving mobile equipment, vehicles or machinery and other potentially fatal incidents. Incidents may occur due to deficiencies in identifying and assessing risks or in implementing sound risk management, and once these risks materialize, they could result in significant environmental and social impacts, human rights violations, damage to or destruction of mines or production facilities, personal injury, illness and fatalities, involving employees, contractors or community members near our operations, as well as delays in production, monetary losses and possible legal liability. Additionally, our employees may be exposed to tropical and contagious diseases that may affect their health and safety, and we have corporate guidelines to mitigate these risks. Notwithstanding our standards, policies, controls and monitoring procedures, our operations remain subject to incidents that could adversely impact our business, stakeholders, reputation or violate human rights.

Our business may be adversely affected by social, environmental and health and safety regulation, including regulations pertaining to climate change.

Nearly all aspects of our activities, products and services associated with capital projects and operations, including mine closure activities, around the world are subject to social, environmental and health and safety regulations, which may expose us to increased liability or increased costs. These regulations require us to have environmental licenses, permits and authorizations for our operations and projects, and to conduct environmental and social impact assessments, including a hazard identification and risk analysis, in order to get approval for our projects and permission for initiating

construction and continuing operating. Significant changes to existing operations are also subject to these requirements.

In connection with our authorizations, licenses and permits, we may be subject to restrictions relating to the operation and maintenance of dams, protection of indigenous people, protection of caves, fauna and flora, climate change, among others, which may require us to limit or modify our mining plans, having an impact on our production volumes, costs and reserves and resources. For more information on our mining concessions and other similar rights, see *Information on the Company—Regulatory matters*. Difficulties in obtaining or renewing permits may lead to construction delays, cost increases, and may adversely impact our production volumes. Social, environmental and health and safety regulations also impose standards, procedures, monitoring and operational controls on activities relating to mineral research, mining, beneficiation, pelletizing activities, railway and marine services, ports, de-characterization, decommissioning, mine closure activities, distribution and marketing of our products. Such regulation may give rise to significant costs and liabilities. Litigation and legal and regulatory uncertainties relating to these or other related matters may adversely affect our financial condition or cause harm to our reputation.

Social, environmental and health and safety regulations in many countries in which we operate have become stricter in recent years, and it is possible that more regulation or more stringent enforcement of existing regulations will adversely affect us by imposing restrictions on our activities, products, and assets, creating new requirements for the issuance or renewal of environmental licenses and labor authorizations, resulting in licensing and operation delays, raising our costs or requiring us to engage in expensive reclamation efforts. All these factors may affect our practices and result in costs or expense increase, require us to new capital expenditures, restrict or suspend operations, write down or write off assets or reserves and resources.

For a discussion of the rules relating to licensing and operations of dams following the tailings dam collapse in Brumadinho, see *Information on the Company—Regulatory matters—Brazilian regulation of mining dams*. For a discussion of the rules relating to the protection of caves in Brazil, which may require us to limit or modify our mining plans from time to time, see *Information on the Company—Regulatory matters*. For a discussion of national policies and international regulations regarding climate change, which may affect a number of our businesses in various countries, see *Information on the Company—Regulatory matters—Environmental regulations*. For a discussion of the 2020 regulatory initiatives of Standard of the International Maritime Organization (“IMO”) prohibiting high sulfur fuel oil, as well as IMO’s goals on greenhouse gas reductions in the industry, see *Information on the Company—Regulatory matters—Environmental regulations*.

Natural disasters may cause severe damage to our operations and projects in the countries where we operate and may have a negative impact on our sales to countries affected by such disasters.

Natural disasters, such as windstorms, droughts, floods, earthquakes and tsunamis may adversely affect our operations, projects and people in the countries where we operate and may cause a contraction in sales to countries adversely affected due to, among other factors, power outages and the destruction of industrial facilities and infrastructure. The physical impact of climate change on our business has been assessed based on both Task Force on Climate-related Financial Disclosures recommendations and “Vale Climate Forecast”, our in-house developed methodology. We have found, so far, that we are likely to experience changes in rainfall patterns, increased temperatures, floods, droughts, water shortages, sea level rising, increased incidence and intensity of atmospheric discharges (lightning), which may adversely affect our operations, employees, contractors and community members. On some occasions in recent years, we have determined that force majeure events have occurred because of the effect of severe weather on our mining and logistics activities.

Our financial condition, results of operations, cash flows, and competitive position could be materially adversely impacted by pandemics, epidemics, or disease outbreaks, such as the COVID-19 pandemic.

Disruptions caused by pandemics, epidemics or disease outbreaks, such as COVID-19, could materially adversely impact our financial condition, results of operations, cash flows, and competitive position, particularly as it relates to rising costs and supply chain delays and disruptions. Measures taken by governmental authorities in response to such events may

also impact our business, including upon restrictions to our operations, lockdowns, shutdowns, reduced inspections, assessments and authorizations, among other difficulties. We cannot predict when and if any such events will occur and evolve, neither their scope and duration, and therefore cannot estimate the potential impact in our financial condition, results of operations, cash flows and competitive position.

Disagreements with local communities could adversely impact our business and reputation.

Disputes with communities where we operate may arise from time to time. Incidents involving mines, industrial facilities and related infrastructure, such as the collapse of the tailings dam in Brumadinho, may significantly impact the communities where we operate. In some instances, our operations and mineral reserves and resources are located on or near lands owned or used by indigenous peoples, traditional communities or other groups of stakeholders. Some of our mining and other operations are located in territories where title may be subject to disputes or uncertainties, or in areas claimed for agriculture or land reform purposes, which may lead to disagreements with landowners, organized social movements, local communities and the government. In some jurisdictions, we may be required to consult and negotiate with these groups as part of the process to obtain licenses required to operate, to mitigate impact on our operations or to obtain access to their lands. Disagreements or disputes with local communities and groups, including indigenous peoples, traditional communities, organized social movements and local communities, could cause delays in obtaining licenses, increases in planned budget, delays or interruptions to our operations. These issues may adversely affect our reputation or hamper our ability to develop our reserves and resources and conduct our operations. In addition, difficulties in the engagement with stakeholders in social, environmental, and health and safety aspects of the mine closure process may adversely impact our business and reputation. See *Information on the Company—Regulatory matters* and *Additional Information—Legal proceedings*.

CYBER RISKS

Failures in our cybersecurity controls, information technology, operational technology and telecommunications systems may adversely affect our business and reputation.

We rely heavily on cybersecurity controls, information technology, operational technology and telecommunications systems for the operation of many of our business processes. Failures in those controls and systems, whether caused by obsolescence, technical failures, negligence, accident or cyber-attacks, may result in the disclosure or theft of sensitive information, loss of data integrity, misappropriation of funds and disruptions to or interruption in our business operations, and impact our ability to disclose financial results. We have been in the past and may be in the future the target of attempts to gain unauthorized access to information technology and operational technology systems through the internet, including sophisticated and coordinated attempts often referred to as advanced persistent threats. Disruption of critical cybersecurity controls, information technology, operational technology, or telecommunications systems, as well as data breaches, may harm our reputation and have a material adverse effect on our operational performance, earnings and financial condition.

We are subject to laws and regulations relating to data protection and data privacy, including the European Union's General Data Protection Regulation ("GDPR") and Brazilian *Lei Geral de Proteção de Dados* ("LGPD"). Any noncompliance with those laws and regulations could result in proceedings or actions against us, the imposition of fines or penalties or damage to our reputation, which could have an adverse effect on us and our business, reputation and results of operations.

LEGAL, POLITICAL, ECONOMIC, SOCIAL AND REGULATORY RISKS

Legal proceedings and investigations could have a material adverse effect on our business.

We are involved in legal proceedings in which adverse parties have sought injunctions to suspend certain of our operations or claimed substantial amounts against us. Under Brazilian law, a broad range of conduct that could be considered to be in violation of Brazilian environmental, labor or tax laws can be considered criminal offenses. Accordingly, our executive officers, employees and, in certain cases, we and our subsidiaries could be subject to criminal investigations and criminal proceedings in connection with allegations of violation of environmental, labor or tax laws,

and we or our subsidiaries could be subject to criminal investigations and criminal proceedings in connection with allegations of violation of environmental laws and human rights.

Defending ourselves in these legal proceedings may be costly and time consuming. Possible consequences of adverse results in some legal proceedings include suspension of operations, payment of significant amounts, triggering of creditor remedies and damage to our reputation, which could have a material adverse effect on our results of operations or financial condition. See *Additional Information—Legal proceedings*.

In addition to the investigations and legal proceedings relating to the dam collapse in Brumadinho, as a shareholder of Samarco, we also face the consequences of the failure of the Fundão tailings dam in November 2015. We are involved in multiple legal proceedings and investigations relating to the collapse of the Fundão tailings dam. Tax authorities or other creditors of Samarco may attempt to recover from us amounts due by Samarco, if Samarco is unable to fulfill its obligations or is unable to restructure its debt. Failure to contain the remaining tailings in Samarco's dams could cause additional environmental damages, additional impacts on our operations, and additional claims, fines and proceedings against Samarco and against us. We have been funding Fundação Renova to support certain remediation measures undertaken by Samarco. If Samarco is unable to generate sufficient cash flows to fund the remediation measures required under these agreements, we will be required to continue funding these remediation measures. If the financial creditors of Samarco manage to approve a plan proposed by them under the judicial reorganization proceeding of Samarco, such plan may exceed the applicable legal requirements and impose (a) new obligations to us, including those related to the payment of Samarco's debt and the funding of its activities, as well as the offset of the debts owed by Samarco to its shareholders, and (b) a mandatory dilution of the equity interest held by us in Samarco. See *Overview—Business overview—Responses to the Collapse of Samarco's Tailings Dam in Minas Gerais* and *Additional Information—Legal proceedings*.

Political, economic and social conditions in the countries in which we have operations projects, customers or suppliers, could adversely impact our business.

Our financial performance may be negatively affected by regulatory, political, economic and social conditions in countries in which we have significant operations or projects. In many of these jurisdictions, we are exposed to various risks such as political instability, bribery, cyber-attacks, extortion, corruption, robbery, sabotage, kidnapping, civil strife, human rights violation, acts of war, guerilla activities, piracy in international shipping routes and terrorism. These issues may adversely affect the economic and other conditions under which we operate in ways that could have a materially negative effect on our business.

In Brazil, where a significant part of our operations is concentrated, the federal government's economic policies may have important effects on Brazilian companies, including us, and on market conditions and prices of securities of Brazilian companies. Our financial condition and results of operations may be adversely affected, for instance, by the following factors and the Brazilian federal government's response to these factors:

- exchange rate movements and volatility;
- inflation and high interest rates;
- financing of the current account deficit;
- liquidity of domestic capital and lending markets;
- tax policy;
- pension, tax and other reforms;
- political instability resulting from allegations of corruption involving political parties, elected officials or other public officials; and
- other political, diplomatic, social and economic developments in or affecting Brazil.

Historically, the country's political situation has influenced the performance of the Brazilian economy, and political crises have affected the confidence of investors and the general public, which resulted in economic deceleration, downgrading of credit ratings of the Brazilian government and Brazilian issuers, and heightened volatility in the securities issued abroad by Brazilian companies. Political instability may aggravate economic uncertainties in Brazil and increase volatility

of securities of Brazilian issuers. Future economic, social and political developments in Brazil may impair our business, financial condition or results of operations, or cause the market value of our securities to decline.

Our governance, internal controls and compliance processes may fail to prevent breaches of legal, regulatory accounting, ethical or governance standards.

We operate in a global environment, and our activities extend over multiple jurisdictions and complex regulatory frameworks, with increasing enforcement activities worldwide. We are required to comply with a wide range of laws and regulations in the countries where we operate or do business, including anti-corruption, international sanctions, anti-money laundering and related laws and regulations. Our governance and compliance processes, which include the review of internal control over financial reporting, may not timely identify or prevent future breaches of legal, regulatory, accounting, governance or ethical standards. We may be subject to breaches of our code of conduct, anti-corruption policies, human rights policies or other internal policies, or breaches of business conduct protocols and to instances of fraudulent behavior, corrupt practices and dishonesty by our employees, contractors or other agents. This risk is heightened by the fact that we have a large number of contracts with local and foreign suppliers, as well as by the geographic distribution of our operations and the wide variety of counterparties involved in our business. Our failure to comply with applicable laws and other standards could subject us to investigations by authorities, litigation, fines, loss of operating licenses, disgorgement of profits, involuntary dissolution and reputational harm.

We could be adversely affected by changes in government policies or by trends such as resource nationalism, including the imposition of new taxes or royalties on mining activities.

Mining is subject to government regulation, including taxes and royalties, which can have a significant financial impact on our operations. In the countries where we are present, we are subject to potential renegotiation, nullification or forced modification of existing contracts and licenses, expropriation or nationalization of property, foreign exchange controls, capital ownership requirements, changes in local laws, regulations and policies and audits and reassessments. We are also subject to new taxes or raising of existing taxes and royalty rates, reduction of tax exemptions and benefits, renegotiation of tax stabilization agreements or changes on the basis on which taxes are calculated in a manner that is unfavorable to us. Governments that have committed to provide a stable taxation or regulatory environment may alter those commitments or shorten their duration. We also face the risk of having to submit to the jurisdiction of a foreign court or arbitration panel or having to enforce a judgment against a sovereign nation within its own territory. See *Information on the Company—Regulatory matters—Royalties and other taxes on mining activities*.

We are also required to meet domestic beneficiation requirements in certain countries, such as local processing rules, export taxes or restrictions or charges on unprocessed ores. The imposition of or increase in such requirements, taxes or charges can significantly increase the risk profile and costs of operations in those jurisdictions. We and the mining industry are subject to rising trends of resource nationalism in certain countries in which we operate that can result in constraints on our operations, increased taxation or even expropriations and nationalizations.

As a supplier of iron ore, nickel and other raw materials to the global integrated steel industry and to other metal-consuming sectors such as battery production and other specified, industrial end-uses we are subject to additional risk from the imposition of duties, tariffs, import and export controls and other trade barriers impacting our products and the products our customers produce. Global trade is subject to a growing trend of increased trade barriers, which could exacerbate commodities' price volatility and in turn result in instability in the prices of our products.

Concessions, authorizations, licenses and permits are subject to expiration, limitation on renewal and various other risks and uncertainties.

Our operations depend on authorizations, concessions and licenses from governmental regulatory agencies and other authorities in the countries in which we operate. We are subject to laws and regulations in many jurisdictions that can change at any time, and changes in laws and regulations may require modifications to our technologies and operations and result in unanticipated capital expenditures.

Some of our mining concessions are subject to fixed expiration dates and might only be renewed a limited number of times for a limited period. Apart from mining concessions, we may need to obtain various authorizations, licenses and permits from governmental or other regulatory bodies in connection with the planning, maintenance, operation and closure of our mines and related logistics infrastructure, which may be subject to fixed expiration dates or periodic review or renewal. There is no assurance that renewals will be granted as and when sought, and there is no assurance that new conditions will not be imposed in connection with renewal. Fees for mining concessions might increase substantially due to the passage of time from the original issuance of each individual exploration license. If so, the costs of holding or renewing our mining concessions may render our business objectives not viable. Accordingly, we need to continually assess the mineral potential of each mining concession, particularly at the time of renewal, to determine if the costs of maintaining the concession are justified by the results of operations to date, and we might elect to let some of our concessions lapse. There can be no assurance that concessions will be obtained on terms favorable to us, or at all, for our future intended mining or exploration targets.

In a number of jurisdictions where we have exploration projects, we may be required to retrocede to the state a certain portion of the area covered by the exploration license as a condition to renewing the license or obtaining a mining concession. This requirement can lead to a substantial loss of part of the mineral deposit originally identified in our feasibility studies.

We are also subject to laws and regulations and acts by authorities, related to dams, caves, indigenous people that may limit or modify our mining plans, impact our production volumes, costs and reserves and resources. For more information on mining concessions and other similar rights, see *Information on the Company—Regulatory matters*.

Changes in Brazilian fiscal policies and tax laws could have an adverse effect on our financial condition and results and on investments in our securities.

The Brazilian government has frequently implemented and may continue to implement changes in its fiscal policies, including, but not limited to tax rates, fees, sectoral charges and occasionally the collection of temporary contributions. Changes in tax laws and in the interpretation of tax laws by Brazilian tax authorities and courts may occur and may result in tax increases and revocation of tax exemptions. Brazilian legislators are currently debating a comprehensive tax reform, which may include the elimination or unification of certain taxes, the creation of new taxes, the increase of existing taxes and contribution rates, the revocation of income tax exemptions on the distribution of profits and dividends and changes relating to interest on net equity. The approval of these legislative proposals or changes in fiscal policies, tax laws and interpretations may impact our tax obligations and may have a material adverse effect on our financial condition and results, and on investments in our securities.

CULTURE AND TALENT MANAGEMENT RISKS

Our performance and ability to achieve our ambitions and to maintain our competitive position is dependent on our culture and our capacity to attract, develop and retain skilled and experienced talented professionals.

Since 2019, we have been promoting a transformation of our culture, which we believe is fundamental to the implementation of our business strategy and our ambitions. Our ability to attract, develop and retain experienced and talented professionals is also dependent on this corporate culture transformation. If we fail to achieve our culture transformation goals and to attract, develop and retain talents, our reputation, performance and competitive position may be adversely impacted.

MINERAL RESERVES AND MINERAL RESOURCES RISKS

Our mineral reserve and resource estimates may materially differ from the volume of materials that we are actually able to recover; our estimates of mine life may prove inaccurate; more stringent regulations, market price fluctuations and changes in operating and capital costs may render certain mineral reserves and resources uneconomical to mine; and we may not be able to replenish our mineral reserves.

There are numerous uncertainties inherent in estimating quantities of mineral resources and mineral reserves in projecting potential future rates of mineral production, including factors beyond our control. Reduction in our mineral resources and mineral reserves may affect our future production and cash generation, impact depreciation and amortization rates, and result in asset write-downs or write-offs, which may have an adverse effect on our financial performance.

Below are the key risks relating to our mineral resources and mineral reserves:

- Reporting and estimates of mine life involves estimating deposits of minerals that cannot be measured in an exact manner, and the accuracy of any estimate is a function of the quality of available data, engineering, market prices of minerals and metals, more stringent regulations, costs estimates, investments, geotechnical analysis, geological interpretation and judgment. No assurance can be given that the indicated amount of ore will be recovered or that it will be recovered at the rates we anticipate. We review our mineral resources and reserves estimates from time to time in light of updated information and changes in regulatory framework (including conditions imposed by environmental laws and regulations), which may result in a reduction of our reported mineral resources and mineral reserves. See *Information on the Company—Reserves and Resources and —Regulatory Matters*.
- Difficulties or the inability to obtain licenses for new operations, supporting structures or activities (such as dams), or to renew our existing licenses, can cause a reduction of our mineral resources that could be converted into mineral reserves.
- Once mineral deposits are discovered, it can take several years from the initial phases of drilling until production is possible, during which the economic feasibility of production may change. If a project proves not to be economically feasible by the time we are able to exploit it, we may incur substantial losses and be obliged to take write-downs or at least to downgrade its mineral reserves into mineral resources categories. In addition, potential changes or complications involving metallurgical and other technological processes arising during the life of a project may result in delays and cost overruns that may render the project not economically feasible by the time of the reporting.
- We engage in mineral exploration, which is highly uncertain in nature, involves many risks and frequently is non-productive. Our exploration programs, which involve significant expenditures, may fail to result in the mineral resources definition suitable for expansion or replacement of mineral reserves depleted by current production. If we do not develop new mineral resources and reserves, we will not be able to sustain our current level of production beyond the remaining lives of our existing mines.
- Mineral reserves are gradually depleted in the ordinary course of a given open pit or underground mining operation. As mining progresses, distances to the primary crusher and to waste deposits become longer, pits become steeper, mines may move from being open pit to underground, and underground operations become deeper. In addition, for some types of deposits, mineralization grade decreases and hardness increases at greater depths. As a result, over time, we usually experience rising unit extraction costs with respect to each mine, or we may need to make additional investments, including adaptation or construction of processing plants and expansion or construction of tailings dams. Several of our mines have been operating for long periods, and we will likely experience rising extraction costs per unit in the future at these operations in particular.

CORPORATE STRUCTURE RISKS

The Brazilian Government has certain veto rights.

The Brazilian government owns 12 of our golden shares, granting it limited veto power over certain company actions, such as changes to our name, the location of our headquarters and our corporate purpose as it relates to mining activities. For a detailed description of the Brazilian government's veto powers, see *Additional information—Bylaws—Common shares and golden shares*.

We do not have a controlling shareholder or control group and we are subject to certain risks as a result.

Since 2020, we do not have a controlling shareholder or a control group that hold rights that permanently ensure it the majority of votes in the resolutions of the general shareholders' meeting and the power to elect the majority of the members of our Board of Directors. In the absence of a controlling shareholder or controlling group, the minimum quorum required by law for certain decisions at shareholders' meetings may not be reached in respect of certain matters, which could adversely affect our business. We are also exposed to shareholder activism, with shareholder groups seeking to cause us to take actions that may not be consistent with our business strategy. This may require us to incur significant expenses and require significant time and attention from our management and Board of Directors, which could interfere with our ability to implement our business strategy and adversely affect our business and operating results.

It could be difficult for investors to enforce any judgment obtained outside Brazil against us or any of our associates.

Our investors may be located in jurisdictions outside Brazil and could seek to bring actions against us or our directors or officers in the courts of their home jurisdictions. We are a Brazilian company, and the majority of our officers and directors are residents of Brazil. The vast majority of our assets and the assets of our officers and directors are likely to be located in jurisdictions other than the home jurisdictions of our foreign investors. It might not be possible for investors outside Brazil to effect service of process within their home jurisdictions on us or on our officers or directors who reside outside their home jurisdictions. In addition, a final conclusive foreign judgment will be enforceable in the courts of Brazil without a re-examination of the merits only if previously confirmed by the Brazilian Superior Court of Justice (*Superior Tribunal de Justiça*—"STJ"), and confirmation will only be granted if the foreign judgment: (i) fulfills all formalities required for its enforceability under the laws of the country where it was issued; (ii) was issued by a competent court after due service of process on the defendant, as required under applicable law; (iii) is not subject to appeal; (iv) does not conflict with a final and unappealable decision issued by a Brazilian court; (v) was authenticated by a Brazilian consulate in the country in which it was issued or is duly apostilled in accordance with the Convention for Abolishing the Requirement of Legalization for Foreign Public Documents and is accompanied by a sworn translation into Portuguese, unless this procedure was exempted by an international treaty entered into by Brazil; (vi) it does not cover matters subject to the exclusive jurisdiction of the Brazilian courts; and (vii) is not contrary to Brazilian national sovereignty, public policy or good morals. Therefore, investors might not be able to recover against us or our directors and officers on judgments of the courts of their home jurisdictions predicated upon the laws of such jurisdictions.

DEPOSITARY SHARES RISKS

If ADR holders exchange ADSs for the underlying shares, they risk losing the ability to remit foreign currency abroad.

The custodian for the shares underlying our ADSs maintains a registration with the Central Bank of Brazil permitting the custodian to remit U.S. dollars outside Brazil for payments of dividends and other distributions relating to the shares underlying our ADSs or upon the disposition of the underlying shares. If an ADR holder exchanges its ADSs for the underlying shares, it will be entitled to rely on the custodian's registration for only five business days from the date of exchange. Thereafter, an ADR holder may not be able to obtain and remit foreign currency abroad upon the disposition of, or distributions relating to, the underlying shares unless it obtains its own registration under applicable regulation. See *Additional Information—Exchange controls and other limitations affecting security holders*. If an ADR holder attempts to obtain its own registration, it may incur expenses or suffer delays in the application process, which could delay the receipt of dividends or other distributions relating to the underlying shares or the return of capital in a timely manner.

The custodian's registration or any registration obtained could be affected by future legislative changes, and additional restrictions applicable to ADR holders, the disposition of the underlying shares or the repatriation of the proceeds from disposition and taxation of dividends could be imposed in the future.

ADR holders may not have all the rights of our shareholders and may be unable to exercise voting rights or preemptive rights relating to the shares underlying their ADSs.

ADR holders may not have the same rights that are attributed to our shareholders by Brazilian law or our bylaws, and the rights of ADR holders may be subject to certain limitations provided in the deposit agreement or by the securities intermediaries through which ADR holders hold their securities.

ADR holders do not have the rights of shareholders. They have only the contractual rights set forth for their benefit under the deposit agreements. ADR holders are not permitted to attend shareholders' meetings, and they may only vote by providing instructions to the depository. In practice, the ability of a holder of ADRs to instruct the depository as to voting will depend on the timing and procedures for providing instructions to the depository either directly or through the holder's custodian and clearing system. With respect to ADSs for which instructions are not received, the depository may, subject to certain limitations, grant a proxy to a person designated by us.

The ability of ADR holders to exercise preemptive rights is not assured, particularly if the applicable law in the holder's jurisdiction (for example, the Securities Act in the United States) requires that either a registration statement be effective or an exemption from registration be available with respect to those rights, as is in the case in the United States. We are not obligated to extend the offer of preemptive rights to holders of ADRs, to file a registration statement in the United States, or to make any other similar filing in any other jurisdiction, relating to preemptive rights or to undertake steps that may be needed to make exemptions from registration available, and we cannot assure holders that we will file any registration statement or take such steps.

The legal protections for holders of our securities differ from one jurisdiction to another and may be inconsistent, unfamiliar or less effective than investors anticipate.

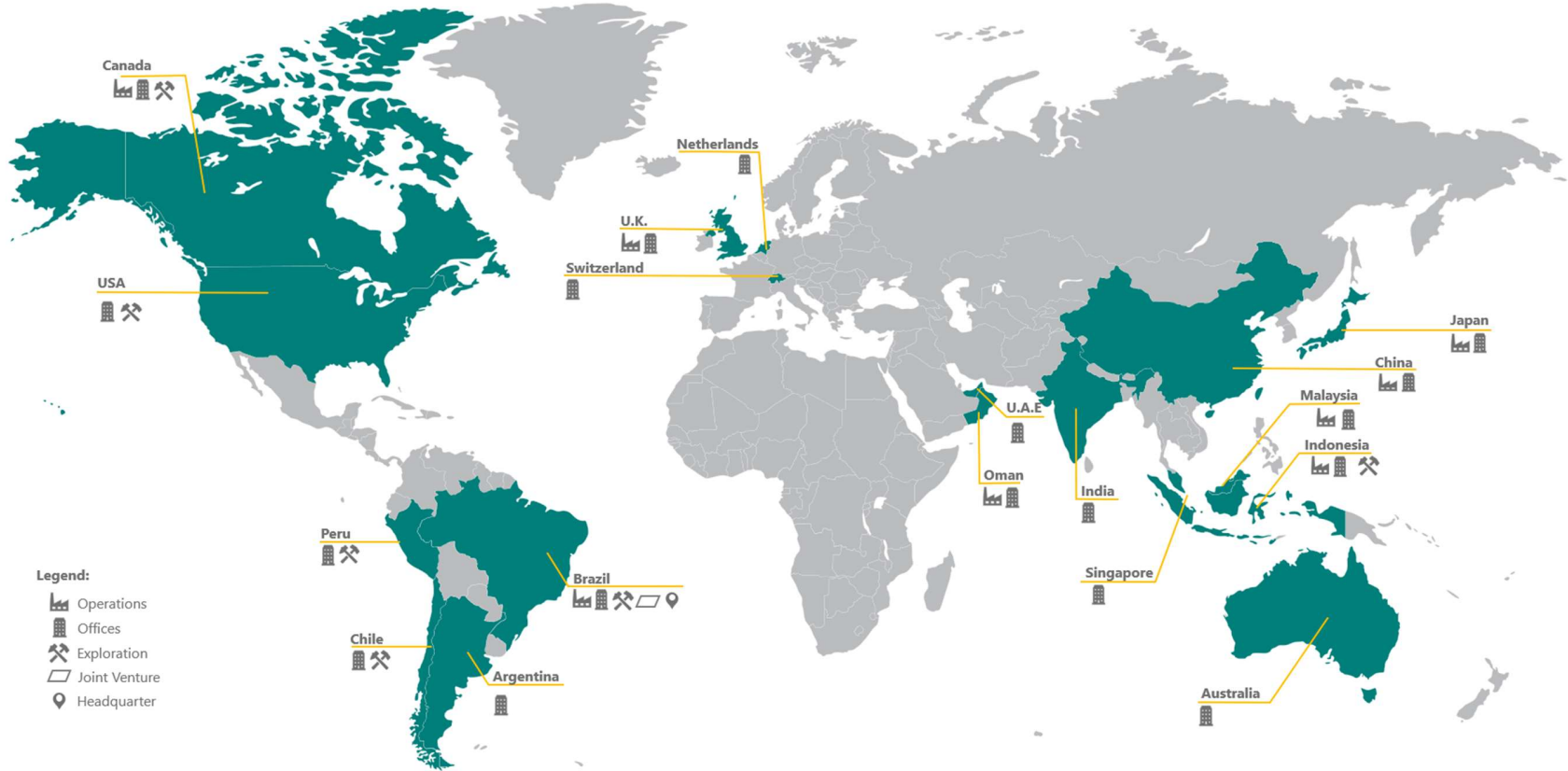
We are a global company with securities traded in several different markets and investors located in many different countries. The legal regime for the protection of investors varies around the world, sometimes in important ways, and investors in our securities should recognize that the protections and remedies available to them may be different from those to which they are accustomed in their home markets. We are subject to securities legislation in several countries, which have different rules, supervision and enforcement practices. The only corporate law applicable to our parent company is the law of Brazil, with its specific substantive rules and judicial procedures. We are subject to corporate governance rules in several jurisdictions where our securities are listed, but as a foreign private issuer, we are not required to follow many of the corporate governance rules that apply to U.S. domestic issuers with securities listed on the New York Stock Exchange, and we are not subject to the U.S. proxy rules.

II. INFORMATION ON THE COMPANY

LINES OF BUSINESS

Our principal lines of business consist of mining and related logistics. This section presents information about operations, production, sales and competition and is organized as follows:

- 1. Iron Solutions**
 - 1.1 Iron ore and iron ore pellets
 - 1.1.1 Iron ore properties
 - 1.1.2 Iron ore production
 - 1.1.3 Individual property disclosure
 - 1.1.3.1 Serra Norte
 - 1.1.3.2 Serra Sul
 - 1.1.4 Iron ore pellets operations
 - 1.1.5 Iron ore pellets production
 - 1.1.6 Iron ore strategy
 - 1.1.7 Customers, sales and marketing
 - 1.1.8 Competition
 - 1.2 Manganese ore
 - 1.2.1 Manganese ore property and production
 - 1.3 Logistics and energy assets to support iron solutions operations
 - 1.3.1 Railroads
 - 1.3.2 Ports and maritime terminals
 - 1.3.3 Energy
- 2. Energy Transition Metals**
 - 2.1 Nickel
 - 2.1.1 Properties
 - 2.1.2 Production
 - 2.1.3 Individual property disclosure
 - 2.1.3.1 Sudbury
 - 2.1.4 Nickel Strategy
 - 2.1.5 Customers and sales
 - 2.1.6 Competition
 - 2.2 Copper
 - 2.2.1 Properties
 - 2.2.2 Production
 - 2.2.3 Individual property disclosure
 - 2.2.3.1 Salobo
 - 2.2.4 Copper Strategy
 - 2.2.5 Customers and sales
 - 2.2.6 Competition
 - 2.3 PGMs and other precious metals
 - 2.4 Cobalt
 - 2.5 Logistics and energy assets to support energy transition metals operations
 - 2.5.1 Ports
 - 2.5.2 Energy
- 3. Other Investments**
 - 3.1 Samarco Mineração S.A.
 - 3.2 Mineração Rio do Norte S.A.
 - 3.3 Others



We have renamed our main operating segments. The operating segment previously named “Ferrous Minerals” is now named “Iron Solutions” while the “Base Metals” operating segment is now named “Energy Transition Metals”.

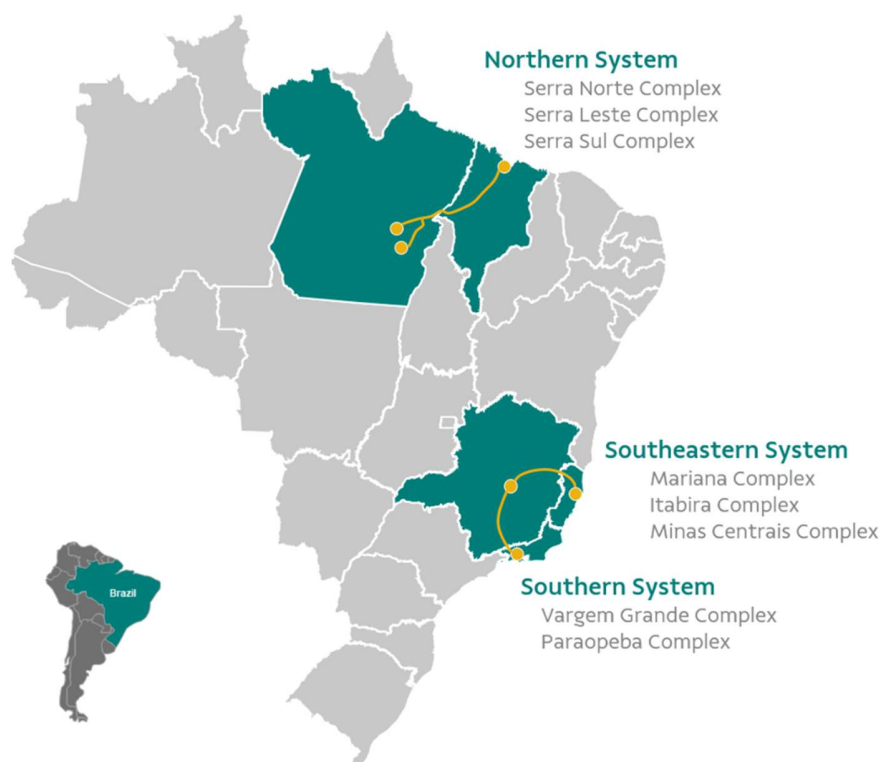
1. IRON SOLUTIONS

Our iron solutions business includes iron ore mining and iron ore pellet production. Each of these operations is described below. Until July 2022, we held manganese ore mining activities (ferroalloy operations), which were fully divested.

1.1 Iron ore and iron ore pellets

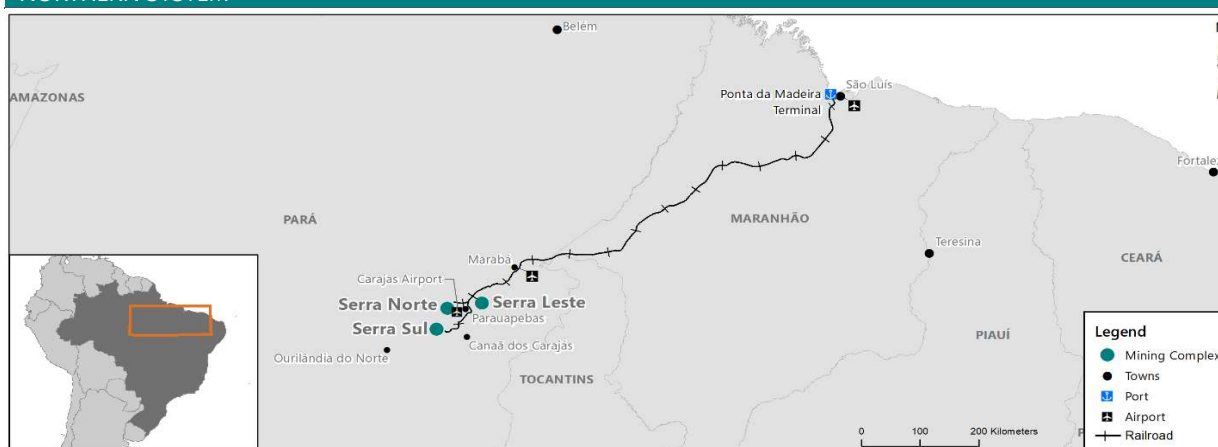
1.1.1 Iron ore properties

We conduct our iron ore business in Brazil primarily at the parent-company level. Our mines, all of which are open pit, and their related operations are mainly concentrated in three systems: the Southeastern, Southern and Northern Systems, each with its own transportation and shipping capabilities. Until July 2022, we also held operations in the Midwestern System, which have been fully divested. A summary of our iron ore resources and reserves is provided under *Information on the Company—Reserves and Resources*. In addition to the properties described below, we have other exploration activities and non-operational properties, mostly in the surroundings of our operations described in this section.



IRON ORE OPERATIONS

NORTHERN SYSTEM



Ownership interest	100%
Location	Carajás, State of Pará, Brazil.
Operator	Vale S.A.
Mining complexes	Three mining complexes: - Serra Norte (three main mining areas and three beneficiation plants). - Serra Sul (one main mining area and one beneficiation plant). - Serra Leste (one mining area and one beneficiation plant).
Mineral titles ⁽¹⁾	Mining concession with no expiration date. Area: Serra Norte: 30,000 ha, Serra Sul: 98,910 ha and Serra Leste: 9,915 ha.
Stage/ Operations	All the complexes are in production stage. Serra Norte has been operating since 1984, Serra Sul since 2016 and Serra Leste since 2014.
Key permit conditions	We have already obtained or expect to obtain in a timely manner the necessary permits for operations. We are in the process of obtaining or renewing (i) certain environmental permits, including permits relating to protective buffer approvals for caves and lakes and (2) mining land zoning approval for areas with provision for environmental management plan. Our expectation as to future licenses is reviewed on a regular basis, and in 2023 we will complete a detailed review of all processes for Serra Sul, which may result in changes that may adversely impact our mineral reserves. For information about environmental licensing, particularly with respect to caves, see <i>Information on the Company—Regulatory matters—Environmental regulations—Protection of caves</i> .
Mine types and mineralization styles	Open pit mining operations with high grade hematite ore type (iron grade around 65%) for Serra Norte, Serra Sul and Serra Leste. In Serra Leste there is also a minor amount of Itabirite material (iron grade of 35-60%).

Associated facilities and infrastructure

Processing plants: In Serra Norte, two of the beneficiation plants apply natural moisture beneficiation process, consisting of crushing and screening, and the one of the plants applies both natural moisture and wet beneficiation process in distinct lines. Wet beneficiation process consists simply of sizing operations, including screening, hydrocycloning, crushing and filtration. Output from this site consists of sinter feed, pellet feed and lump ore. Serra Leste and Serra Sul natural moisture beneficiation process consists of crushing and screening. Serra Sul and Serra Leste produce only sinter feed.

Other facilities: Waste and tailings disposal structures in Serra Norte and Serra Leste and waste disposal structures in Serra Sul.

Logistics: Carajás railroad (“EFC”) transports the iron ore to the Ponta da Madeira maritime terminal in the Brazilian state of Maranhão. Serra Leste iron ore is transported by trucks from the mine site to EFC railroad. The Serra Sul ore is shipped via a 101-kilometer-long railroad spur to the EFC railroad.

Energy: Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.

(1) Area with reserves and resources associated.

SOUTHEASTERN SYSTEM



Ownership interest

100% of Itabira and Mariana;
98.6% of Minas Centrais (China Baowu Steel Group Corporation Limited indirectly holds 1.4% of Minas Centrais through a 50% ownership of the Morro Agudo mine).

Location

Iron Quadrangle, State of Minas Gerais, Brazil.

Operator

Vale S.A.

Mining complexes

Three mining complexes:
- Itabira (two mines, with three major beneficiation plants).
- Minas Centrais (two mines, with two major beneficiation plants and one secondary plant).
- Mariana (three mines, with three major beneficiation plants).

Mineral titles⁽¹⁾

Mostly mining concessions with no expiration date.
Area involved: Itabira: 8,404 ha, Minas Centrais: 4,973 ha and Mariana: 7,192 ha.

<p>Stage/ Operations</p>	<p>All the complexes are in production stage. Itabira has been operating since 1957, Minas Centrais since 1994 and Mariana since 1976.</p>
<p>Key permit conditions</p>	<p>We have or expect to obtain in a timely manner the necessary permits for operations. We are in the process of obtaining or renewing (i) certain environmental permits, including influence area study for caves and dams and (i) waste and tailings storage facilities permit. For information about environmental licensing, particularly with respect to caves, see <i>Information on the Company—Regulatory matters—Environmental regulations—Protection of caves</i> and — <i>Brazilian Regulation of Mining Dams</i>.</p>
<p>Mine types and mineralization styles</p>	<p>Open pit mining operations with high ratios of itabirite ore relative to hematite ore type. Itabirite ore type has iron grade of 35-60%. Part of the ore is concentrated to achieve shipping grade and part is shipped and blended in Asia with the high-grade ore from our Northern System.</p>
<p>Associated facilities and infrastructure</p>	<p><i>Processing plants:</i> We generally process the run of mine by means of standard crushing, classification and concentration steps, producing sinter feed, lump ore and pellet feed in the beneficiation plants located at the mining complexes. <i>Other facilities:</i> Waste and tailings disposal structures in all complexes. <i>Logistics:</i> EFVM railroad connects these mines to the Tubarão port. <i>Energy:</i> Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.</p>

⁽¹⁾ Area with reserves and resources associated.

SOUTHERN SYSTEM



Ownership interest	100%
Location	Iron Quadrangle, State of Minas Gerais, Brazil.
Operator	Vale S.A.
Mining complexes	Two mining complexes: - Vargem Grande (five mines and five major beneficiation plants). - Paraopeba (five mines and three major beneficiation plants).
Mineral titles ⁽¹⁾	Mostly mining concessions with no expiration date. Area involved: Vargem Grande: 8,940 ha, Paraopeba: 5,826 ha.
Stage/ Operations	All the complexes are in production stage. Vargem Grande has been operating since 1942 and Paraopeba since 2003.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations. We are in the process of obtaining or renewing (i) certain environmental permits, including influence area study for caves and dams and (ii) waste and tailings storage facilities permits. For information about environmental licensing, particularly with respect to caves, see <i>Information on the Company—Regulatory matters—Environmental regulations—Protection of caves</i> and — <i>Brazilian Regulation of Mining Dams</i> .
Mine types and mineralization styles	Open pit mining operations with high ratios of itabirite ore relative to hematite ore type. Itabirite ore type has iron grade of 35-60%. Part of the ore is concentrated to achieve shipping grade and part is shipped and blended in Asia with the high-grade ore from our Northern System.

<p>Associated facilities and infrastructure</p>	<p><i>Processing plants:</i> We generally process the run of mine by means of standard crushing, classification and concentration steps, producing sinter feed, lump ore and pellet feed in the beneficiation plants located at the mining complexes.</p> <p><i>Other facilities:</i> Waste and tailings disposal structures in all complexes.</p> <p><i>Logistics:</i> MRS transports our iron ore products from the mines to our Guaíba Island and Itaguaí maritime terminals in the Brazilian state of Rio de Janeiro. EFVM railroad connects certain mines to the Tubarão port in the state of Espírito Santo.</p> <p><i>Energy:</i> Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.</p>
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(1) Area with reserves and resources associated.

1.1.2 Iron ore production

The following table sets forth information about our iron ore production.

Mine/Plant	Type	Production for the year ended December 31,			Process recovery 2022 ⁽²⁾ (%)
		2022 ⁽¹⁾	2021 ⁽¹⁾	2020 ⁽¹⁾	
<i>(million metric tons)</i>					
<i>Southeastern System</i>					
Itabira	Open pit	27.3	28.7	23.9	53.7
Minas Centrais ⁽³⁾	Open pit	20.8	19.3	15.7	88.9
Mariana	Open pit	24.6	21.8	17.7	81.0
Total Southeastern System		72.7	69.8	57.3	69.6
<i>Southern System</i>					
Vargem Grande	Open pit	33.5	31.3	25.1	80.1
Paraopeba	Open pit	30.1	23.0	23.3	73.5
Total Southern System		63.6	54.3	48.4	77.8
<i>Northern System</i>					
Serra Norte	Open pit	96.3	109.3	109.1	97.2
Serra Leste	Open pit	6.0	5.9	0.3	100
Serra Sul	Open pit	69.3	73.7	82.9	100
Total Northern System		171.6	188.9	192.3	98.4
Total		307.9	313.0	298.0	86.0

(1) Production figures include third-party ore purchases, run of mine and feed for pelletizing plants.

(2) Percentage of the run-of-mine recovered in the beneficiation process. Process recovery figures do not include third-party ore purchases.

(3) These figures correspond to 100% production and are not adjusted to reflect our 50% ownership of Morro Agudo mine.

1.1.3 Individual property disclosure

We consider Serra Norte and Serra Sul to be material properties, for purposes of Item 1300 of Regulation S-K (“S-K 1300”). There have been no material changes in the reported reserves or resources or in the material assumptions and information since the last technical report summary filed for Serra Norte and Serra Sul operations.

1.1.3.1 Serra Norte

Property Description

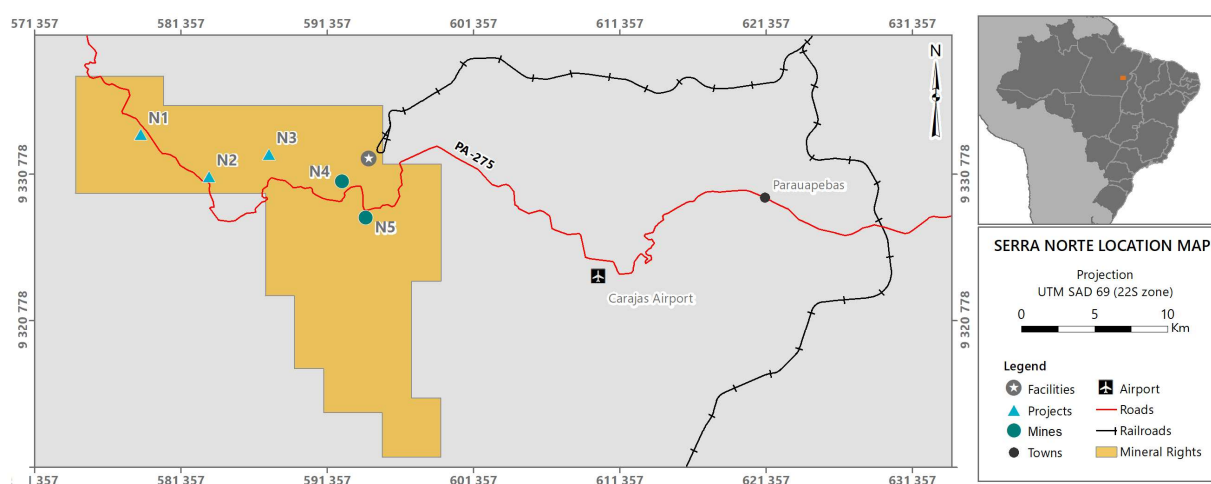
The Serra Norte mining complex is a production stage property, part of our Northern System, located in the municipality of Parauapebas, state of Pará, in the North region of Brazil. The property consists of five orebodies (N1, N2, N3, N4, and N5) and has the approximate coordinates 587,140E, 9,331,790N using the UTM SAD 69 (Universal Transverse Mercator

– South American Datum 1969) coordinate system. Central mass point coordinates of the Serra Norte mines are presented below:

Serra Norte mines central coordinates UTM South American Datum (SAD69)

Mine	Status	UTM E	UTM N
N4	Operating	590,140	9,329,567
N5	Operating	596,410	9,328,668
N1	Non-operating	579,891	9,333,075
N2	Non-operating	583,351	9,330,472
N3	Non-operating	587,140	9,331,790

The property can be accessed via regular flights between the Carajás village and the cities of Marabá, Belém, Belo Horizonte, and Brasília, as well as paved highways PA-275, PA-150, and PA-70. There is also a railroad linking Carajás with the Ponta da Madeira port, in the city of São Luis.



Infrastructure

Various services are available approximately 50 km east of the complex in Parauapebas (population 213,576, estimated 2020). A greater range of general services is available at the state capital of Belém, located approximately 770 km to the northeast. Electric power is provided through Brazil's national electricity production and transmission system. Dewatering boreholes provide a source of water that is used for dust control, washing floors and equipment. An on-site treatment plant treats borehole water for potable use. Process makeup water is sourced from the Gelado and Pera dams. Infrastructure at the complex includes a tailings storage facility, three processing plants, ore stockpiles, waste rock dumps, maintenance workshops, an assay laboratory, administration offices, and a clinic. Personnel reside mainly in the urban center of Carajás and the city of Parauapebas.

Geology and Mineralization

The main Carajás iron ore deposits are associated with flat-topped elevated plateaus, defined along two main morphological alignments corresponding to Serra Norte and Serra Sul. These alignments form the flanks of the Carajás Syncline structure. The Serra Norte complex corresponds to the inverted flank of the Carajás Syncline. Mineralization occurs mainly as a product of supergenic enrichment, developed over jaspilites (BIF – Banded Iron Formation – interlayered with basalts), generating a high-grade ore composed of friable hematite, compact hematite, and manganese hematite. The main structural controls are faults and folds that favored the BIFs thickening of the levels of jaspilite, by duplication and the efficiency of supergenic processes through the tilting and fracturing of these rocks.

Exploration

Exploration has occurred in the property since the late 1960s and includes geological mapping, drilling, ore control field sampling and geophysics. We continually invest in mineral exploration with the aim of expanding our mineral resources and mineral reserves and achieve an adequate level of confidence in the resource estimate that supports our mining plans.

Mineral rights

We have a mining concession for Serra Norte operations, under Brazilian national mining agency (*Agência Nacional de Mineração – “ANM”*) Mineral Right number 813.682/1969, that covers an area of 30,000.00 ha, with no expiration date. This mining right is part of a group of permits referred to as “Grupamento Mineiro” (number 852.145/1976), which includes mining concessions from the Carajás region, such as mining concessions of operations of Serra Sul and Serra Leste.

Surface rights

Surface rights are independent of mineral rights in Brazil. Serra Norte is located entirely within the National Forest of Carajás, which belongs to the Federal Government. We have the required licenses and authorizations from the Brazilian Institute of Environment and Renewable Natural Resources (“IBAMA”) and the Chico Mendes Institute for Biodiversity Conservation (“ICMBIO”) to operate in this area. There are no associated payments related to surface rights.

Current, planned, future mining plans

Mining at Serra Norte is by traditional open pit mining methods. Ore is hauled by off-road trucks to strategically positioned primary crushing facilities, and waste is hauled to waste dumps. Plant 1 has a mixed beneficiation process, 55% wet process and 45% dry while Plants 2 and 3 have a 100% natural moisture process. The current nominal production rates are 85.0 Mtpy for Plant 1, 40 Mtpy for Plant 2, and 20 Mtpy for Plant 3.

The current life of mine plan runs from 2023 through 2038. The mine plan involves opening new mining areas for extraction at the N1, N2, and N3 orebodies. Additionally, Plant 1 is undergoing a conversion to a 100% natural moisture process, which is expected to be completed between 2024 and 2025.

Asset details and modernization

Serra Norte mines have been operating since 1984 and being expanded laterally and in depth, with simultaneous mining of more mineral bodies. Consequently, the average haulage distance is increasing. Crushers were implemented for the run of mine (“ROM”) in the pits with conveyor belts, to reduce the haulage distance. There are projects for the installation of new crushers with the same objective. In 2021, we started operating autonomous trucks. The implementation of hybrid electric powered trucks (Trolley Assist System) is expected to operate in 2025. Also, there are projects under study for the implementation of semi-mobile crushers with conveyor belts for the waste. In regions where is a needed vibration control in rock blasting, surface miners are used.

Total property book value

The book value of the Serra Norte mining complex and its associated plant and equipment was US\$2,992 million as of December 31, 2022, not including shared infrastructure assets such as ports and railways.

Operator History

The Carajás Complex has undergone exploration work since 1922. In July 1967, United States Steel began an exploration program in the region to search for manganese deposits, resulting in the first field surveys of the Serra Norte (N1, N2, N3, N4, and N5 locations) as well as the nearby Serra Sul. Exploration and evaluation activities continued, and in 1977 we acquired a shareholding in United States Steel (“USS”) and took over work on the project. Construction began in 1979, with operations at the N4E mine commencing in 1984. Production at the N4W mine began in 1994.

Encumbrances and permitting requirements

We hold an environmental operating license for the property that was valid through March 27, 2021 and is currently being renewed. According to Brazilian legislation we can continue to operate during the renewal process, until there is a decision from the licensing agency (in this case, IBAMA).

Mineral resources

Our mineral resources as of December 31, 2022 have not changed since the previous fiscal year, see *Reserves and Resources*. All disclosure of mineral resources is exclusive of mineral reserves.

Serra Norte - Summary of Iron Ore Mineral Resources as of December 31, ⁽¹⁾⁽²⁾						
Category	2022 ⁽³⁾		2021 ⁽³⁾		Cut-off grade	Metallurgical recovery
	Tonnage	Grade	Tonnage	Grade		
Measured	591.5	66.4	592.7	66.4	N/A ⁽⁴⁾	100%
Indicated	491.2	66.1	491.5	66.1		
Measured + Indicated	1,082.7	66.3	1,084.2	66.3		
Inferred	293.4	66.0	293.4	66.0		

⁽¹⁾ The mineral resource prospects of economic extraction were determined based on a long-term price of US\$90/dmt for 62% iron grade.

⁽²⁾ Resources reported on an 100% basis, as operations are entirely owned by us.

⁽³⁾ Tonnage stated as metric million tons inclusive of 7.47% of moisture content and dry %Fe grade. The point of reference used is *in situ* tons.

⁽⁴⁾ The economic cut-off grade was not applied, as it is lower than the values estimated in the mineralized portion of the block model.

Mineral reserves

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*.

Serra Norte – Summary of Iron Mineral Reserves as of December 31, ⁽¹⁾⁽²⁾						
Category	2022 ⁽³⁾		2021 ⁽³⁾		Cut-off grade	Metallurgical recovery
	Tonnage	Grade	Tonnage	Grade		
Proven	397.8	66.1	464.3	66.1	N/A ⁽⁴⁾	99.6%
Probable	1,101.8	65.7	1,125.9	65.7		
Total	1,499.6	65.8	1,590.2	65.8		

⁽¹⁾ The mineral reserve economic viability was determined based price curve with the long-term price being US\$74.5/dmt for 62% iron grade.

⁽²⁾ The reserves reported on an 100% basis, as operations are entirely owned by us.

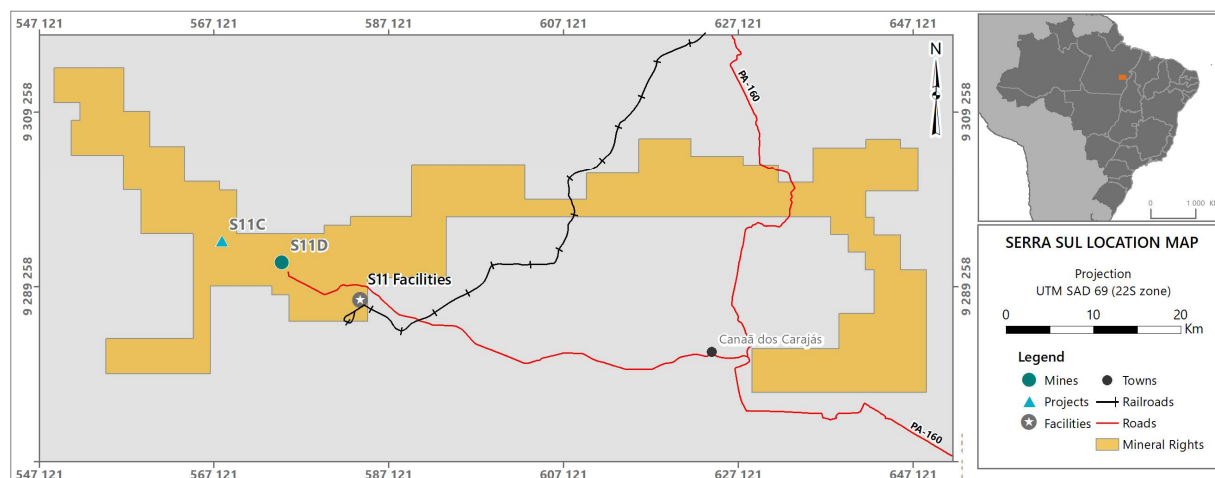
⁽³⁾ Tonnage stated as metric million tons inclusive of 7.55% of moisture content and dry %Fe grade. The point of reference used is *in situ* metric tons.

⁽⁴⁾ The economic cut-off grade was not applied, as it is lower than the values estimated in the mineralized portion of the block

1.1.3.2 Serra Sul

Property Description

Serra Sul mining complex is a production stage property, part of our Northern System, located in the municipality of Canaã dos Carajás, state of Pará, North region of Brazil at coordinates 574,671 E, 9,291,735 N using the SAD69. The property consists of orebody S11, subdivided on A, B, C, and D. Current production activities are in the S11D mine and the mineral reserves and mineral resources are defined only for the orebodies C and D. Access to the property is from Carajás airport towards Canaã dos Carajás via state roads PA-275 and PA-160, covering 83 km. Production ore is transported via railway of the southeast of Pará where it connects to the Carajás Railroad and the Ponta da Madeira port terminal in São Luís in the State of Maranhão.



Infrastructure

The nearest city to the mine complex is Canaã dos Carajás (population 38,100, estimated 2020).

Electric power is provided to the mines through Brazil's national electricity production and transmission system. Water is sourced from permitted dewatering wells and water catchments across the site and is used for industrial and domestic purposes. Infrastructure at the complex includes the open pit mine, waste dumps, processing plant, a complete maintenance workshop facility, an assay and quality control laboratory, offices, and a clinic. As the plant is a 100% natural moisture process, a tailings storage facility is not necessary for Serra Sul. Personnel reside mainly in the urban center of Canaã dos Carajás.

Geology and Mineralization

The main Carajás iron ore deposits are associated with flat-topped elevated plateaus, defined along two main morphological alignments corresponding to Serra Norte and Serra Sul. These alignments form the flanks of the Carajás Syncline structure. The Serra Sul complex corresponds to the normal flank domain of the Carajás Syncline. Mineralization at Serra Sul is mainly formed from alteration on supergenic enrichment over jaspilites (BIF – Banded Iron Formation – interlayered with basalts), generating a high-grade ore composed of friable hematite, compact hematite, and manganiferous hematite which occur in a sub-horizontal tabular layer. The main structural controls are folds and faults that are responsible for the BIF thickening of the levels of jaspilite, by duplication and the efficiency of supergenic processes through the tilting and fracturing of these rocks.

Exploration

Exploration has occurred in the property since the late 1960s and includes geological mapping, drilling, ore control field sampling and geophysics. We continually invest in mineral exploration with the aim of expanding our mineral resources and mineral reserves and achieve an adequate level of confidence in the resource estimate that supports our mining plans.

Mineral Rights

We have a mining concession for Serra Sul operations, under ANM Mineral Right number 813.684/1969, that covers an area of 98,910.42 ha. This mining right is part of a group of permits referred to as "Grupamento Mineiro" (number 852.145/1976), which includes mining concessions from the Carajás region, such as mining concessions of operations of Serra Norte and Serra Leste. In 2021, we decided to relinquish our mineral rights in indigenous lands in Brazil. For this purpose, we filed application for area reduction with respect to the mining right number 813.684/1969, reducing its area from 100,000.00 ha to 98,910.42 ha. This area reduction will become effective upon publication of ANM approval in the Official Gazette.

Surface Rights

Surface rights are independent of mineral rights in Brazil. We own the relevant properties or have easements to conduct our operations in Serra Sul.

Current, planned, future mining plans

Mining at Serra Sul is by open pit primarily using a truckless In Pit Crusher Conveyor (“IPCC”) mining method. There are four mobile crushing systems working in conjunction with conveyor belts that move along the benches as the mining face advances. Where IPCC is not feasible, the mine uses traditional truck-shovel methods for extraction of ore and waste. The processing plant at Serra Sul has a nominal annual capacity of 90 Mtpy. Additional mining areas are being assessed at Serra Sul to maintain and expand the complex’s production capacity.

Asset details and modernization

The S11 mine has been operating since 2016 and since the project was conceived there was a premise of having a minimal environmental impact on virgin forest areas. The mine operates with the truckless concept with an IPCC system for waste and ore. The dump piles are also located outside the forest area and have a spreader system for waste disposal. A robust equipment and infrastructure replacement program ensures that equipment manufacturer recommendations for life of asset are followed, and key parts replaced or replaced when required. When the useful life of equipment is done, we plan and invest in upgraded equipment.

Total property book value

The book value of the Serra Sul mining complex and its associated plant and equipment was US\$4,400 million as of December 31, 2022, not including shared infrastructure assets such as ports and railways.

Operator history

The geological surveys in Serra dos Carajás, where the North System is located, began in 1922, but the first citations on the occurrence of iron formations date back to 1933. In July 1967, United States Steel began an exploration program in the region to search for manganese deposits, resulting in the first field surveys of Serra Sul as well as the nearby Serra Norte. Exploration and evaluation activities continued, and in 1977 we acquired a shareholding United States Steel and took over work on the project. In 1979, the construction of the complex, integrating the mine, railroad, and port of the Carajás Iron Project (North System) began and after 6 years, the São Luís – Carajás railroad was completed. Iron ore production began in 1984 in Serra Norte complex while Serra Sul complex started the mine operation in 2016.

Encumbrances and permitting requirements

We hold an operating license for mining, expansions, processing, and infrastructure. The operating license is valid through December 9, 2026.

Mineral resources

Our mineral resources as of December 31, 2022 have not changed since the previous fiscal year, see *Reserves and Resources*. All disclosure of mineral resources is exclusive of mineral reserves.

Serra Sul - Summary of Iron Ore Mineral Resources as of December 31, ⁽¹⁾⁽²⁾						
Category	2022 ⁽³⁾		2021 ⁽³⁾		Cut-off grade	Metallurgical recovery
	Tonnage	Grade	Tonnage	Grade		
Measured	479.9	66.0	479.9	66.0	N/A ⁽⁴⁾	100%
Indicated	388.0	64.6	388.0	64.6		
Measured + Indicated	867.8	65.4	867.8	65.4		
Inferred	123.5	64.3	123.5	64.3		

⁽¹⁾ The mineral resource prospects of economic extraction were determined based on a long-term price of US\$90/dmt for 62% iron grade.

⁽²⁾ The resources reported on an 100% basis, as operations are entirely owned by us.

⁽³⁾ Tonnage stated as metric million tons inclusive of 7.21% of moisture content and dry %Fe grade. The point of reference used is *in situ* metric tons.

⁽⁴⁾ The economic cut-off grade was not applied, as it is lower than the values estimated in the mineralized portion of the block model.

Mineral reserves

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*.

Serra Sul - Summary of Iron Ore Mineral Reserves as of December 31, ⁽¹⁾⁽²⁾						
Category	2022 ⁽³⁾		2021 ⁽³⁾		Cut-off grade	Metallurgical recovery
	Tonnage	Grade	Tonnage	Grade		
Proven	1,807.6	66.1	1,825.8	66.0	N/A ⁽⁴⁾	100%
Probable	2,385.6	65.6	2,447.2	65.6		
Total	4,193.2	65.8	4,273.0	65.8		

⁽¹⁾ The mineral reserve economic viability was determined based price curve with the long-term price being US\$74.5/dmt for 62% iron grade.

⁽²⁾ The reserves reported on an 100% basis, as operations are entirely owned by us.

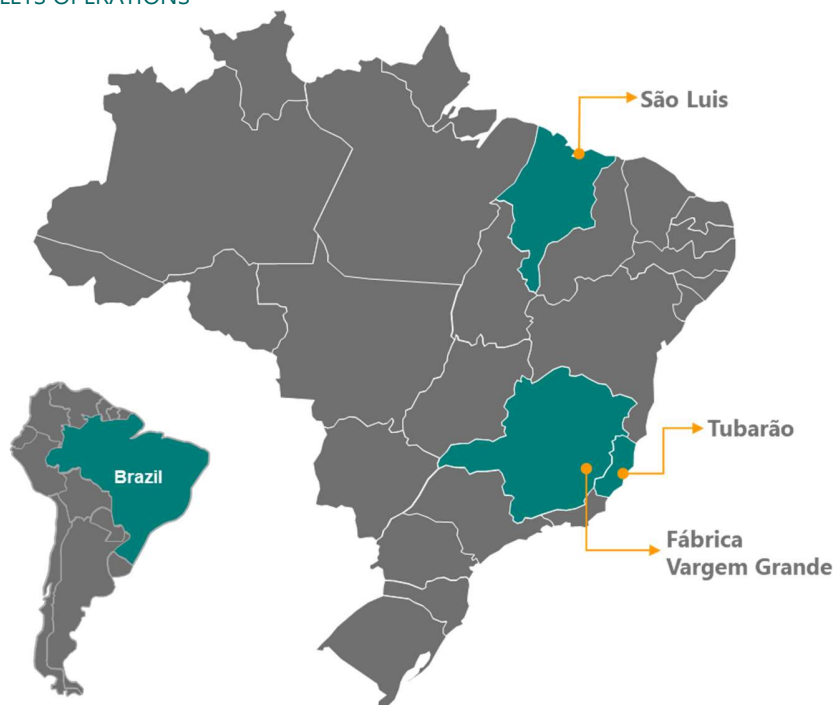
⁽³⁾ Tonnage stated as metric million tons inclusive of 7.22% of moisture content and dry %Fe grade. The point of reference used is *in situ* metric tons.

⁽⁴⁾ The economic cut-off grade was not applied, as it is lower than the values estimated in the mineralized portion of the block model.

1.1.4 Iron ore pellet operations

We produce iron ore pellets in Brazil and Oman, directly and through joint ventures, as set forth in the table below. Our total estimated nominal capacity is 57.7 Mtpy, including the full capacity of our pelletizing plants in Oman, our joint ventures and Tubarão, but not including the capacity of plants owned by our joint venture Samarco.

IRON ORE PELLETS OPERATIONS



	TUBARÃO	FÁBRICA	VARGEM GRANDE	SÃO LUIS
Ownership interest⁽¹⁾	- Vale Tubarão VIII (100% owned by Vale) - Itabasco (50.9% owned by Vale) - Hispanobras (50.89% owned by Vale) - Kobrasco (50% owned by Vale) - Two Nibrasco plants (51% owned by Vale)	100% owned by Vale	100% owned by Vale	100% owned by Vale
Location	State of Espírito Santo, Brazil	State of Minas Gerais, Brazil	State of Minas Gerais, Brazil	State of Maranhão, Brazil
Operator	Vale S.A.	Vale S.A.	Vale S.A.	Vale S.A.
Capacity (Mtpy)	31.3 ⁽²⁾	4.5	7.0	7.5
Operations	One wholly owned pellet plant (Tubarão VIII) and five leased plants (Itabasco, Hispanobras, Kobrasco and two Nibrasco plants). These plants receive iron ore primarily from our Southeastern System mines	Part of the Southern System. Receives iron ore from the Paraopeba complex and purchases from third parties. Since February 2019, Fabrica operations are suspended.	Part of the Southern System. Receives iron ore from the Vargem Grande complex.	Part of the Northern System. Receives iron ore from the Carajás mines.
Energy	Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements	Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.	Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.	Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.
Logistics	Production is shipped to customers through our Tubarão maritime terminal.	Production is mostly transported by MRS and EFVM.	Production is mostly transported by MRS.	Production is shipped to customers through our Ponta da Madeira maritime terminal.

(1) The operating lease for the Hispanobras pellet plant expires in December 2023, for the Itabasco pellet plant in June 2024, for the Nibrasco pellet plant in December 2025, and for the Kobrasco pellet plants in 2033.

(2) Our environmental operating licenses for the Tubarão pellet plants provide for a capacity of 36.2 Mtpy.

OMAN



VALE OMAN PELLETIZING COMPANY LLC ("VOPC")	
Ownership interest	70% stake ⁽¹⁾ <i>Partner:</i> OQ S.A.O.C.
Location	Sohar, Oman
Operator	Vale S.A.
Capacity (Mtpy)	9.0
Operations	Vale's industrial complex. Two pellet plants with total nominal capacity of 9.0 Mtpy. The pelletizing plant is integrated with our distribution center that has a nominal capacity of 40.0 Mtpy. The Oman plant is supplied by iron ore from the Iron Quadrangle state of Minas Gerais through the Tubarão port and by iron ore from Carajás through the Ponta da Madeira maritime terminal.
Energy	Supplied through the national electricity grid.

(1) In February 2023, OQ S.A.O.C. exercised an option to sell its 30% interest held in VOPC. Upon closing of the transaction, which is expected to take place in the second quarter of 2023, we will own 100% of VOPC's share capital.

1.1.5 Iron ore pellets production

The following table sets forth information about our main iron ore pellet production.

Operator	Production for the year ended December 31,		
	2022	2021	2020
Vale ⁽¹⁾	32.1	31.7	29.7

(million metric tons)

(1) These figures correspond to 100% production from our pellet plants in Oman and in Tubarão and the four pellet plants we lease in Brazil and are not adjusted to reflect our ownership.

1.1.6 Iron ore strategy

Our key priorities for Iron Solutions are to recover production and operational flexibility, build sustainable solutions and optimize our product portfolio by increasing the supply of high-quality products:

Recovering production and operational flexibility

Our goal is to achieve an overall production ranging from 340 to 360 Mtpy in 2026. In the Northern System, our plan is to increase high-quality volumes in with new low-cost assets, ramping up and opening new mining fronts and enhancing assets performance. In the Southeastern System, we are developing solutions to increase our pellet feed

production, developing tailings filtration facilities and dry stacking.

Another key goal is to increase our flexibility by creating capacity buffers across the operations. We are pursuing it through initiatives that include: (i) expanding Northern System through opening new mining fronts and obtaining new licenses, such as Northern System 240 Mtpy and Serra Sul 120 projects as well as the opening of S11C mining front at Serra Sul, (ii) developing the Capanema project in Southeastern System, (iii) unlocking capacity in Vargem Grande complex and (iv) developing other projects.

Building sustainable solutions

We continue to invest in solutions to reduce our reliance on new dams and dam raisings. In 2022, we reached an approximate 79% share of dry processing production compared to 40% in 2014. Once we reach 360 Mtpy in capacity and complete the implementation of other related projects, including the production increase in Northern System, the conversion of Plant 1 in Serra Norte to dry processing, the Capanema project start-up, and the implementation of tailings filtration plants and dry concentration facilities, we expect to have only approximately 15% of our production based on tailings disposal in dams build in a single step or raised by center line or downstream method.

In order to treat the tailings from wet processing, we are investing in tailings filtration systems to allow the reduction of disposal of tailings in dams and also to operate certain mines and plants without using tailings dams. We have announced an estimated investment of US\$2,223 million between 2019 and 2027 in some of our sites, including Vargem Grande Complex, Itabira Complex and Brucutu, to be operated with tailings filtration systems and dry stacking tailings disposal, which consists of filtering and stacking of partially dewatered tailings, reducing our reliance on tailings dams. In 2022, we invested US\$305 million in tailings filtration system and dry stacking tailings disposal, and we started the operation of the Itabira Complex (Cauê and Conceição) and Brucutu filtration plants, the second and third of four plants under construction in Minas Gerais.

In line with this goal, we acquired New Steel in January 2019, bringing in innovative technologies for the dry beneficiation of iron ore. The world's first industrial-scale dry magnetic fines concentration plant was approved to produce 1.5 Mtpy with the start-up expected for 2024 in the Vargem Grande complex.

We have also developed a sand certified for application use in the civil construction market in order to reduce the volume of tailings disposed in dams; We have made some adjustments at Brucutu and Viga Mine to start the production of sustainable sand from the treatment of iron ore tailings. This sand was certified by national and international laboratories. Faced with a scenario in which the scale of tailings generation is substantially more significant than the scale of potential solutions for consumption/reuse of tailings, our strategy adopted is to diversify the portfolio of applications for different business models.

Optimizing product portfolio by increasing the supply of higher-quality products and developing innovative solutions for the decarbonization of steel industry

In the iron ore business, we will continue to promote the Brazilian Blend Fines ("BRBF"), a standard product with silica ("SiO₂") content limited to 5% and lower alumina (1.5%), which offers strong performance in any kind of sintering operation. We produce BRBF by blending fines from Carajás ores and Southern and Southeastern ores, which are complementary ores for our blending strategy. BRBF is produced in our Teluk Rubiah Maritime Terminal in Malaysia and in fourteen ports in China. This process reduces the time needed to reach Asian markets and increases our distribution capillarity by allowing the use of smaller vessels. Our blending strategy also enables the use of iron ore with lower iron concentration from the Southern and Southeastern Systems, allowing more efficient mining plans and increasing the use of dry processing methods, which in turn reduce capital expenditures, extend the life of our mines, reduce use of dams, and reduce water consumption by our operations: a key flexibility to cope with the short-term challenges.

We continue to improve our portfolio to provide our customers with solutions and to adapt to potential market demands. Steel demand will grow steadily over the years based on emerging regions and current megatrends. Decarbonization will create market segmentation with increased appetite for high quality products that can deliver

lower CO₂ emissions. Our strategy aims to accelerate the implementation of breakthrough iron solutions to attend more stringent demand of steelmakers. As development progresses, an optimized portfolio focused on improving quality and gradually recovering capacity will be achieved. Our goal is to increase the production of agglomerated products – briquettes and pellets –securing the supply of high-grade products to the market. The iron ore green briquettes are part of our iron solutions portfolio, as a result of a breakthrough technology developed in-house over 18 years of research and patented by us. Our iron ore briquettes are low temperature, low CO₂ agglomerated alternative to lump, pellets and sinter. They can provide a reduction of up to 10% of greenhouse gases emissions in the steel industry production chain, while the low temperature (approximately 200°C) required for its production process allows for up to 80% less CO₂ emissions when compared to traditional agglomeration routes (approximately 1300°C). The green briquette had its performance proven by several industrial trials conducted since 2019 in different clients, delivering excellent results. It also connects with circular economy, as the binder production can use sand from our mining tailings as a raw material.

1.1.7 Customers, sales and marketing

We supply all of our iron ore and iron ore pellets to the steel industry. Prevailing and expected levels of demand for steel products affect demand for our iron ore and iron ore pellets. Demand for steel products is influenced by many factors, such as global manufacturing production, civil construction and infrastructure spending. For further information about demand and prices, see *Operating and Financial Review and Prospects—Overview—Major factors affecting prices*.

In 2022, China accounted for 62.9% of our iron ore and iron ore pellet shipments, and Asia as a whole accounted for 77%, Brazil accounted for 11.8%, Europe accounted for 5.7% followed by the Middle East and Africa with 4.3% and others with 1.2%. Our ten largest customers collectively purchased 130 million metric tons of iron ore and iron ore pellets from us, representing 43% of our 2022 iron ore and iron ore pellet sales volumes and 43% of our total iron ore and iron ore pellet revenues. In 2022, no individual customer accounted for more than 10% of our iron ore and iron ore pellet shipments.

Of our 2022 pellet production, 52% was blast furnace pellets and 49% was direct reduction pellets. Blast furnace and direct reduction are different technologies employed by steel mills to produce steel, each using different types of pellets. In 2022, the Brazilian markets and the Asian market (mainly China and Japan) were the primary markets for our blast furnace pellets, while the Middle East and North America were the primary markets for our direct reduction pellets.

We invest in customer service in order to improve our competitiveness. We work with our customers to understand their objectives and to provide them with iron solutions to meet specific customer needs. Using our expertise in mining, agglomeration and iron-making processes, we search for technical solutions that will balance the best use of our world-class mining assets and the satisfaction of our customers. We believe that our ability to provide customers with a total iron solution and the quality of our products are both very important advantages helping us improve our competitiveness in relation to competitors that may be more conveniently located geographically. In addition to offering technical assistance to our customers, we have offices in St. Prex (Switzerland), Tokyo (Japan), Singapore, Dubai (UAE), Shanghai, Beijing and Qingdao (China), which support global sales by Vale International. These offices also allow us to stay in close contact with our customers, monitor their requirements and our contract performance, and ensure that our customers receive timely deliveries.

We sell iron ore and iron ore pellets under different arrangements, including long-term contracts with customers and on a spot basis through tenders and trading platforms. Our pricing is generally linked to market price indexes and uses a variety of mechanisms, including current spot prices and average prices over specified periods. In cases where the products are priced before the final price is determinable at delivery, we recognize the sale based on a provisional price with a subsequent adjustment reflecting the final price.

In 2022, we hedged part of our total exposure to bunker oil prices relating to our shipping requirements connected to our FOB and CFR international and domestic sales.

1.1.8 Competition

The global iron ore and iron ore pellet markets are highly competitive. The main factors affecting competition are price, quality and range of products offered, reliability, operating costs and shipping costs.

Asia. Our main competitors in the Asian market are located in Australia and include subsidiaries and affiliates of BHP Group Limited (“BHP”), Rio Tinto Ltd (“Rio Tinto”) and Fortescue Metals Group Ltd.

- We are competitive in the Asian market for two main reasons. (1) First, steel companies generally seek to obtain the types (or blends) of iron ore and iron ore pellets that can produce the intended final product in the most economic and efficient manner. Our iron ore has low impurity levels and other properties that generally lead to lower processing costs. For example, in addition to its high-grade, the alumina content of our iron ore is very low compared to Australian ores, reducing consumption of coke and increasing productivity in blast furnaces, which is particularly important during periods of high demand and environmental restrictions. When market demand is strong, our quality differential generally becomes more valuable to customers. (2) Second, steel companies often develop sales relationships based on a reliable supply of a specific mix of iron ore and iron ore pellets. Our ownership and operation of logistics facilities in the Northern and Southeastern Systems help us ensure that our products are delivered on time and at a relatively low cost.
- We rely on long-term contracts of affreightment to secure transport capacity and enhance our ability to offer our products in the Asian market at competitive prices on a CFR basis, despite higher freight costs compared to Australian producers.
- To support our commercial strategy for our iron ore business, we operate two distribution centers, one in Malaysia and one in Oman and we have long-term agreements with nineteen ports in China, which also serve as distribution centers.
- In 2015, we launched the Brazilian blend fines (“BRBF”), a product resulting from blending fines from Carajás, which contain a higher concentration of iron and a lower concentration of silica in the ore, with fines from the Southern and Southeastern Systems, which contain a lower concentration of iron in the ore. In August 2018, Metal Bulletin launched a new index, the 62% Fe low-alumina index, which is based on our BRBF. During 2022, the 62% Fe low-alumina index traded with a premium of US\$2.8 per dmt over the 62% Fe index. The resulting blend offers strong performance in any kind of sintering operation. It is produced in our Teluk Rubiah Maritime Terminal in Malaysia and in the seventeen distribution centers in China, which reduces the time to reach Asian markets and increases our distribution capillarity by using smaller vessels.

Europe. Our main competitors in the European market are Luossavaara Kiirunavaara AB (“LKAB”), ArcelorMittal Mines Canada Inc., Iron Ore Company of Canada, a subsidiary of Rio Tinto, Kumba Iron Ore Limited and Société Nationale Industrielle et Minière. We are competitive in the European market for the same reasons as in Asia, and due to the proximity of our port facilities to European customers.

Brazil. The Brazilian iron ore market is also competitive and includes several small iron ore producers. Some steel companies, including Gerdau S.A., Companhia Siderúrgica Nacional, Vallourec Tubos do Brasil S.A., Usiminas and Arcelor-Mittal, also have iron ore mining operations. Although pricing is relevant, quality and reliability are important competitive factors as well. We believe that our integrated transportation systems, high quality ore and technical services make us a strong competitor in the Brazilian market. With respect to pellets, our major competitors are LKAB, Iron Ore Company of Canada, Ferrexpo Plc, Arcelor-Mittal Mines Canada, Samarco and Bahrain Steel.

1.2 Manganese ore

1.2.1 Manganese ore property

We have a manganese mining operation in Brazil, operated by our parent company Vale S.A. under concessions from the federal government granted for an indefinite period, subject to the life of mines. This operation produces metallurgical ore, used primarily to produce manganese ferroalloys, a raw material used to produce carbon and stainless steel. We have suspended our manganese ore operations since 2020 for strategic review.



MANGANESE ORE OPERATIONS

AZUL	
Ownership interest	100%
Location	Carajás, State of Pará, Brazil.
Operator	Vale S.A.
Mining title	Mining concession for indefinite period. Acreage: 4.650 ha.
Stage/ Operations	Open pit mining operations and on-site beneficiation plant. Crushing, scrubbing and classification steps, producing lumps and fines. Azul mine operations have been suspended since March 2020 for strategic review.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	High and medium grade oxide ores (24% and 46% manganese grade).

Associated facilities and infrastructure	<p>Processing Plant: Crushing, scrubbing and classification steps, producing lumps and fines.</p> <p>Other facilities: Waste and tailings disposal structures.</p> <p>Logistics: Manganese ore is transported by truck and EFC railroad to the Ponta da Madeira maritime terminal.</p> <p>Energy: Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements.</p>
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Also, we no longer produce manganese ferroalloys. In January 2022, we sold our ferroalloys operations in Barbacena and Ouro Preto, in the state of Minas Gerais, to VDL. In 2020, we shut down our operations in Simões Filho, state of Bahia. In 2021, we produced 71 thousand metric tons at the Barbacena and Ouro Preto operations, and in 2020 we produced 73 thousand metric tons at the Barbacena, Ouro Preto and Simões Filho operations.

1.3 Logistics and energy assets to support Iron Solutions operations

1.3.1 Railroads

Vitória a Minas railroad (Estrada de Ferro Vitória a Minas - "EFVM"). The EFVM railroad links our Southeastern System mines in the Iron Quadrangle region in the Brazilian state of Minas Gerais to the Tubarão port, in Vitória, in the Brazilian state of Espírito Santo.

- We operate this 905-kilometer railroad under a concession agreement, which was recently renewed and will expire in 2057.
- The EFVM railroad consists of two lines of track extending for 584 kilometers to permit continuous railroad travel in opposite directions, and single-track branches of 304 kilometers. Industrial manufacturers are in this area and major agricultural regions are also accessible to it.
- VLI S.A. ("VLI") has rights to purchase railroad transportation capacity on our EFVM railroad.
- In 2022, the EFVM railroad transported 76.85 thousand metric tons of iron ore and 19.20 thousand metric tons of other cargo. The EFVM railroad also carried 529,125 thousand passengers in 2022. In 2022, we had a fleet of 319 locomotives and 12,138 wagons at EFVM, which were operated by us and third parties.

Carajás railroad ("EFC"). The EFC railroad links our Northern System mines in the Carajás region in the Brazilian state of Pará to the Ponta da Madeira maritime terminal, in São Luis, in the Brazilian state of Maranhão.

- We operate the EFC railroad under a concession agreement, which was recently renewed and will expire in 2057. EFC extends for 892 kilometers from our Carajás mines to our Ponta da Madeira maritime terminal complex facilities. Its main cargo is iron ore, principally carried for us.
- VLI has rights to purchase railroad transportation capacity on our EFC railroad.
- In 2022, the EFC railroad transported 173,167 thousand metric tons of iron ore and 16,018 thousand metric tons of other cargo. EFC also carried 329 thousand passengers in 2022. EFC supports the largest train, in terms of capacity, in Latin America, which measures approximately 3.4 kilometers, weighs approximately 41.5 thousand gross metric tons when loaded and has 333 cars. In 2022, EFC had a fleet of 298 locomotives and 20,941 wagons, which were operated by us and third parties.

The principal items of cargo of the EFVM and EFC railroads are:

- Iron ore and iron ore pellets and manganese ore, carried for us and customers;
- Steel, coal, pig iron, limestone and other raw materials carried for customers with steel mills located along the railroad;
- Agricultural products, such as soybeans, soybean meal and fertilizers; and
- Other general cargo, such as pulp, fuel and chemical products.

We charge market prices for customer freight, including iron ore pellets originating from joint ventures and other enterprises in which we do not have a 100% equity interest. Market prices vary based on the distance traveled, the type

of product transported and other criteria, subject to price caps set forth in the relevant concession agreements and are regulated by the Brazilian transportation regulatory agency (*Agência Nacional de Transportes Terrestres – “ANTT”*).

1.3.2 Ports and maritime terminals

Brazil

We operate ports and maritime terminals principally to complete the delivery of our iron ore and iron ore pellets to bulk carrier vessels serving the seaborne market. See —*Iron solutions—Iron ore and iron ore pellets—Iron ore operations*. We also use our ports and terminals to handle customers’ cargo.

Tubarão and Praia Mole Ports. The Tubarão port, which covers an area of 18 square kilometers, is in the Brazilian state of Espírito Santo and contains the iron ore maritime terminal and the general cargo terminals (*Terminal de Granéis Líquidos* and the *Terminal de Produtos Diversos*).

- The iron ore maritime terminal has two piers. From this terminal in the Tubarão port, we export mostly iron ore produced from our Southeastern System. The iron ore maritime terminal has a storage yard with a capacity of 2.9 million metric tons. In 2022, 61.5 million metric tons of iron ore and iron ore pellets were shipped through the terminal for us.
- Pier I can accommodate two vessels at a time, one of up to 170,000 deadweight tonnage (“DWT”) on the southern side and one of up to 210,000 DWT on the northern side. In Pier I there are two ship loaders, which can load up to 13,500 metric tons per hour each.
- Pier II can accommodate one vessel of up to 405,000 DWT at a time, limited at 23 meters draft. In Pier II there are two ship loaders that work alternately and can each load up to 16,000 metric tons per hour continuously.
- The Terminal de Produtos Diversos handled 5.54 million metric tons of grains and fertilizers in 2022. VLI has the right to purchase capacity of the Terminal de Produtos Diversos, upon agreement with us on volume.
- The Terminal de Granéis Líquidos handled 0.71 million metric tons of fuel in 2022. VLI has the right to purchase capacity of the Terminal de Granéis Líquidos, upon agreement with us on volume.
- The Praia Mole port is also located in the Brazilian state of Espírito Santo. The Praia Mole terminal is principally a coal terminal and handled 11 million metric tons of coal and other related cargo in 2022. VLI has the right to purchase capacity of the Praia Mole terminal, upon agreement with us on volume.

Ponta da Madeira maritime terminal. Our Ponta da Madeira maritime terminal is in the Brazilian state of Maranhão.

- Pier I can accommodate vessels of up to 420,000 DWT and has a maximum loading rate of 16,000 metric tons per hour. Pier III, which has two berths and three ship loaders, can accommodate vessels of up to 210,000 DWT at the south berth and 180,000 DWT at the north berth (or two vessels of 180,000 DWT simultaneously), subject to tide conditions, and has a maximum loading rate of 8,000 metric tons per hour in each shiploader.
- Pier IV (south berth) is able to accommodate vessels of up to 420,000 DWT and have two ship loaders that work alternately with a maximum loading rate of 16,000 metric tons per hour.
- In 2018, we received from the Brazilian tax authorities, the customs authorization for the operations of Pier IV (north berth). Cargo shipped through our Ponta da Madeira maritime terminal consists of the Northern System production of iron ore, pellets and manganese. Pier IV (north berth) is able to accommodate vessels of up to 420,000 DWT and have two ship loaders that work alternately with a maximum loading rate of 16,000 metric tons per hour.
- In 2022, 167.9 million metric tons of iron ore and pellets were shipped through the terminal. The Ponta da Madeira maritime terminal has a storage yard with a static capacity of 7.2 million metric tons.

Itaguaí maritime terminal—Cia. Portuária Baía de Sepetiba (“CPBS”). From this terminal we mostly export iron ore from our Southern system. CPBS is a wholly owned subsidiary that operates the Itaguaí terminal, at the Itaguaí Port, in Sepetiba in the Brazilian state of Rio de Janeiro, which is leased from Companhia Docas do Rio de Janeiro (“CDRJ”) until 2026, with a proposal for an extension for more 25 years, currently under analysis by the Ministry of Ports and Airports, federal regulatory agency and Port Authority. The Itaguaí port terminal has a pier with one berth that allows the loading of ships up to 17.8 meters of draft and approximately 200,000 DWT of capacity. In 2021, the terminal loaded 16.3 million

metric tons of iron ore.

Guaíba Island maritime terminal. From this terminal we export mostly iron ore from our Southern system. We operate a maritime terminal on Guaíba Island in the Sepetiba Bay, in the Brazilian state of Rio de Janeiro. The iron ore terminal has a pier with two berths that allows the loading of ships of up to 350,000 DWT. In 2022, the terminal loaded 27.9 million metric tons of iron ore.

Oman

Vale Oman Distribution Center LLC is part of the Oman Industrial Complex and operates a blending and distribution center in Liwa, Sultanate of Oman. The maritime terminal has a large deep-water jetty, a 600-meter long platform connected to the shore by means of a 700-meter long trestle and is integrated with a storage yard that has throughput capacity to handle 40 Mtpy of iron ore and iron ore pellets per year. The loading nominal capacity is 10,000 metric tons per hour and the nominal unloading capacity is 9,000 metric tons per hour.

Malaysia

Teluk Rubiah Maritime Terminal is in the Malaysian state of Perak and has a pier with two berths that allows the unloading of vessels of approximately 400,000 DWT of capacity and the loading of vessels up to 220,000 DWT of capacity. In 2022, the terminal unloaded 18.7 million metric tons of iron ore and loaded 18.3 million metric tons of iron ore.

Shipping – Maritime shipping of iron ore and pellets

In 2022, we shipped approximately 256 million metric tons of iron ore and pellets in transactions in which we were responsible for transportation. We ship a large amount of our iron ore products from Brazil to Asia through long-term contracts of affreightment with owners of very large ore carriers. The vessels employed under these contracts of affreightment reduce energy consumption and greenhouse emissions by carrying an increased amount of cargo in a single trip, reducing our carbon footprint and offering lower shipping costs. The majority of these vessels are efficient and modern Valemax (400,000 DWT) and Guaibamax (325,000 DWT) vessels, which transported approximately 140 million metric tons of iron ore products in 2022. These vessels also help us mitigate most of the volatility and strength of the capsize spot market.

Considering the IMO regulation that limits global Sulphur emissions to 0.5%, which became effective in January 2020, we negotiated the fitting of scrubbers on the majority of the vessels employed under long-term contracts of affreightment. These scrubbers allow us to continue bunkering high-sulphur fuel oil, while complying with the new regulation. Since 2021, 97% of the vessels employed under our long-term contracts of affreightment were scrubber-fitted.

1.3.3 Energy

We have developed our energy assets based on the current and projected energy needs of our operations, with the goal of reducing our energy costs, minimizing the risk of energy shortages and meeting our consumption needs through renewable sources.

Energy management and efficient supply in Brazil are priorities for us, given the uncertainties associated with changes in the regulatory environment and the risk of rising electricity prices. In 2022, our installed capacity in Brazil was 2.1 GW, sourced mostly from directly or indirectly owned power plants. We use the electricity produced by these plants for our internal consumption needs.

We have a 50% direct stake at the hydroelectric plant of Candonga (140 MW), located in the Southeastern region. We also have an 8% direct stake at the hydroelectric plant of Machadinho (1,140 MW), located in the Southern region and a 30% direct stake at the hydroelectric plant of Estreito (1,087 MW), located in the Northern region.

Through our 55% participation in Aliança Geração de Energia S.A. (“Aliança Geração”), we also have indirect stakes in

the hydroelectric power plants of Igarapava (210 MW), Porto Estrela (112 MW), Funil (180 MW), Candonga (140 MW), Aimorés (330 MW), Capim Branco I (240 MW), Capim Branco II (210 MW), located in the Southeastern Region and, additionally, we have indirect stake in Santo Inácio (98,7 MW), a Wind Complex located in the Brazilian state of Ceará, which started operations in December 2017. In addition, in 2019, we also approved the construction of two wind farms (Gravier and Acauã) in the Brazilian states of Ceará and Rio Grande do Norte, respectively, with a total of 180.6 MW of installed capacity. Gravier (71.4 MW) began operations in 2022, and Acauã (109.2 MW) is scheduled to start in the fourth quarter of 2023. Part of the electricity generated by Gravier and Acauã is or will be supplied to our operations through power purchase agreements with Aliança Geração.

We also have a 4.59% indirect stake in Norte Energia S.A., through our 51% stake in Aliança Norte Energia, a joint venture with Cemig Geração e Transmissão S.A. Norte Energia S.A. is the company established to develop and operate the Belo Monte hydroelectric plant in the Brazilian state of Pará, which started operations in April 2016 and accomplished the start-up of the last of its 24 turbines in 2019. Our participation in the Belo Monte project gives us the right to purchase 9% of the electricity generated by the plant, which has already been contracted through a long-term power purchase agreement with Norte Energia S.A.

With the aim of reaching 100% renewable electricity in Brazil by 2025 and increasing renewable energy sources, in November 2022, we announced the operational start-up of the Sol do Cerrado solar project and ramp up is expected by July 2023. The solar plant contemplates a total installed capacity of 766 megawatts peak (MWp) in the municipality of Jaíba, in the state of Minas Gerais, Brazil. Our 100% solar generation also optimizes the generation profile of our portfolio, which is based on hydro generation.

In addition, we have entered into a long-term energy supply contract for 20 years, to be supplied by the Folha Larga Sul wind farm, a 151.2 MW project in Campo Formoso, Bahia, Brazil.

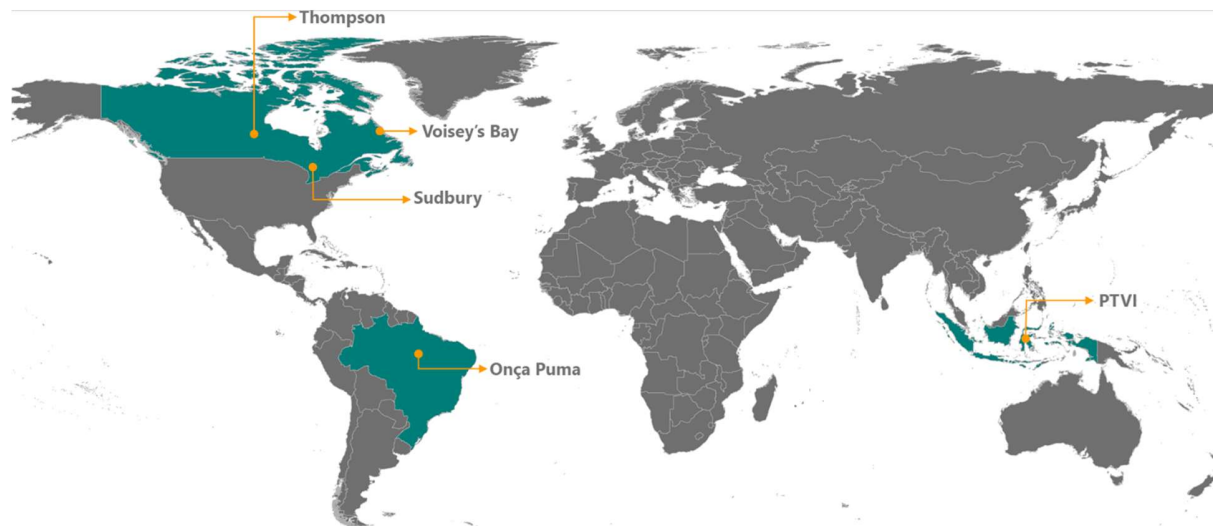
2. ENERGY TRANSITION METALS

2.1 Nickel

2.1.1 Properties

We conduct our integrated nickel operations primarily through three regional production systems: (i) the North Atlantic which includes Canada and the United Kingdom, (ii) the Asia-Pacific which includes Indonesia and Japan and (iii) the South Atlantic region in Brazil. Our North Atlantic region also produces Copper as a co-product, as well as cobalt and precious metals as by-products.

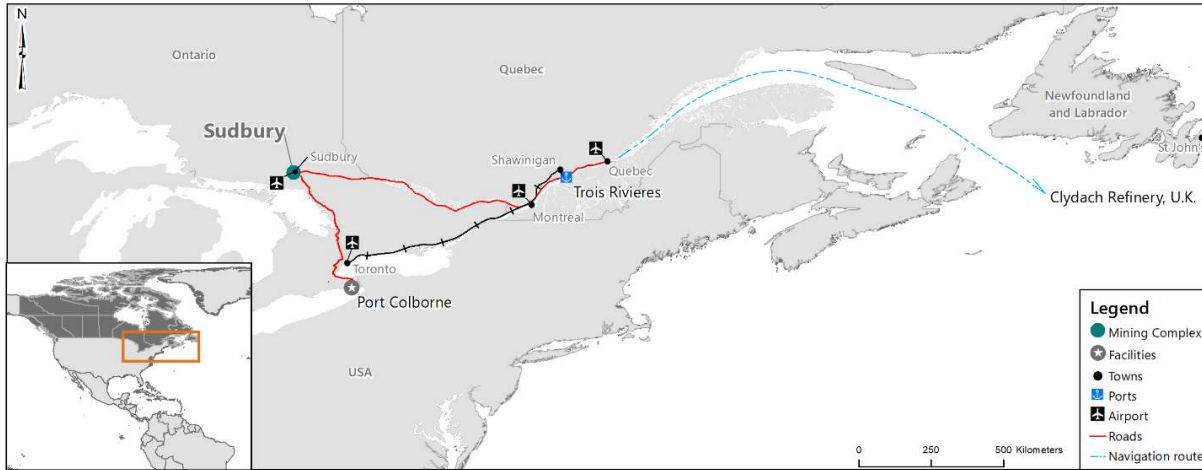
Our nickel operations are described in the tables below.



NICKEL OPERATIONS AND PROJECTS

NORTH ATLANTIC OPERATIONS

Sudbury



Ownership interest	100%
Location	Ontario, Canada.
Operator	Vale Canada.
Mineral titles ⁽¹⁾	<ul style="list-style-type: none"> - Patented mineral rights with no expiration date. - Mineral leases expire between 2024 and 2042. - Mining licenses of occupation with renewable terms. We can continue to operate during the renewal process. Acreage: 9,062 ha.
Stage/ Operations	Production stage since 1885. Integrated underground/open pit mining, milling, smelting and refining operations.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Nickel and copper. Primarily underground mining operations with nickel sulfide ore bodies, which also contain some copper, cobalt, PGMs, gold and silver.

Associated facilities and infrastructure

Processing plants: Milling, smelting and refining facilities. In Ontario, we also process external feeds from third parties and our Thompson operation. Finished Nickel is produced by the Copper Cliff Nickel Refinery (“CCNR”) and sent for packaging at Port Colborne Refinery (“PCR”). In addition to producing finished nickel in Sudbury, we ship a nickel oxide intermediate product to our nickel refinery in Clydach, Wales, United Kingdom to produce finished nickel. Intermediate residues from CCNR are also sent to PCR for further treatment and production of Cobalt and Precious Metals (PGMs, Gold and Silver). Copper Concentrate produced by Ontario Mill is directly sold to the market.

Other facilities: Water treatment plant, acid plant, waste and tailings facilities.

Logistics: Plants are located by the Trans-Canada highway and two major railways that pass through the Sudbury area. Finished products are delivered to the North American market by truck and rail. For overseas customers, the products are loaded into containers and travel intermodally (truck/rail/containership) through Canadian ports (Quebec, Trois Rivieres) bulk material (Copper Concentrate) is sold directly to market and is shipped bulk via Canadian port (Quebec, Trois Rivieres)

Energy: Supplied by Ontario’s provincial electricity grid and produced directly by Vale Canada via hydro generation.

⁽¹⁾ Area with reserves and resources associated.

THOMPSON



Ownership interest	100%
Location	Thompson, Manitoba, Canada.
Operator	Vale Canada.
Mineral titles ⁽¹⁾	<ul style="list-style-type: none"> - Mining Claim Leases (“MCL”) are in good standing and expire between 2023 and 2027. - Transition Agreement with the government of Manitoba will renew MCLs to Mineral Leases, with renewable terms of 21 years. We can continue to operate during the renewal process. Acreage: 1,793 ha.

Stage/ Operations	Production stage since 1961. Integrated underground mining and milling operations.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Nickel. Primarily underground mining operations with nickel sulfide ore bodies, which also contain copper, PGMs and cobalt.
Associated facilities and infrastructure	<p>Following the closure of Thompson Smelter and Refinery, since the second half of 2018, Nickel Concentrate is shipped from Thompson to be processed at Sudbury integrated operations and/or Long-Harbor refinery, depending on the demand.</p> <p><i>Other facilities:</i> Waste and tailings disposal structures.</p> <p><i>Logistics:</i> From Thompson, the nickel concentrate can be trucked or railed to Winnipeg (Manitoba) or directly railed to Sudbury (Ontario) or Trois-Rivieres, (Quebec). From Trois-Rivieres, the concentrate is stored at the port and loaded aboard a ship for Long Harbour Refinery (Newfoundland & Labrador).</p> <p><i>Energy:</i> Hydro-electric power supplied by Manitoba's provincial utility company.</p>

⁽¹⁾ Area with resources associated.

VOISEY'S BAY AND LONG HARBOUR

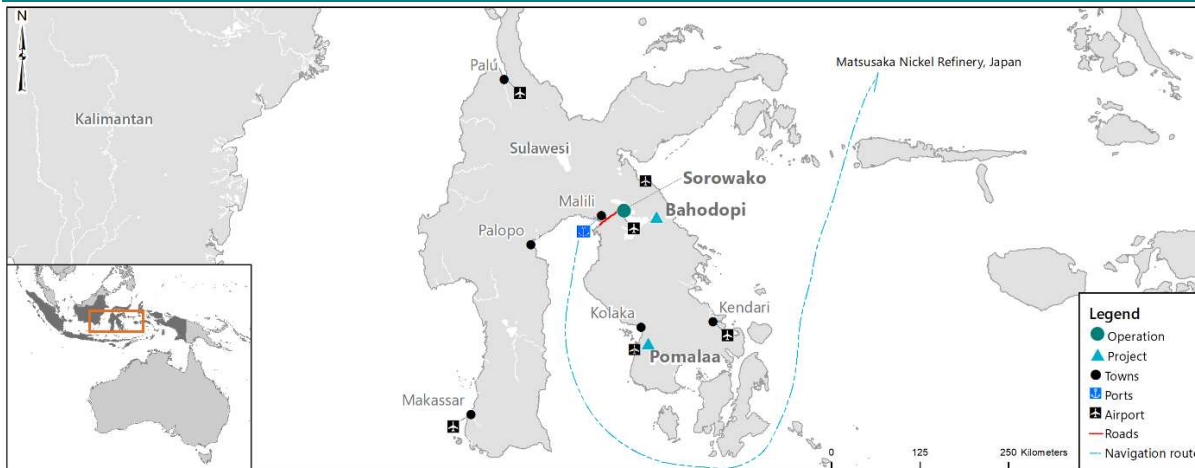


Ownership interest	100%
Location	Newfoundland and Labrador, Canada.
Operator	Vale Newfoundland & Labrador Limited which is wholly owned by Vale Canada.
Mineral titles ⁽¹⁾	Mining lease expiring in 2027 with a right of further renewals for 10-year periods. Acreage: 1,595 ha.
Stage/ Operations	Production stage since 2005. Integrated mining and milling operation at Voisey's Bay producing nickel and copper concentrates. further integrated with Long Harbour Refinery (in operation since 2014).

Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Nickel and copper. Open pit and underground mining operations with nickel sulfide ore bodies, which also contain copper and cobalt.
Associated facilities and infrastructure	<p>Processing plant: Nickel concentrate from Voisey's Bay (Labrador) is refined at Long Harbor (Newfoundland) to produce finished nickel rounds and pellets, as well as associated copper and cobalt products. Since the second half of 2021, Long Harbor also started processing additional feed from Thompson, Manitoba. Copper Concentrate produced by Voisey's Bay (Labrador) is directly sold to the market.</p> <p>Other facilities: Waste and tailings disposal structures.</p> <p>Logistics: The copper and nickel concentrate from Voisey's Bay are transported to the port by haulage trucks and then shipped by dry bulk vessels to either overseas markets (copper) or to our Long Harbour facilities (nickel) for further processing. Thompson concentrate is sent to Long Harbor by rail and ship.</p> <p>Energy: Power at Voisey's Bay is 100% supplied through Vale-owned diesel generators. Power at the Long Harbour refinery is supplied by the Newfoundland and Labrador provincial utility company.</p>

⁽¹⁾ Area with reserves and resources associated.

ASIA/PACIFIC OPERATIONS
PTVI



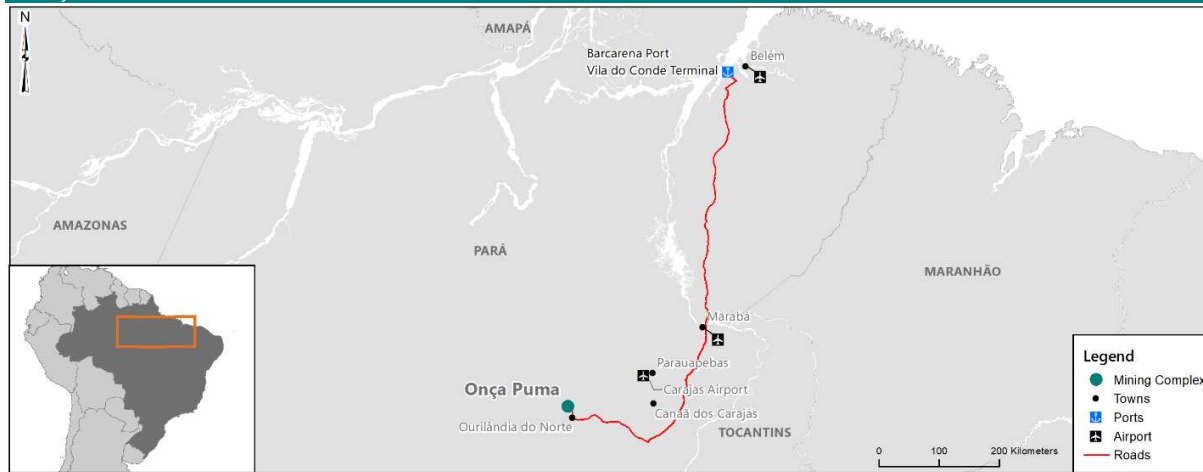
Ownership interest

Owned by PT Vale Indonesia Tbk ("PTVI"). We indirectly hold 44.34% of PTVI (Sumitomo Metal Mining ("Sumitomo") holds 15.03%, PT Indonesia Asahan Aluminium (Persero) ("Inalum") holds 20%, Sumitomo Corporation holds 0.14% and the public holds 20.49%).

Location	- Sorowako, South Sulawesi Province. - Bahodopi, Central Sulawesi Province. - Pomalaa, Southeast Sulawesi Province.
Operator	PTVI.
Mineral titles ⁽¹⁾	Contract of Work expires in 2025, with right to two consecutive ten-year extensions. Acreage: 118,017ha.
Stage/ Operations	Sorowako: Production stage since 1978 and engages in mining and value-added smelting activities in the production of nickel matte. Bahodopi and Pomalaa Projects: Exploration Stage.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Nickel laterite open pit mining which also contains cobalt.
Associated facilities and infrastructure	<i>Processing plant:</i> PTVI mines nickel laterite ore and produces nickel matte, which is shipped primarily to our nickel refinery in Japan. Pursuant to life of mine off take agreements, PTVI sells part of its production to Vale Canada (currently, 80%) and part of Sumitomo (currently 20%). Vale Canada annual share of the offtake of PTVI may change based on the total production of PTVI. <i>Other facilities:</i> Waste disposal structures and hydroelectric power facilities. <i>Logistics:</i> PTVI nickel matte product is trucked approximately 55 km to the river port at Malili and then loaded onto barges. <i>Energy:</i> Produced primarily by PTVI's low-cost hydroelectric power plants on the Larona River (there are currently three facilities). PTVI has thermal generating facilities to supplement its hydroelectric power supply with a source of energy that is not subject to hydrological factors.

⁽¹⁾ Area of the contract of work (COW).

SOUTH ATLANTIC OPERATIONS
ONÇA PUMA



Ownership interest	100%
Location	Pará, Brazil.
Operator	Vale S.A.
Mineral titles ⁽¹⁾	Mining concession with no expiration date. Acreage: 14,787 ha.
Stage/ Operations	Production stage since 2010. Mining and smelting operation producing a high-quality ferronickel for application within the stainless-steel industry.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Nickel laterite deposit, open pit mining.
Associated facilities and infrastructure	<i>Processing plant:</i> The operation produces ferronickel via a rotary kiln electric furnace process. We are currently operating a single line with one electric furnace and two lines of calcine and rotary kilns, with nominal capacity estimated at 27,000 metric tons per year. We have approved the construction of the second furnace. See <i>Additional Information—Legal proceedings—Legal proceedings seeking suspension of certain operations in the state of Pará.</i> <i>Other facilities:</i> Waste and tailings disposal structures. <i>Logistics:</i> The ferro nickel is transported by truck to the Vila do Conde maritime terminal in the Brazilian state of Pará and exported in ocean containers. <i>Energy:</i> Supplied through the national electricity grid. Produced directly by our power plants or acquired through power purchase agreements

⁽¹⁾ Area with reserves and resources associated.

NICKEL REFINERIES



Long Harbour, Port Colborne and Copper Cliff are described as part of Canadian operations summary above.

	CLYDACH	MATSUSAKA
Ownership interest	100%	We own 87.2% of the shares, and Sumitomo owns the remaining shares.
Location	Clydach, Wales (U.K.).	Matsusaka, Japan.
Operator	Vale Europe Limited.	Vale Japan Limited.
Capacity	Standalone nickel refinery (producer of finished nickel), with nominal capacity of 40,000 metric tons per year.	Standalone nickel refinery (producer of intermediate and finished nickel), with a nominal capacity of 60,000 metric tons per year for intermediate nickel products (for finished nickel product capacity the estimated capacity is 30,000 mt).
Operations	Processes a nickel intermediate product, nickel oxide, supplied from our Sudbury and Matsusaka operations to produce finished nickel in the form of powders and pellets.	Produces intermediate products for further processing in our refineries in the UK, and Canada, and finished nickel products using nickel matte sourced from PTVI.
Energy	Supplied through the national electricity grid.	Supplied through the national electricity grid. Acquired from regional utility companies.
Logistics	Transported to final customer in the UK and continental Europe by truck. Products for overseas customers are trucked to the ports of Southampton and Liverpool and shipped by ocean container.	Products trucked over public roads to customers in Japan. For overseas customers, the product is loaded into containers at the plant and shipped from the ports of Yokkaichi and Nagoya.

2.1.2 Production

The following table sets forth our annual mine production by operating mine and the average percentage grades of nickel and copper. Please, note that: (i) the mine production at Sorowako Mine represents the product from the PTVI's screening station delivered to the processing plant and does not include nickel losses due to drying and smelting; (ii) for our Sudbury, Thompson and Voisey's Bay operations, the production and average grades represent the run-of-mine delivered from those operations to respective mills and do not include adjustments due to beneficiation, smelting or refining; (iii) for our Onça Puma operation in Brazil the production and average grade represents the run-of-mine not accounting for losses due to processing.

	2022 ⁽¹⁾			2021 ⁽¹⁾			2020 ⁽¹⁾		
	Production	Grade		Production	Grade		Production	Grade	
		Cu	Ni		Cu	Ni		Cu	Ni
<i>Sudbury, Ontario</i>									
Copper Cliff North	748	1.35	1.17	468	1.57	1.26	580	1.49	1.30
Creighton	433	2.17	2.62	330	2.76	2.59	508	2.78	2.60
Garson	616	1.21	1.29	410	1.14	1.39	485	1.05	1.52
Coleman	875	2.62	1.47	664	3.33	1.36	1,038	3.41	1.43
Totten	414	1.97	1.57	256	1.59	1.18	637	1.83	1.31
Ontario - total	3,086	1.88	1.53	2,128	2.22	1.51	3,248	2.30	1.58
<i>Manitoba</i>									
Thompson	608	0.13	1.56	646	-	1.85	691	-	1.93
<i>Voisey's Bay</i>									
Ovoid+Discovery Hil	1,575	0.74	1.28	2,061	1.07	2.04	1,588	1.16	2.19
Reid Brook+Eastern Deeps	89	0.72	1.74	-	-	-	-	-	-
<i>Indonesia</i>									
Sorowako ⁽²⁾	4,565	0	1.31	4,149	-	1.79	4,163	-	1.82
<i>Brazil</i>									
Onça Puma ⁽³⁾	1,726	0	1.90	2,016	-	2.11	3,429	-	1.58

(1) Production is stated in thousands of metric tons. Grade is % of copper or nickel, respectively.

(2) These figures correspond to 100% production and are not adjusted to reflect our ownership. We own a 44.34% interest in PTVI.

(3) Mining activities in Onça Puma were suspended from September 2017 through September 2019.

The following table provides information about our nickel production, including nickel refined through our facilities and intermediates designated for sale. The numbers below are reported on a contained nickel basis.

Mine	Type	Finished production by ore source for the year ended December 31,		
		2022	2021	2020
<i>(thousand metric tons contained nickel)</i>				
Sudbury	Underground	38.99	32.18	43.28
Thompson	Underground	9.94	5.88	10.60
Voisey's Bay ⁽¹⁾	Open pit/Underground	24.35	38.13	35.70
Sorowako ⁽²⁾	Open cast	63.90	65.40	72.20
Onça Puma	Open pit	23.59	19.07	16.00
External ⁽³⁾	–	18.32	6.05	6.59
Total⁽⁴⁾		179.09	166.71	184.37

(1) Includes finished nickel produced at Long Harbour.

(2) These figures have not been adjusted to reflect our ownership. We own a 44.34% interest in PTVI.

(3) Finished nickel processed at our facilities using feeds purchased from unrelated parties.

(4) These figures do not include tolling of feeds for unrelated parties.

2.1.3 Individual property disclosure

We consider Sudbury to be a material property, for purposes of S-K 1300.

2.1.3.1 Sudbury

Property Description

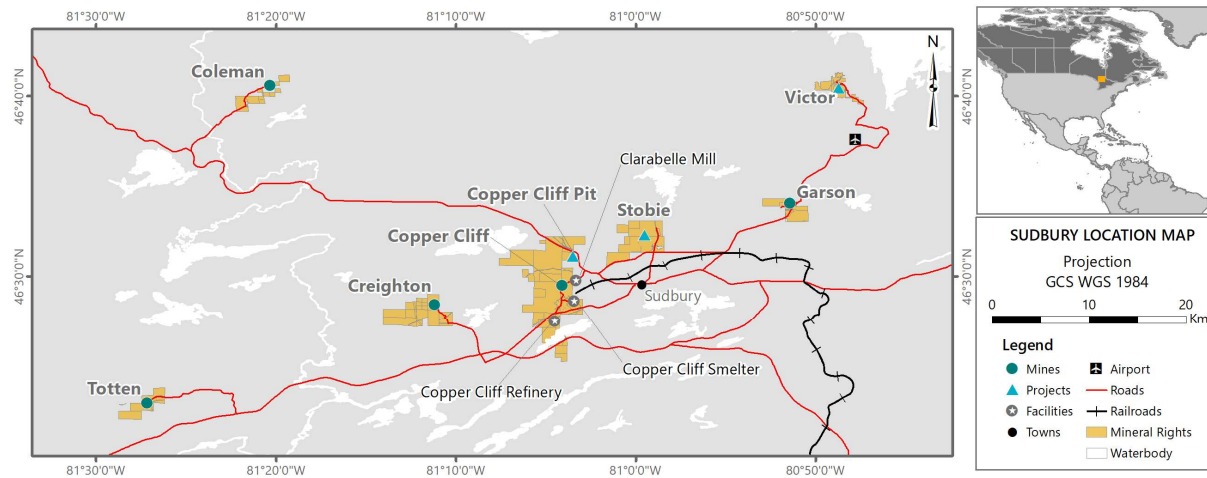
The Sudbury property is in the Greater City of Sudbury, which is approximately 330 km North–Northeast of the city of Toronto in the Province of Ontario, as illustrated below. Our Sudbury operations consist of:

- Production stage underground mines (Coleman, Copper Cliff, Creighton, Garson, Totten), a non-operating mine (Stobie), in addition to exploration stage and non-producing deposits (e.g., Victor and Copper Cliff Pit)
- Processing and refining capabilities are a combination of facilities in Sudbury (Clarabelle Mill, Copper Cliff Smelter and Nickel Refinery), Port Colborne Nickel Refinery, which is located in in Port Colborne, Ontario, about 160 km from Toronto, Ontario.

The following table shows the locations of the central mass point of the Sudbury Operations in WGS 1984 datum.

Mine	Latitude (north)	Longitude (west)
Coleman	46°40'37.0	81°20'21.2

Copper Cliff	46°29'29.0	81°04'05.0
Creighton	46°28'23.7	81°04'05.0
Garson	46°34'02.9	80°51'26.4
Copper Cliff Pit	46°31'05.4	81°03'30.2
Stobie	46°32'15.3	80°59'31.1
Totten	46°22'55.2	81°27'09.8
Victor	46°40'26.8	80°48'44.2



Infrastructure

The Sudbury operations currently have all infrastructure in place to support mining and processing activities.

Our operations in Sudbury have a 120-year history of mining in the region, and we possess a highly skilled and trained workforce as well as sophisticated local goods and service providers to support our mining operations. Multiple transportation routes access the Sudbury area inclusive of air, rail and vehicle transport. Access to the various mine and deposit sites is through a system of numbered municipal roads and roads operated by us.

Electrical power for the Sudbury operations is primarily sourced from grid supply (approximately 90%). In Sudbury, all incoming grid-connected power and hydroelectric generation is distributed to mines and processing plants through our electrical distribution network, consisting of 69 kV distribution power lines, substations, transformers, breakers, disconnects and other electrical equipment. This distribution system is owned, operated, and maintained by us.

A portion of the demand is met by our hydroelectric power facilities. We consume 100% of our self-generated and produced hydro generation. The hydroelectric facilities have a nameplate capacity of 55 MW.

Process water for Clarabelle Mill is sourced from water recycled from the tailings complex. Mines depend on the Vermilion River water intake which is owned and operated by us. The intake pumps raw water from the river to Creighton where it is treated at the Vermilion water treatment plant. After treatment, water is supplied to mines in the Sudbury area, Clarabelle Mill, Copper Cliff Smelter, and Copper Cliff Refinery.

Geology and Mineralization

Deposits within the Sudbury Igneous Complex (“SIC”) are examples of nickel–copper mineralization related to magnetism following a meteorite impact. The SIC is exposed as an elliptical ring with a northeast-trending long axis of approximately 72 km and a short axis of approximately 27 km. The Sudbury deposits host three principal styles of mineralization: Contact-style, Offset-style, Footwall style. However, the three mineralization environments can be quite variable, transitional, and many exhibit characteristics fitting more than one mineralization environment description.

Exploration

The first exploration activities date back to 1856 when nickel was first discovered. Over the years different exploration activities have been carried out, including geological mapping, drilling, ore control field sampling and geophysics. We continually invest in mineral exploration with the aim of expanding our mineral resources and mineral reserves and to achieve an adequate level of confidence in the resource estimate that supports our mining plans.

Mineral Rights

Our landholdings in the area include mining claims, mining leases, patented claims, and mining licenses of occupation. The total Mineral Rights area of the Ontario licenses containing the mineral resource and mineral reserve estimate (MRMR) footprint is determined by vertically projecting mineral envelopes to surface and itemizing by license surface area. The total Mineral Rights area contains 172 licenses totaling approximately 9,062 ha. We hold Mineral Rights licenses in Ontario as follows: 168 licenses are registered patents, two licenses are 21-year mining leases, one license is a mining license of occupation, and one license is an unpatented mining claim. Each of these license types are subject to terms, applicable fees and/or penalties as defined by their current expiry dates, and/or if said expiry dates are properly renewed or breached as per definition in the Provincial Mining Act of Ontario. We also have mineral rights outside of the defined MRMR footprint held under various license titles listed above. These licenses and their mineral rights are kept in good standing with exploration expenditures or where applicable cash in lieu of expenditures.

Surface rights

We hold sufficient surface rights for the current life of mine. In the Sudbury district, we are the registered owner of mining rights and surface rights or a combination of both shown as fee simple lands and mining leased lands.

Current, planned, future mining plans

Mines are owner-operated and use conventional equipment. The current extraction methods used in underground mining are conventional bulk stoping and narrow vein cut-and-fill mining methods, depending on the mine and geological setting. As part of the long-term strategy and continuous pursuit to add value to the company, by bringing operational reliability, expanding mineral resources and reserves portfolio and development of additional future production capacity we continually invest in mineral exploration.

Asset details and modernization

Over the years, current and previous owners have invested capital to modernize the property, and we now have equipped some of our mines with a wireless network underground (LTE and WiFi), tele-remote mobile equipment and battery electric vehicles. Our underground mines also rely on a robust micro seismic network, as part of our seismic management plan. As part of our innovation program, we are also testing continuous development with deployment of a mechanical rock excavation machine in Sudbury. Our mobile and fixed assets follow a strategic maintenance program for repair, refurbishment and replacement. Our underground development drifts are also part of a ground control monitoring program, for timely rehabilitation and/or enhancement of ground support when needed.

Total property book value

The book value of the property and its associated plant and equipment was US\$ 6,356 million as of December 31, 2022, which does not include goodwill for energy transition metals operations.

Operator history

The Sudbury, Ontario operations have over 120 years of active mining history, and exploration activities that date back to 1856 when nickel was first discovered. Various company names are documented in Ontario's history such as the Canadian Copper Company of Cleveland, Mond Nickel company, International Nickel Company, Ltd. (joint venture by the Canadian Copper Company, Orford Copper Company and American Nickel Works. Nickel refinery at Clydach, Wales constructed by the Mond Nickel Company) and the British American Nickel Corporation. In 1975, Inco became the formal name of the International Nickel Company of Canada, Limited and in 2006 CVRD obtained ownership of Inco. CVRD rebranded itself to Vale and CVRD–Inco changed its name to Vale Inco and in 2010, Vale Inco changed its name to Vale Canada.

Encumbrances and permitting requirements

There are no known encumbrances on the property, considering the part of the property with reserves or resources associated.

Reserves and resources

The mineral resources and reserves in Ontario are shown as of year ending 2022. For each table, the price, timeframe and point of reference used, when estimating mineral resources and reserves are highlighted.

Mineral resource estimate

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*. All disclosure of mineral resources is exclusive of mineral reserves.

Sudbury - Summary of Nickel, Cobalt, Copper, PGMs and Gold Mineral Resources as of December 31 ⁽¹⁾⁽²⁾⁽³⁾⁽⁵⁾																
Category	2022							2021							Cut-off grade ⁽⁴⁾	Metallurgical recovery ⁽⁴⁾
	Tonnage	Ni	Co	Cu	Pt	Pd	Au	Tonnage	Ni	Co	Cu	Pt	Pd	Au		
Measured	5.5	1.13	0.03	2.33	1.92	2.39	0.90	7.3	1.24	0.05	0.93	0.51	0.61	0.20	4-298 US\$/t 3.5% CuEq	Ni -55-90% Cu - 70-95% Co-20-30% Pt 55-80% Pd 60-80% Au 25-75%.
Indicated	38.2	1.30	0.03	2.14	0.90	1.11	0.35	50.5	1.59	0.04	2.19	0.92	1.17	0.38		
Measured + Indicated	43.7	1.28	0.03	2.16	1.03	1.27	0.42	57.9	1.54	0.04	2.04	0.87	1.10	0.35		
Inferred	18	1.3	0.04	1.4	0.9	1.0	0.3	8.6	2.1	0.05	2.5	1.5	1.8	0.6		

- (1) The mineral resource reasonable prospects of economic extraction were determined using the following price ranges: nickel US\$13,376-18,800/t, copper US\$ 6,100-8,150/t, cobalt US\$ 45,000-52,911/t, platinum US\$ 1,124-1,290/oz, palladium US\$ 925-1,400/oz, gold US\$ 1,000-1,650/oz, depending on the deposit. For each deposit, mineral resource prospect of economic extraction was determined based on a commodity price assumption established at the time of mine design. The commodity price assumption for each deposit continues to provide a reasonable basis for establishing the prospects of economic extraction for mineral resources estimated at this deposit as of December 31, 2022.
- (2) Resources are reported on a 100% basis, as operations are entirely owned by us.
- (3) Tonnage is in millions of dry metric tons. Cu, Ni, Co grades are in (%), Pt, Pd and Au grades are in g/t. Point of reference of the estimate is in situ.
- (4) Cut-off grade, metallurgical recovery, pricing data is shown as ranges, due to the variability in specific orebody requirements and timing of the associated estimate.
- (5) Details on the material assumptions supporting the estimate can be found in the Technical Report Summary for Sudbury operations filed as Exhibit 96.1 to this annual report on Form 20-F.

Mineral reserves estimate

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*.

Sudbury - Summary of Nickel, Cobalt, Copper, PGMs and Gold Mineral Reserves as of December 31 ⁽¹⁾⁽²⁾⁽³⁾⁽⁶⁾																
Category	2022							2021							Cut-off grade ⁽⁴⁾	Metallurgical recovery ⁽⁴⁾
	Tonnage	Ni	Co	Cu	Pt	Pd	Au ⁽⁵⁾	Tonnage	Ni	Co	Cu	Pt	Pd	Au ⁽⁵⁾		
Proven	18.1	1.55	0.04	1.87	1.15	1.14	0.47	18.9	1.51	0.04	1.94	1.22	1.19	0.51	80-240 US\$/ton	Ni -65-90% Cu - 80-95% Co-20-30% Pt 55-80% Pd 50-80% Au 25-80%
Probable	54.3	1.44	0.04	1.32	0.84	1.11	0.29	35.0	1.24	0.03	1.40	1.12	1.49	0.39		
Total	72.4	1.47	0.04	1.46	0.92	1.11	0.34	53.9	1.33	0.04	1.59	1.16	1.38	0.43		

- (1) The mineral reserve economic viability was determined based on a commodity price curve with long-term price of per metric ton of US\$17,725 for nickel, US\$7,950 for copper, US\$56,250 for cobalt. US\$/oz platinum US\$1,175 palladium US\$1,175, and gold US\$1,525.
- (2) Reserves are reported on an 100% basis, as operations are entirely owned by us.
- (3) Tonnage is in millions of dry metric tons. Ni, Cu, Co grades are in (%), Pt, Pd and Au grades are in g/t. The point of reference is the point of delivery to the process plant.
- (4) Cut-off, metallurgical recovery, pricing data is shown as ranges, due to the variability in specific orebody requirements and timing of the associated estimate.
- (5) Figures shown do not deduct the streaming amounts. For a description of our streaming arrangement with Wheaton, see Section 2.3 PGM's and other Precious Metals.
- (6) Details on the material assumptions supporting the estimate can be found in the Technical Report Summary for Sudbury operations filed as Exhibit 96.1 to this annual report on Form 20-F.

2.1.4 Nickel Strategy

A key aspect of our strategy for the nickel business is retaining our product leadership position supplying nickel for the global renewable energy transition, while striving to be a sustainable operator and a global benchmark for health and safety in the industry and in the communities where we operate. We are focused on transforming the business, continuing to review asset utilization, optimizing our operations and concentrating our efforts to increase productivity and improve returns, while preserving capacity for growth. We are one of the world's largest nickel producers, with large-scale, long-life and low-carbon assets. Leveraging our substantial resource base and diversified mining operations, we produce nickel products from nickel sulfide and laterite sources utilizing advanced technology. Our commercial footprint is global, with a focus on providing top-tier customer service.

Our nickel products are tailored to meet the needs of customers across different industries and geographies, including those requiring high-purity nickel as well as the rapidly evolving electric vehicle battery supply chain. In 2022, 52% of our global nickel production came from our Canadian operations, which benefits from the use of renewable energy, and a stable jurisdiction with strong ESG standards and credentials.

Our operations in the North Atlantic position us well to supply into the electric vehicle market, in line with our low-carbon agenda. We have agreements to sell our low-carbon Class I nickel to several North American and European producers in the electric vehicle supply chain. In the medium term, we are targeting to direct 30-40% of our Class I nickel production to the electric vehicle battery market. We are also exploring other partnerships on a regular basis.

The plating rounds and nickel melt rounds from our Long Harbour processing plant, a leading-edge hydrometallurgical facility on Canada's East Coast, are one of the least carbon-intensive nickel products on the market. With a carbon footprint of 4.0t CO₂ e per tonne, these Class I nickel products position us well for supplying to the electric vehicle industry.

In 2022, we made significant advancements on two replacement projects in Canada: the Voisey's Bay Underground and phase 1 of the brownfield expansion of Copper Cliff Mine. Both projects have high nickel content and a significant amount of base-metal/precious metal by-products. For our operation in Onça Puma in Brazil we obtained approval for the construction of the 2nd furnace, and the option to develop, through joint ventures, the Pomalaa and Bahodopi projects in Indonesia, which have reached groundbreaking.

2.1.5 Customers and sales

Our nickel customers are broadly distributed on a global basis. In 2022, 45% of our refined nickel sales were delivered to customers in Asia, 23% in Europe, 30% in North America and 2% in other markets. We have short-term fixed-volume contracts with customers for most of our expected annual nickel sales. These contracts generally provide stable demand for a significant portion of our annual production. We also have multiple long-term agreements to sell our Class I nickel, including into the North Atlantic electric vehicle market. For more information, see *Overview—Business Overview*.

Nickel is an exchange-traded metal, currently listed on the London Metal Exchange ("LME") and Shanghai Futures Exchange ("SHFE"), and most nickel products are priced according to a discount or premium to the LME price, depending primarily on the nickel product's physical and technical characteristics. Our finished nickel products represent what is known in the industry as "primary" nickel, meaning nickel produced principally from nickel ores (as opposed to "secondary" nickel, which is recovered from recycled nickel-containing material). Finished primary nickel products are distinguishable in terms of the following characteristics, which determine the product price level and the suitability for various end-use applications:

- nickel content and purity level: (i) intermediates have various levels of nickel content, (ii) nickel pig iron has 1.5-15% nickel, (iii) ferro-nickel has 15-40% nickel, (iv) refined nickel with less than 99.8% nickel, including products such as Tonimet™ nickel, (v) standard LME-grade nickel has a minimum of 99.8% nickel, and (vi) high-purity nickel has a minimum of 99.9% nickel and does not contain specific elemental impurities;
- shape (such as discrete or filamentary powders, pellets, discs, squares and strips);
- size (from micron powder particles to large full-sized cathodes); and

- packaging (such as bulk, 2-ton bags, 250 kg drums, 10 kg bags).

In 2022, the principal first-use applications for primary nickel were:

- stainless steel (64% of global nickel consumption);
- non-ferrous alloys, alloy steels and foundry applications (12% of global nickel consumption);
- nickel plating (6% of global nickel consumption);
- battery precursors (15% of global nickel consumption); and
- others (3% of global nickel consumption).

In 2022, 84% of our refined nickel sales were made into non-stainless-steel applications, compared to the industry average for nickel producers of 36%. This brings more diversification and sales volume stability to our nickel revenues. As a result of our focus on higher-value segments, our average realized nickel prices for refined nickel have typically exceeded LME cash nickel prices.

We offer sales and technical support to our customers on a global basis through an established marketing network headquartered at our head office in Toronto (Canada). We have a well-established global marketing network for finished nickel with sales and technical support distributed around the world with presence in Singapore and Toronto (Canada) and have sales managers located in St. Prex (Switzerland), Paramus, New Jersey (United States) and at several locations throughout Asia. For information about demand and prices, see *Operating and Financial Review and Prospects—Overview—Major factors affecting prices*.

2.1.6 Competition

The global nickel market is highly competitive. Our key competitive strengths include our long-life mines, sophisticated exploration and processing technologies, and a diversified portfolio of products. Our global marketing reach, diverse product mix, and customer technical support direct our products into applications and geographic regions that offer the highest margins for our products.

Our nickel production represented 6.13% of global consumption for primary nickel in 2022. In addition to us, the largest mine-to-market integrated suppliers in the nickel industry (each with its own integrated facilities, including nickel mining, processing, refining and marketing operations) are Tsingshan Group, Jiangsu Delong Nickel, Jinchuan Nonferrous Metals Corporation, Nornickel and Eramet. Together with us, these companies accounted for about 45% of global refined primary nickel production in 2022.

The quality of nickel products determines its market suitability. Upper Class I products, which have higher nickel content and lower levels of deleterious elements, are more suitable for high-end nickel applications, such as the growing electric vehicle market (batteries) and utilization in specialty industries (e.g., aircraft and spacecraft) and draw a higher premium. Lower Class I products have slightly higher levels of impurities compared to Upper Class I products and are suitable for more general nickel applications, such as foundry alloys and generally receive a lower premium compared to Upper Class I products. Class II products, which have lower nickel content and higher levels of deleterious elements, are mostly used in the making of stainless steel. Intermediate products do not represent finished nickel production and are generally sold at a discount given that they still need to be processed before being sold to end customers.

Much of the world nickel production is composed of Class II nickel products (61% of the global market in 2022), which include nickel pig iron (“NPI”) and ferro nickel (with nickel content under 99%). Most of our products are high quality nickel products, which makes us the supplier of choice for specialty nickel applications. In 2022, 52% of our nickel products were Upper Class I, 13% were Lower Class I and 9% were Intermediates.

While stainless steel production is a major driver of global nickel demand, stainless steel producers can obtain nickel with a wide range of nickel content, including secondary nickel (scrap). The choice between primary and secondary nickel is largely based on their relative prices and availability. See *Operating and Financial Review and Prospects—Overview—Major factors affecting prices—Nickel*.

Competition in the nickel market is based primarily on quality and reliability of supply and price. We believe our operations are competitive in the nickel market because of the high quality of our nickel products.

2.2 COPPER

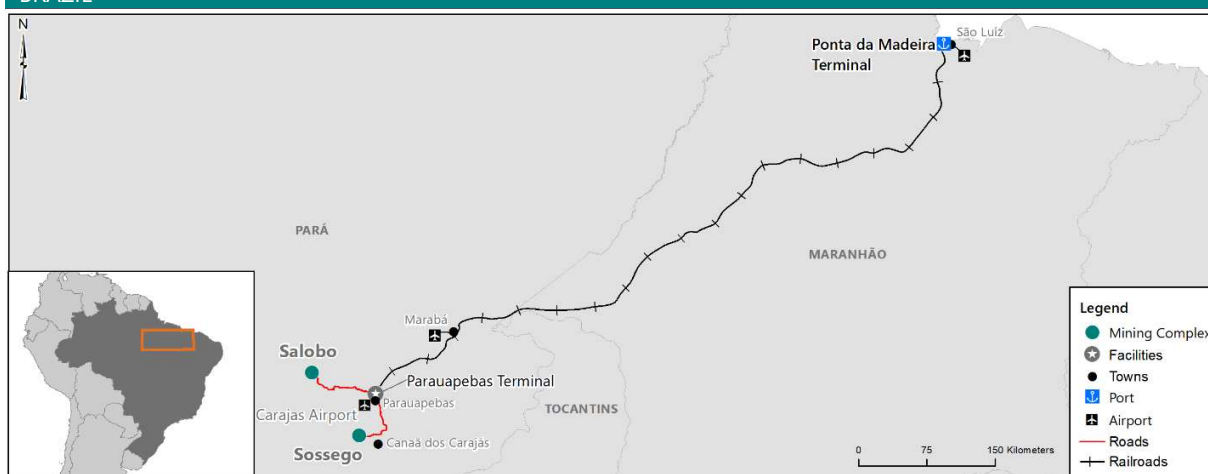
2.2.1 Properties

We conduct our copper operations primarily through our parent company Vale S.A. and our wholly owned subsidiary Salobo Metais S.A. in Brazil, and through our subsidiary Vale Canada in Canada. The copper concentrate produced by the South Atlantic contains gold and silver. Our copper operations are described in the tables below.



COPPER OPERATIONS & PROJECTS

BRAZIL

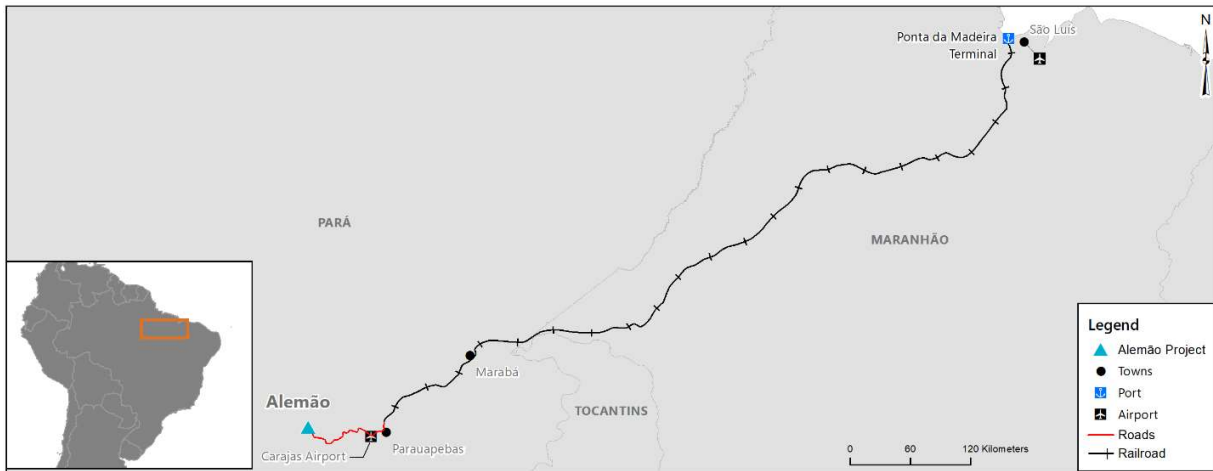


SOSSEGO

Ownership interest	100%
Location	Carajás, State of Pará, Brazil.
Operator	Vale S.A.
Mineral titles	Mining concession and application for mining concession with no expiration date. Acreage: 117,508 ha.
Stage/ Operations	Production stage since 2004. Two main open pits (Sossego and Sequerinho) and a processing facility to concentrate the ore, and satellites deposits (118, Cristalino, Bacaba and Mata II projects).
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations. We are in the process of obtaining or renewing (1) waste and tailings storage facilities permits and (2) social licenses related to projects. For information about environmental licensing, see <i>Information on the Company—Regulatory matters—Brazilian Regulation of Mining Dams</i> .
Mine types and mineralization styles	Iron oxide-copper-gold (“IOCG”) deposit, with copper as main element of economic interest and mined using the open pit method.
Associated facilities and infrastructure	<i>Processing Facilities:</i> The run of mine is processed at Sossego processing facilities with four main components: crushing, grinding, flotation and concentrate dewatering. <i>Other facilities:</i> Waste and tailings disposal structures. <i>Logistics:</i> We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Itaqui Port in São Luís, state of Maranhão. In Itaqui Port, we lease a storage terminal until 2023, with a proposal for an extension for more 20 years, currently under analysis by competent authorities. <i>Energy:</i> Supplied through the national electricity grid. Produced directly by us or acquired through power purchase agreements.

SALOBO	
Ownership interest	100%
Location	Carajás, State of Pará, Brazil.
Operator	Salobo Metais S.A.
Mineral titles	Mining concession with no expiration date. Acreage: 9,181 ha.
Stage/ Operations	Production Stage since 2012. Integrated open pit mining and milling operations.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Iron oxide-copper-gold ("IOCG") deposit, with copper and gold as main elements of economic interest and mined using open pit method.
Associated facilities and infrastructure	<p><i>Processing Facilities:</i> The run of mine is processed by means of standard primary and secondary crushing, conveying, roller press grinding, ball milling, copper concentrate flotation, tailings disposal, concentrate thickening, filtration and load out.</p> <p><i>Other facilities:</i> Waste and tailings disposal structures.</p> <p><i>Logistics:</i> We truck the concentrate to a storage terminal in Parauapebas and then transport it via the EFC railroad to the Itaqui Port in São Luís, state of Maranhão. In Itaqui Port, we lease a storage terminal until 2023, with a proposal for an extension for more 20 years, currently under analysis by competent authorities.</p> <p><i>Energy:</i> Supplied through the national electricity grid. Acquired through power purchase agreements.</p>

ALEMÃO PROJECT



Ownership interest	100%
Location	Carajás, State of Pará, Brazil.
Operator	Vale S.A.
Mineral titles	Mining concession with no expiration date. Acreage: 10,000 ha.
Stage/ Operations	Exploration Stage – Pre-Feasibility technical study ongoing.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	Iron oxide-copper-gold deposit situated in the Carajás National Forest. The project is to develop a sublevel caving underground mine.
Associated facilities and infrastructure	<i>Processing Facilities:</i> The project is expected to have as processing facilities primary crusher, ball milling, copper concentrate flotation, magnetic concentration, filtration and tailings disposal. <i>Energy:</i> Is expected to improve the current transmission line to 230kV capacity.

**ASIA/PACIFIC
HU'U PROJECT**



Ownership interest	80% ownership Vale.
Location	Dompu and Bima Regencies of Province of Nusa Tenggara Barat (NTB) Sumbawa Island, Indonesia.
Operator	Sumbawa Timur Mining – STM.
Mineral titles ⁽¹⁾	Contract of Work covering approximately 19,260 ha is valid with the Government of Indonesia, comprising all the stages of a Mining project. The exploration stage (feasibility study) based on Government's regulations can be extended annually until the feasibility study report is complete and approved. Following approval, the operation-production stage will start, and will be valid for 30 years, renewable subject to the Government's approval. Acreage: 19,260 ha.
Stage/ Operations	Exploration stage – Pre-Feasibility technical study ongoing.
Key permit conditions	We have or expect to obtain in a timely manner the necessary permits for operations.
Mine types and mineralization styles	The Onto copper-gold deposit is a large porphyry copper-gold deposit that also has some characteristics of high sulphidation epithermal deposits. The project is to develop an underground mine.
Associated facilities and infrastructure	<i>Logistics:</i> This project is a greenfield project, therefore the actual logistics of transporting ore as well as processing are still under study. <i>Infrastructure:</i> The existing infrastructure is under development due to the project's greenfield location.

⁽¹⁾Area of the contract of work.

CANADA

See *Energy transition metals—Nickel—Operations*

2.2.2 Production

The following table sets forth our annual mine production in our Salobo and Sossego mines and the average percentage grades of copper. The production and average grade represent run-of-mine production and do not include losses due to processing. For the annual mine production of copper as a co-product in our nickel operations, see *Energy transition metals—Nickel—Production*.

	2022 ⁽¹⁾		2021 ⁽¹⁾		2020 ⁽¹⁾	
	Production	Grade	Production	Grade	Production	Grade
<i>Brazil</i>						
Sossego	10,552	0.64	16,164	0.74	13,145	0.85
Salobo	38,203	0.61	39,418	0.61	43,151	0.68
Total	48,755	0.62	55,582	0.77	56,296	0.72

(1) Production is stated in thousands of metric tons. Grade is % of copper.

The following table sets forth information on our copper production.

Mine	Type	Finished production by ore source for the year ended December 31,		
		2022	2021	2020
<i>(thousand metric tons)</i>				
<i>Brazil:</i>				
Sossego	Open pit	43.2	81.8	87.7
Salobo	Open pit	127.8	144.6	172.7
<i>Canada: (as co-product of nickel operations)</i>				
Sudbury	Underground	59.2	46.2	76.5
Voisey's Bay	Open pit/Underground	10.8	20.2	17.8
Thompson	Underground	5.3	0.4	0.8
External ⁽¹⁾	–	6.8	3.6	4.5
Total		253.1	296.8	360.0

(1) We process copper at our facilities using feed purchased from unrelated parties.

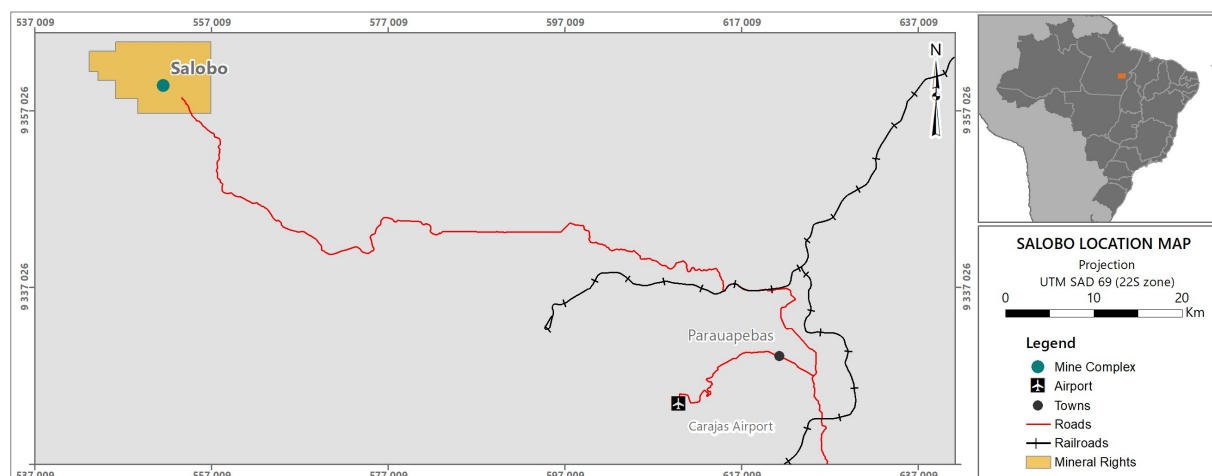
2.2.3 Individual property disclosure

We consider Salobo to be a material property, for purposes of S-K 1300. There have been no material changes in the reported reserves or resources or in the material assumptions and information since the last technical report summary filed for Salobo operations.

2.2.3.1 Salobo

Property description

Salobo operations constitute a production stage property situated in the Carajás Mining District, Pará State, Brazil, 90 km northwest of the city of Parauapebas. Geographic coordinates for the Salobo Operations are 5°47'27"S latitude and 50°32'5" W longitude, using the Geographic _SAD 69 coordinate system. Salobo operations are owned by Salobo Metais S.A., our wholly owned subsidiary.



Infrastructure

Salobo operations are connected via an all-weather road network to the cities of Parauapebas (90 km) and Marabá (240 km). There is a commercial airport at Carajás. Railroads link Carajás with the port city of São Luis.

The required water permits are adequate and current.

The Carajás district has a long history of mining operations. Personnel with experience in mining activities are available throughout the district. The workforce resides in Carajás, Parauapebas, and surrounding settlements.

Salobo is in the Northwest of the Carajás region within Tapirapé–Aquiri national forest. In the mine area the topography is steep, varying between 190–520 m in elevation. The area is heavily forested and dominated by relative dense trees with substantial underbrush. The Carajás district is within the eastern Amazon humid tropical rainforest and has distinct wet and dry seasons. Mining operations are conducted year-round.

Geology and Mineralization

The Salobo deposit is an example of an iron oxide–copper–gold (“IOCG”) deposit and is hosted in the Carajás Mining District within Carajás Province, a sigmoidal-shaped, west–northwest–east–southeast-trending late Archean basin.

The mineralization consists of mineralogical assemblages of magnetite–chalcopyrite–bornite and magnetite–bornite–chalcocite in a number of styles as disseminations, stringers, stockworks, massive accumulations, fracture fillings, or veins.

The deposit extends over an area of approximately 4 km along strike (west–northwest), is 100–600 m wide, and has been recognized to depths of 750 m below the surface.

Exploration

Exploration has occurred on the property since 1974 and includes geological mapping, drilling, and airborne geophysical surveys, metallurgical testwork, environmental and baseline studies, mining studies, and permitting activities. We continually invest in mineral exploration with the aim of expanding our mineral resources and mineral reserves and achieving an adequate level of confidence in the resource estimate that supports our mining plans.

Mineral Rights

We have a mining concession for Salobo operations, concession 807.426/1974, granted for copper ore, gold and silver by ANM on July 16, 1987, covering 9,180.60 ha.

Surface rights

Salobo is located entirely within the Tapirapé–Aquiri National Forest, which belongs to the Federal Government. There are no third-party properties adjacent to the mining complex. There are no associated payments related to surface rights.

Current, planned, future mining plans

Mining is carried out as an open pit truck-shovel operation with a planned mine life of approximately 26 years, ending in 2045. The process plant will continue to operate by reclaiming stockpiled material until 2053.

With the Salobo 3 expansion, the base case mine production schedule involves the movement of 126 Mtpy to feed an expanded processing capacity of 36 Mtpy, by processing a portion of the ore that would have been stockpiled in the previous 24 Mtpy production plan.

The process plant is designed to operate 365 days per year. The plant produces a copper concentrate that is transported by road to a rail offloading facility for rail transport to the seaport of São Luis.

The existing processing plants, Line 1 and Line 2 (Salobo I and II), each have a nominal 12 Mt capacity. We are currently implementing the Salobo III project to provide a third line that has a nominal 12 Mt circuit, to increase the process capacity to a total of 36 Mtpy.

Asset details and modernization

Salobo mine has been operating since 2012, with an open pit method, using shovels for ore and waste production, together with hydraulic shovels, wheel loaders, a fleet of off-road haul trucks and auxiliary equipment to maintain the access to production areas and slope drainage. A robust replacement program ensures that this equipment follows a manufacturer recommendation for life of asset and when the useful life of equipment is ending, we plan and invest in a fleet upgrade.

Total property book value

The book value of the Salobo operations and its associated plant and equipment was US\$2,483 million, as of December 31, 2022, which does not include the shared infrastructure assets such as ports and railways.

Operator history

All exploration and development were conducted by us. Copper mineralization was discovered in the Igarapé Salobo region in 1974. Detailed exploration commenced in 1977. A scoping study was completed in 1981, and pilot studies ran from 1985 to 1987, culminating in the grant of a mining concession. A prefeasibility study was concluded in 1988, an initial feasibility study was conducted in 1998, updates to the feasibility study were undertaken in 2001 and 2002, and a final study was completed in 2004. The Salobo Operations commenced pre-stripping in 2009, and the first concentrate was produced in 2012. The process plant was upgraded in 2014 and is currently undergoing a second upgrade.

Encumbrances and permitting requirements

There are no material encumbrances for Salobo Operations.

Mineral resources

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*. All disclosure of mineral resources is exclusive of mineral reserves.

Salobo - Summary of Copper Mineral Resources as of December 31, ^{(1) (2)}								
Category	2022 ⁽³⁾			2021			Cut-off grade ⁽⁴⁾	Metallurgical Recovery ⁽⁴⁾
	Tonnage	Cu	Au	Tonnage	Cu	Au		
Measured	37.7	0.37	0.15	30.2	0.39	0.17	0.25 %CuEq	Cu 80-90%. Au-60-70%
Indicated	492.1	0.47	0.24	439.4	0.49	0.25		
Measured + Indicated	529.8	0.46	0.23	469.7	0.48	0.24		
Inferred	216.1	0.6	0.3	268.9	0.5	0.3		

- (1) The mineral resource prospects of economic extraction were determined using the following price assumptions per metric ton: for copper US\$7,500/metric ton and for gold US\$1,450/oz.
- (2) Resources are reported on an 100% basis, as operations are entirely owned by us.
- (3) Tonnage is in millions of dry metric tons and Cu grades are in (%), Au grades in g/t. The point of reference for the estimate is in situ metric tons.
- (4) The metallurgical recovery is shown as a range, due to the variability in specific orebody requirements and timing of the associated estimate.

Mineral reserves

For a discussion of the changes from the previous fiscal year, see *Reserves and Resources*.

Salobo - Summary of Copper Mineral Reserves as of December 31, ^{(1) (2) (3) (6)}								
Category	2022			2021			Cut-off grade ⁽⁴⁾	Metallurgical Recovery ⁽⁴⁾
	Tonnage	Cu	Au ⁽⁵⁾	Tonnage	Cu	Au ⁽⁵⁾		
Proven	251.8	0.69	0.40	231.0	0.69	0.40	0.25% CuEq	Cu 80-90%. Au-60-70%
Probable	860.6	0.60	0.34	902.4	0.60	0.34		
Total	1,112.4	0.62	0.35	1,133.4	0.62	0.35		

- (1) The mineral reserve economic viability was determined based on a commodity price curve with long-term price of per metric ton of US\$7,950/metric ton for copper, gold US\$1,525/oz.
- (2) The resources are reported on an 100% basis, as operations are entirely owned by us.
- (3) Tonnage is in millions of dry metric tons and Cu grades are in (%), Au grades are in g/t. Point of reference is the point of delivery to the process plant.
- (6) The resources are reported on an 100% basis, as operations are entirely owned by us.

- (4) The metallurgical recovery is shown as a range, due to the variability in specific orebody requirements and timing of the associated estimate.
- (5) Figures shown do not deduct the streaming amounts. For a description of our streaming arrangement with Wheaton, see Section 2.3 PGM's and other Precious Metals.
- (6) Estimated consolidated copper ore reserves include 220.6 million dry metric tons of stockpile.

2.2.4 Copper strategy

Copper has a solid long-term growth profile, driven by industrialization, construction, and electrical grid infrastructure expansion. Governments around the world have set ambitious decarbonization targets that, along with the dropping of renewable energy costs and green economy and stimulus investments, will be crucial for more intensive use of copper in renewable energy and electric vehicle-related infrastructure projects. We have significant opportunities to expand our copper business through organic growth. We have a strong portfolio of copper assets, and we intend to develop a multiyear copper expansion plan, especially with Salobo III, to support our strategic objective of up to 420 thousand tons per year of production capacity by 2026. In addition to these projects, we have other opportunities to grow in the future, such as the Alemão project, or even leveraging the knowledge and logistics that already exist in the Carajás region, while also evaluating opportunities to increase copper production in Canada and Indonesia. In Indonesia, we are advancing studies to develop the Hu'u project, a world-class deposit, which could further expand our copper business. We are also engaged in greenfield exploration for copper in some of the world's most prolific belts, looking for tier-one assets for future development.

2.2.5 Customers and sales

From our South Atlantic operations, we sell most of our copper concentrates from Sossego and Salobo under medium- and long-term contracts to copper smelters in Europe and Asia. From our North Atlantic operations, we sell copper concentrates and copper matte produced in Sudbury domestically and to smelters in Europe and Asia under long-term contracts, as well as copper concentrates from Voisey's Bay under medium term contracts. Also, from our North Atlantic operations, we sell copper cathodes from Sudbury and Long Harbour under short-term contracts.

2.2.6 Competition

The global refined copper market is highly competitive. Producers are integrated mining companies and custom smelters, covering all regions of the world, while consumers are principally wire rod and copper alloy producers. Competition occurs mainly on a regional level and is based primarily on production costs, quality, reliability of supply and logistics costs. The world's largest copper cathode producers are Jiangxi Copper Corporation Ltd., Tongling Non-Ferrous Metals Group Co., Corporación Nacional del Cobre de Chile ("Codelco"), Aurubis AG, Freeport McMoRan and Jinchuan, each operating at the parent company level or through subsidiaries. Our participation in the global refined copper cathodes market is marginal as we position ourselves more competitively in the copper concentrate market.

Copper concentrate and copper matte are intermediate products in the copper production chain. Both the concentrate and matte markets are competitive, having numerous producers but fewer participants and smaller volumes than in the copper cathode market due to the high levels of integration by the major copper producers.

In the copper concentrate market, mining occurs on a global basis with a predominant share from South America, while consumers are custom smelters located mainly in Europe and Asia. Competition in the custom copper concentrate market occurs mainly on a global level and is based on production costs, quality, logistics costs and reliability of supply. The largest competitors in the copper concentrate market are Freeport McMoRan, BHP, Glencore, Codelco, First Quantum, Anglo American, Zijin Mining, Rio Tinto and Antofagasta; each operating at the parent company level or through subsidiaries. Our market share in 2022 was about 1.2% of the total copper concentrate market.

2.3 PGMs and other precious metals

As by-products of our Sudbury nickel operations in Canada, we recover significant quantities of PGMs, as well as small quantities of gold and silver. We operate a processing facility in Port Colborne, Ontario, which produces PGMs, gold

and silver intermediate products using feed from our Sudbury operation. PGM concentrates, gold and silver intermediates from our Port Colborne operation are being sold to third parties. Our copper concentrates from our Salobo and Sossego mines in Carajás, in the Brazilian state of Pará, also contain gold, the value of which we realize in the sale of those products.

We have sold to Wheaton Precious Metals Corp. (“Wheaton”) an aggregate of (i) 75% of the by-product gold contained in concentrate from our Salobo copper mine, in Brazil, for the life of mine, and (ii) 70% of the by-product gold from our Sudbury nickel mines, in Canada, for 20 years. These sales were made in three different streaming transactions, in February 2013, March 2015 and August 2016. In connection with these streaming transactions:

- We received upfront payments of (i) US\$1.9 billion in 2013, (ii) US\$900 million in 2015 and (iii) US\$800 million in 2016. We also received 10 million warrants exercisable into Wheaton shares, which we sold in February 2020 for US\$2.5 per warrant, totaling US\$25 million.
- We receive ongoing payments of the lesser of US\$400 per ounce (subject to a 1% annual inflation adjustment under the Salobo contract starting January 1, 2019) and the prevailing market price, for each ounce of gold that we deliver under the agreement.
- As per the Salobo gold by-product stream purchase agreement, we were entitled to receive an additional cash payment if we expanded our capacity to process Salobo copper ores to more than 28 Mtpy before 2036. In March 2023, we agreed with Wheaton to amend this agreement to adjust the additional cash payment terms.
 - As per the amended agreement, the additional cash payment will be phased, with Wheaton making an initial payment once actual throughput is demonstrated to be above 32 Mtpy and a second payment once if actual throughput is demonstrated to be above 35 Mtpy by January 1, 2031. The total cumulative payments will range from \$283 million to \$552 million, dependent on our timing for each of the production increases.
 - In addition, Wheaton will be required to make annual payments of between \$5.1 million to \$8.5 million for a 10-year period following payment of the expansion additional cash payments if the Salobo mine maintains a high-grade mine plan. The following table presents information on the contained volume of precious metals and platinum group metals as a by-product of our production of nickel and copper concentrates.

Mine	Type	By-product finished production by ore source for the year ended December 31,		
		2022	2021	2020
<i>(thousand troy ounces of contained metal)</i>				
<i>Sudbury:</i> ⁽¹⁾				
Platinum	Underground	102	78	140
Palladium	Underground	127	98	186
Gold ⁽²⁾	Underground	44	27	70
<i>Salobo:</i>				
Gold contained in copper concentrate ⁽²⁾	Open pit	215	274	331
<i>Sossego:</i>				
Gold contained in copper concentrate	Open pit	30	63	68

(1) These numbers also include ore source from Manitoba, external source, and minor amounts from Voisey 's Bay.

(2) Figures represent 100% of Salobo and Sudbury contained volume of gold as a by-product of our production of nickel and copper concentrates and do not deduct the portion of the gold sold to Wheaton.

2.4 Cobalt

We recover significant quantities of cobalt as a by-product of our nickel operations. In 2022, we produced 909 metric tons of refined cobalt metal (in the form of cobalt rounds) at our Port Colborne refinery, 1,525 metric tons of cobalt rounds at our Long Harbour refinery. We sell cobalt on a global basis. The cobalt metal and the Long Harbour cobalt rounds are electrorefined at our Port Colborne refinery and have very high purity levels (99.8%), meeting the LME

contract specification. Cobalt metal is used in the production of various alloys, particularly for aerospace applications, and in the manufacturing of cobalt-based chemicals primarily for use in rechargeable batteries.

In June 2018, we sold to Wheaton and Cobalt 27 Capital Corp. ("Cobalt 27") a combined 75% of the cobalt produced as a by-product at our Voisey's Bay mine from January 1, 2021, which includes the ramp down of production from the existing mine and the life of mine production from our underground mine expansion project. In consideration, we received US\$690 million in cash from Wheaton and Cobalt 27 upon closing of the transaction on June 28, 2018, and will receive additional payments of 18-22% of cobalt prices upon delivery. In February 2021, the stream originally sold to Cobalt 27 was assigned to Anglo Pacific Group. We remain exposed to approximately 40% of future cobalt production from Voisey's Bay, through our retained interest in 25% of cobalt production and the additional payments upon delivery.

The following table sets forth information on our cobalt production.

Mine	Type	By-product finished production by ore source for the year ended December 31,		
		2022	2021	2020
		<i>(contained metric tons)</i>		
Sudbury	Underground	367	304	453
Thompson	Underground	143	35	60
Voisey's Bay ⁽¹⁾	Open pit/Underground	1,169	1,770	1,591
Others ⁽²⁾	–	755	414	369
Total		2,434	2,523	2,473

(1) Figures represent 100% of cobalt production, and do not deduct the portion of cobalt stream sold to Cobalt27, Wheaton and Anglo Pacific Group.

(2) These figures do not include tolling of feeds for unrelated parties. Includes cobalt processed at our facilities using feeds purchased from unrelated parties and PTVI ore source 233 metric tons in 2020, 324 metric tons in 2021, and 521 metric tons in 2022.

2.5 Logistics and energy assets to support energy transition metals operations

Ports

Canada

Vale Newfoundland & Labrador Limited operates a port as part of our mining operation at Voisey's Bay, Labrador and a port as part of our processing operation at Long Harbour, Newfoundland. The port at Voisey's Bay is used for shipping nickel and copper concentrates and re-supply. The port at Long Harbour is used to receive nickel concentrate from Voisey's Bay along with goods and materials required for the Long Harbour operation.

Indonesia

PTVI owns and operates two ports in Indonesia to support its nickel mining activities.

- The Balantang Special Port is located in Balantang Village, South Sulawesi, and has two types of piers, two barge slips for barges with capacity of up to 5,000 DWT each for dry bulk cargo, and a general cargo wharf for vessels of up to 2,000 DWT.
- The Tanjung Mangkasa Special Port is in Lampia Village, South Sulawesi, with mooring buoys that can accommodate fuel tankers with capacity of up to 20,000 DWT, and a jetty terminal that can accommodate fuel tanker vessels with capacity of up to 5,000 DWT.

Energy

Canada

In 2022, our wholly owned and operated hydroelectric power plants in Sudbury generated 13.7% of the electricity

requirements of our Sudbury operations. The power plants consist of five separate generation stations High Falls I and II, Big Eddy, Wabageshik and Nairn with an installed generator nameplate capacity of 55 MW. The output of the plants is limited by water availability, as well as by constraints imposed by a water management plan regulated by the provincial government of Ontario. Over the course of 2022, average demand for electrical energy was 161.45 MW to all surface plants and mines in the Sudbury area.

In 2022, diesel generation provided 100% of the electric requirements of our Voisey's Bay operations. We have six diesel generators onsite, with output ranging from 12 to 14 MW, in order to meet seasonal demands.

Indonesia

Energy costs are a significant component of our nickel production costs for the processing of lateritic ore at our PTVI operations in Indonesia. A major portion of PTVI's electric furnace power requirements is supplied at a low cost by its three hydroelectric power plants on the Larona River: (i) the Larona plant, which has an average generating capacity of 165 MW, (ii) the Balambano plant, which has an average capacity of 110 MW and (iii) the Karebbe plant, with 90 MW of average generating capacity. These plants help reduce production costs by substituting oil used for power generation with hydroelectric power, reduce CO₂ emissions by replacing non-renewable power generation, and enable us to increase our current nickel production capacity in Indonesia.

3. OTHER INVESTMENTS

3.1 Samarco Mineração S.A.

We have a 50% equity interest in Samarco, and BHP Billiton Brasil Ltda. (“BHP Brasil”) owns the remaining 50%. Samarco owns an integrated system comprised of two different pits, three beneficiation plants, three pipelines, four pellet plants and a port. The mines and the beneficiation plants are in the state of Minas Gerais and the pellet plants and port are located in the state of Espírito Santo. From Minas Gerais to Espírito Santo, the production flows through the three pipelines which extend for approximately 400 Km. Samarco’s mining and pelletizing operations have been gradually resuming since December 2020.

In 2015, the Fundão tailings dam owned by Samarco collapsed. For additional information, see *Business Overview—Responses to the Collapse of Samarco’s Tailings Dam in Minas Gerais*. From 2015 through December 2020, Samarco’s operations were suspended. In December 2020, Samarco commenced the gradual resumption of its operations, with the integrated restart of iron ore extraction and beneficiation at the Germano complex, located in Mariana, state of Minas Gerais, and pelletizing at the Ubu complex, located in Anchieta, state of Espírito Santo. Samarco’s operations are resuming with approximately 8 Mtpy production capacity, with the use of one of three concentrators to beneficiate iron ore at the Germano complex and one of four pellet plants in the Ubu complex, representing 26% of Samarco’s productive capacity. The integrated restart of operations occurs following extensive commissioning tests after the five-year halt. Samarco is using new processes for tailings disposal, reflecting its commitment to a sustainable restart and operational safety. Samarco produced 8.3 Mt in 2022 and 7.87 Mt in 2021.

Through the implementation of the filtration process, Samarco is now able to substantially dewater sand tailings, which represent approximately 80% of total tailings volume, and safely stack these filtered sand tailings in piles. The remaining 20% of tailings are being deposited in Alegria Sul pit, a bedrock self-contained structure, which is safer than a tailings dam. Additionally, Samarco is progressing in the decommissioning of Germano dam, following the required safety standards. Samarco operates a 24/7 Monitoring and Inspection Center in real time to monitor the stability and safety of its geotechnical structures. Furthermore, Samarco is implementing the GISTM in all of its tailing’s facilities.

The carrying value for our investment in Samarco has been reduced to zero since 2015. Samarco has approximately R\$51 billion in debt subject to a judicial reorganization proceeding in Brazil, of which approximately R\$24 billion is owed to its shareholders, BHP Brasil and us. Debt claims of BHP Brasil and us are mostly related to funds provided to Samarco after the collapse of the Fundão dam, for the purpose of maintenance and operating expenses, as well as contributions to Fundação Renova and the reestablishment and resumption of Samarco’s operations.



Ownership interest

50% owned by Vale; 50% by BHP Brasil.

Location	Mariana and Ouro Preto, State of Minas Gerais, Brazil.
Operator	Samarco Mineração S.A.
Mining complexes	Integrated system comprised of two different pits, three beneficiation plants, three pipelines, four pump stations, two valves station, four pellet plants and a port.
Mining title ⁽¹⁾	Mining concession with no expiration date. Acreage: 1,174.30 ha.
Stage/ Operations	Continued operations from 1977 to 2015. Operations were suspended in November 2015, following the collapse of the Fundão dam. Gradually resuming operations since December 2020.
Key permit conditions	We understand that Samarco has the necessary permits for its current operations.
Mine types and mineralization styles	Itabirite ore types extracted using an open-pit mining method.
Associated facilities and infrastructure	<p><i>Mine:</i> Long distance conveyor belt systems and trucks transport the ore blending to beneficiation plants.</p> <p><i>Processing plant:</i> The three beneficiation plants, located at the site, process the run of mine by means of standard crushing, milling, concentration steps, producing pellet feed.</p> <p><i>Logistics:</i> Samarco mines supply Samarco pellet plants using three pipelines extending approximately 400 kilometers, with four pump stations and two valve stations. These pipelines transport the iron ore from beneficiation plants to the pelletizing plants in the state of Espírito Santo.</p> <p><i>Port:</i> The production is embarked in an own port in the state of Espírito Santo.</p> <p><i>Energy:</i> Supplied through the national electricity grid. Acquired from regional utility companies or produced directly by Samarco.</p>

⁽¹⁾ Area with reserves and resources associated.

All mineral resource and mineral reserve information for Samarco's mining property has been estimated by a qualified person engaged by Samarco. We are reporting this mineral reserve and resource information given our indirect economic interest in Samarco's property, as required under Item 1303(b)(3) of Subpart 1300 of Regulation S-K. However, for the reasons described above, our ability to receive cash flows from Samarco is limited by the current outstanding debt of Samarco and its ongoing judicial reorganization proceeding and the carrying value for our investment in Samarco has been reduced to zero since 2015.

Samarco Iron Ore Mineral Reserves as of December 31, 2022 ^{(1) (2) (3)}								
Tonnage in metric million tons inclusive moisture and wet %Fe grade								
	Proven – 2022		Probable – 2022		Total – 2022		Total – 2021	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Samarco	60	41.14	377	43.01	437	42.75	-	-

(1) The mineral reserve economic viability was determined based an average long-term price of US\$122.84/t pellets and fines - FOB Ubú Port (100% Blast Furnace).

(2) Adjusted to reflect our 50% equity interest.

(3) The point of reference is in-situ material. The moisture content is 6.5% and the average product recovery (tonnage basis) is 47%.

Samarco Iron Ore Mineral Resources as of December 31, 2022 ⁽¹⁾ ⁽²⁾ ⁽³⁾								
Tonnage in metric million tons inclusive moisture and wet %Fe grade								
	Measured - 2022		Indicated - 2022		Measured and Indicated - 2022		Inferred - 2022	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Samarco	1,207	38.3	753	36.8	1,960	37.7	210	37.4

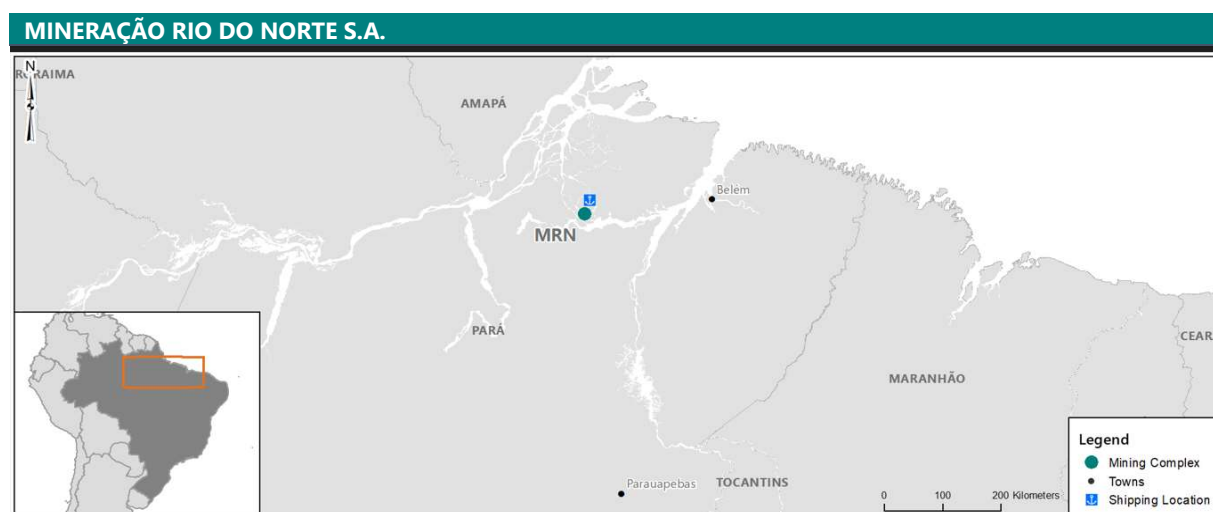
(1) The mineral resources prospects of economic extraction were determined based an average long-term price of US\$130.18/t pellets and fines - FOB Ubú Port (100% Blast Furnace).

(2) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves and have been adjusted to reflect our 50% equity interest.

(3) The point of reference is in-situ material. The moisture content is 6.5% and the average product recovery (tonnage basis) is 41%.

3.2 Mineração Rio do Norte S.A.

Bauxite. We own a 40% equity interest in Mineração Rio do Norte S.A. ("MRN"), a bauxite mining business located in Brazil.



Ownership interest	40% owned by Vale; 33% by South 32; 12% by Rio Tinto Alcan, 10% by Companhia Brasileira de Alumínio ("CBA") and 5% by Hydro.
Location	Oriximiná, State of Pará, Brazil.
Operator	MRN.
Mining complexes	Integrated system comprised of 4 different plateaus, 2 crushers facilities, 32 km of conveyor belt system, washing and dryer plants, railroad system and a port.
Mining title	Mining concession with no expiration date. Acreage: 143,000 ha.
Stage/ Operations	Operating since 1979.
Key permit conditions	We understand that MRN has the necessary permits for its current operations or expect to obtain them in a timely manner.
Mine types and mineralization styles	Bauxite ore types extracted using a strip-mining method.

Associated facilities and infrastructure	<p>Processing plant: The beneficiation plant, located at the site, process the run of mine by means of standard crushing and washing steps, producing coarse and fines bauxite ores.</p> <p>Logistics: MRN mines supply ore to its crushers using 32km of conveyor belt system. The washed ore is transported to the port by 5km conveyor belt to a train load out facility and then by 28km railroad system to the port.</p> <p>Port: The production is embarked in an own port located on site (Trombetas Port).</p> <p>Energy: Produced on-site using diesel generators.</p>
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In 2022, MRN produced 12,333 million tons of bauxite, whereas in 2021 the production was 12,639 million tons and in 2020 12,910 million tons.

3.3 Other Investments

Below is a list of our main other investments:

VLI. VLI provides integrated logistics solutions through 7,940 kilometers of railroads in Brazil (FCA and FNS), eight inland terminals with a total storage capacity of 795,000 metric tons and three maritime terminals and ports operations. We hold a 29.6% stake in VLI and are currently party to a shareholders' agreement with FI-FGTS, Mitsui, Brookfield and BNDESPar, which hold the remaining equity interests in VLI. In 2022, VLI transported a total of 41.8 billion ntk of general cargo, including 30.8 billion ntk from FCA and FNS and 11 billion ntk through operational agreements with Vale S.A. VLI's main assets are:

- **Ferrovía Centro-Atlântica S.A. ("FCA").** Central-east regional railway network of the Brazilian national railway system, held under a 30-year renewable concession, which expires in 2026. The central east network has 7,220 kilometers of track, extending into the states of Sergipe, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, Goiás and the Federal District of Brazil;
- **Ferrovía Norte-Sul S.A. ("FNS").** A 30-year renewable sub concession for the commercial operation of a 720-kilometer stretch of the North-South railroad in Brazil, between the cities Açailândia, in the Brazilian state of Maranhão, and Porto Nacional, in the Brazilian state of Tocantins. This railway is connected to EFC railroad, and creates a new corridor for the transportation of general cargo, mainly for the export of soybeans, rice and corn produced in the center-northern region of Brazil;
- Right to purchase capacity of our EFVM and EFC railroads for general cargo; and
- Right to purchase capacity of our Tubarão and Praia Mole terminals for general cargo.

MRS Logística S.A. ("MRS"). The MRS railroad, in which we hold a 48.16% direct and indirect equity interest, is 1,643 kilometers long and links the Brazilian states of Rio de Janeiro, São Paulo and Minas Gerais. The MRS railroad transports our iron ore products from the Southern System mines to our maritime terminals. In 2022, it transported a daily average of 291,9 thousand metric tons of iron ore and 196,5 thousand metric tons of other cargo.

RESERVES AND RESOURCES

INTERNAL CONTROLS

We have historically estimated mineral resources and mineral reserves utilizing the Committee for Mineral Reserves International Reporting Standards (“CRIRSCO”) based codes. Starting in the fiscal year ended December 31, 2021, we began to report in accordance with S-K 1300.

We have an established risk management process that is integrated with our Executive Risk Committee. For additional information, see *Operating and Financial Review and Prospects—Risk Management*. As part of our risk management process, we identify risks affecting uncertainty of mineral reserves and mineral resources disclosure, with standardized risk ratings and proposed mitigation activities.

We work based on a line of defense structure for governance of our estimation and reporting of mineral reserves and resources, with the purpose of promoting transparency, consistency, professional competence, and the reliability of all information prepared for internal purposes and public reporting.

Our internal guidelines define the responsibility for the governance and reporting of mineral resource and reserves, clarify concepts and bring technical guidance from the broader view to all business units. These internal guidelines are periodically reviewed and revised to ensure alignment with industry practice.

Our internal controls protocols for exploration data, as they relate to mineral resource and reserve estimation, contain:

- Written procedures and guidelines to support exploration work and approaches.
- Quality control checks on collar and downhole survey data to identify errors or significant deviations.
- Geological logs are checked and verified in a peer review, and a physical sign-off attests to the validation protocol.
- Maintenance of a chain-of-custody, ensuring the traceability and integrity of the samples at all handling stages from collection, transportation, sample preparation and analysis to long-term pulp and coarse reject storage.
- Regular inspection of analytical and sample preparation facilities by appropriately experienced Vale personnel.
- Appropriate types of quality control samples (standards, duplicates, and blanks) are inserted into the sample stream at appropriate frequencies to assess analytical data quality and representativity.
- Data is regularly verified to ensure that outlier sample mix-ups, contamination, or laboratory biases during the sample preparation and analysis steps are correctly identified, mitigated or remediated. An appropriate number of samples are analyzed at a different laboratory.
- Bulk density determinations are regularly checked by alternate methods.
- Quality Control and Quality Assurance (“QA/QC”) data validation and verification procedures are in place to support database upload which ensure the accuracy and integrity of the data being entered into the Project database(s). These are typically performed using software data-checking routines. Changes to database entries are required to be documented. Data files are subject to regular backups.
- The geological model, interpretation (includes reconciliation insights) and 3D modelling of the mineralized zones are subject to a peer review process aiming to identify any flaws or alternative interpretations that might not have been considered by the main modeler.

We have the following internal control protocols in place to guide mineral resource and mineral reserve estimation:

- Prior to use in mineral resource or mineral reserve estimation, the data being used to support estimation are downloaded from the database into a project file and reviewed for improbable entries and outlier values.
- Written procedures and guidelines are used to guide estimation methods and approaches.
- Peer reviews are undertaken on mineral reserve and resource estimations to ensure consistency with industry practices including reviews of geological model, block models, and mineral resource and reserve estimates.

- Annual mineral reserve and resource technical statements estimates are prepared following our layered responsibility system. See *Operating and Financial Review and Prospects—Risk Management*.
- External mineral resource and mineral reserve audits are undertaken for applicable cases in accordance with our guidelines.

We have an internal study process to progress our project studies that fulfill S-K 1300 reporting requirements from initial assessments, pre-feasibility, feasibility reporting. This staged approach provides for project review and allows for assessment and risk evaluations, including the ones related to mineral resource and mineral reserve estimates, economic assumptions and the engineering requirements for mining and extraction.

We conduct reviews of and updates to property risk registers as part of the mineral resource and mineral reserve estimation processes. Areas of uncertainty that may materially impact mineral resource and reserve estimates and are monitored for material changes for impact to estimations may include but are not limited to:

- Changes to long-term metal price, market and exchange rate assumptions.
- Changes in local interpretation of lithological, structural and mineralization geometry and continuity.
- Changes to estimation input parameters and estimation techniques in the resource modeling process.
- Changes to metallurgical recovery assumptions affecting concentrate grade, variability and quality.
- Changes in processing that result in higher deleterious elements that result in penalties or result in unsalable concentrate.
- Changes to the input assumptions used to derive the potentially mineable shapes applicable to the assumed underground and open pit mining methods used to constrain the estimates.
- Changes to mining selectivity and production rate assumptions.
- Changes to the forecast dilution and mining recovery assumptions.
- Changes to the cut-off values applied to the estimates.
- Variations in geotechnical (including seismicity), structures, rock mass strength, stress regime), hydrogeological, hydrothermal, geothermal factors, and mining method assumptions.
- Changes to environmental, permitting and social license assumptions.
- Long-term consumables price assumptions.

Other factors that can affect the reserve estimates include changes to:

- Mineral resource input parameters.
- Constraining underground or pit designs.
- Cut-off grade, Grade descriptor assumptions.
- Geotechnical (including seismicity), geothermal/hydrothermal and hydrogeological factors.
- Mining recovery assumptions based on similar types of mining methods; Metallurgical recovery are determined through testing of a significant number of drill core samples.
- Ability to control unplanned dilution.
- Ability to access the site, retain mineral, surface rights and water rights titles.
- Ability to maintain environmental and other regulatory permits and maintain the social license to operate.

PRESENTATION OF INFORMATION CONCERNING MINERAL RESERVES

The estimates of proven and probable mineral reserves at our mines and projects and the estimates of mine life included in this annual report have been prepared by our staff of experienced geologists and engineers, unless otherwise stated, and in accordance with the technical definitions established by the SEC under S-K 1300.

We periodically revise our reserve estimates when we have new geological data, economic assumptions or mining plans. During 2022, we performed an analysis of our reserve estimates for certain projects and operations, which is presented in this report. Reserve estimates for each operation assume that we either have or expect to obtain all the necessary rights and permits to mine, extract and process mineral reserves at each mine. For some of our operations, the projected exhaustion date includes stockpile reclamation. Where we own less than 100% of the operation, reserve estimates have been adjusted to reflect our proportional ownership interest. Certain numbers in the tables, discussions and notes have

been rounded. For a description of risks relating to reserves and resources and reserve and resource estimates, see *Overview—Risk factors*.

The projected exhaustion date of our mines or complexes are continuously reviewed based on several factors and studies, including geological exploration, socio-environmental factors, mineral processing, economic assumptions, market demand, mining constraints, tailings or waste disposal constraints and production capacity, in each case supported by proven and probable mineral reserves. Investments in mineral exploration and the review of technical studies are part of our long-term strategy and continuous pursuit to add value to the company, by bringing operational reliability and expanding mineral reserves portfolio.

Our reserves have been estimated based on the commodity price assumptions as of December 31, 2022, the time of the economic analysis.

PRESENTATION OF INFORMATION CONCERNING MINERAL RESOURCES

Estimation was performed by our staff of experienced geologists and engineers, unless otherwise stated. All mineralogical information, exploration drilling and background information were provided to the estimators by the geological staff at the mines or by exploration staff.

The mineral resource confidence categories were initially assigned based on a combination of factors, including geological understanding and confidence, drill hole support, grade estimation confidence relative to planned production rates, and identified risk factors. The initial assignments were reviewed to assess the impacts of factors such as metallurgical recoveries, geomechanical studies, mine design work, and representative mineability and recovery reconciliation analysis. Where mining has occurred or is currently active, the mined-out volumes were overprinted upon the mineral resource model to account for mining depletion.

For each mineral resource estimate, at least an initial assessment was undertaken that assessed likely infrastructure, mining, and process plant requirements; mining methods; process recoveries and throughputs; environmental, permitting, and social considerations relating to the proposed mining and processing methods, and proposed waste disposal, and technical and economic considerations in support of an assessment of reasonable prospects of economic extraction. The assumptions made in the estimation our mineral resources may differ from those made in the estimation of our mineral reserves, because (i) the extraction of mineral resources occurs over a longer period of time, compared to the extraction of reserves, and (ii) different timing for mineral resource estimation and the economic analysis for purposes of reserve estimation or review. As of December 31, 2022, all the assumptions, including commodity price and resource mine designs, considered for our resource estimation continue to provide a reasonable basis for establishing the prospects of economic extraction of mineral resources.

We periodically revise our mineral resource estimates when we have new geological data, economic assumptions or mining plans. During 2022, we performed an analysis of our resource for certain projects and operations, which is presented in this report. Mineral resource estimates for each operation assume that we either have or expect to obtain all the necessary rights and permits to mine, extract and process mineral resources at each mine. Where we own less than 100% of the operation, resource estimates have been adjusted to reflect our proportional ownership interest. All mineral resources presented are exclusive of mineral reserves. Certain numbers in the tables, discussions and notes have been rounded. For a description of risks relating to resource and reserve estimates, see *Overview—Risk factors*. Our mineral resource estimates are based on certain assumptions about prices as shown in the table below.

IRON ORE MINERAL RESERVES AND MINERAL RESOURCES

We classify our iron ore mineral reserves as proven to the extent that they satisfy the requirements of the definition of proven reserves under S-K 1300 and that we have obtained the environmental licenses for the corresponding pit operation or have at least a reasonable expectation of obtaining on a timely basis any additional licenses necessary to conduct the operations.

We periodically review the economic viability of our iron ore mineral reserves considering changes in the iron ore industry.

	Iron Ore Mineral reserves at December 31, ^{(1) (2)}							
	Tonnage in metric million tons inclusive moisture and dry %Fe grade							
	Proven – 2022		Probable – 2022		Total – 2022		Total – 2021	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Southeastern System⁽³⁾</i>								
Itabira ⁽⁴⁾	290.6	48.4	554.0	44.3	844.6	45.7	922.9	45.6
Minas Centrais ⁽⁵⁾	419.7	42.4	875.9	50.1	1,295.6	47.6	1,355.8	48.1
Mariana ⁽⁶⁾	207.2	56.1	244.2	57.4	451.4	56.8	469.4	56.8
Southeastern System - total	917.5	47.4	1,674.1	49.3	2,591.6	48.6	2,748.1	48.8
<i>Southern System ⁽⁷⁾</i>								
Vargem Grande ⁽⁸⁾	605.8	46.8	2,366.5	45.0	2,972.4	45.4	3,300.0	46.1
Paraopeba ⁽⁹⁾	113.0	57.3	211.9	57.6	325.0	57.5	330.4	57.5
Southern System - total	718.8	48.5	2,578.5	46.1	3,297.4	46.6	3,630.4	47.1
<i>Northern System ⁽¹⁰⁾</i>								
Serra Norte ⁽¹¹⁾	397.8	66.1	1,101.8	65.7	1,499.6	65.8	1,590.2	65.8
Serra Sul ⁽¹²⁾	1,807.6	66.1	2,385.6	65.6	4,193.2	65.8	4,273.0	65.8
Serra Leste	1.2	66.4	248.5	64.7	249.7	64.7	253.6	64.7
Northern System - total	2,206.6	66.1	3,735.9	65.6	5,942.5	65.8	6,116.8	65.8
Total	3,842.9	58.3	7,988.4	55.9	11,831.5	56.7	12,495.3	56.6

(1) Iron Ore Reserve estimates stated as metric million tons inclusive moisture and dry %Fe grade; following moisture contents: 1.08% Itabira; 5.28% Minas Centrais; 6.57% Mariana; 5.85% Vargem Grande; 6.85% Paraopeba; 7.55% Serra Norte; 7.22% Serra Sul; 6.53% Serra Leste. Our Iron Ore mineral reserve estimates are of in-situ material, except for 46.1 Mt tons of stockpile included in the Mariana Complex.

(2) The mineral reserve economic viability was determined based price curve with the long-term price being US\$74.5/dmt for 62% iron grade.

(3) Average product recovery (tonnage basis) of the iron ore reserves are: 56.3% for Itabira, 70.0% for Minas Centrais and 95.6% for Mariana.

(4) The Itabira integrated operation includes Conceição and Minas do Meio mines.

(5) Minas Centrais complex comprises the reserves for Brucutu, Apolo project and Morro Agudo mine. The mineral reserve for the Minas Centrais complex has been adjusted to reflect our 98.6% ownership interest.

(6) Mariana complex includes Alegria, Fábrica Nova and Fazendão mines and Capanema project.

(7) Average product recovery (tonnage basis) of the iron ore reserves are: 56.4% for Vargem Grande and 79.6% for Paraopeba.

(8) Vargem Grande complex includes Sapecado, Galinheiro, Tamanduá, Capitão do Mato and Abóboras mines.

(9) Paraopeba complex includes João Pereira and Segredo, Mar Azul and Capão Xavier mines.

(10) Average product recovery (tonnage basis) of the iron ore reserves are: 99.6% for Serra Norte, 100% for Serra Leste and 100% for Serra Sul.

(11) Serra Norte complex includes N3, N4W, N4E and N5 mines and N1 and N2 projects.

(12) Serra Sul complex includes S11D and S11C deposits.

We periodically revise our mineral resource and mineral reserve estimates based on new geological data, study developments, economic assumptions, mining plans, new technology developments and regulatory updates, among other factors. Future changes in these aspects may impact our future mineral reserves. Variations in iron ore reserves from 2021 to 2022 reflect mainly depletion resulting from mine production for operating mines (corresponding to approximately 306 Mt), downgrades resulting from mine designs review and temporary restrictions on waste and tailings disposal.

The main changes are summarized below:

- In the Northern System, our mineral reserves decreased 3%, to 5,943 Mt in 2022 from 6,116.8 Mt in 2021. The changes on the three complexes were due to mine depletion, consisting of 80Mt at Serra Sul Complex, 91Mt at Serra Norte Complex and 4Mt at Serra Leste Complex.
- In the Southeastern System, our mineral reserves decreased 6%, to 2.6Bt in 2022 from 2.7Bt of mineral reserves in 2021. The mineral reserves of Itabira Complex decreased by 78Mt, corresponding to approximately 8% of the total mineral reserves, 43Mt due to mine depletion and 36Mt as a result of mine design reviews and boundary constraints. The mineral reserves of Minas Centrais Complex decreased by 60Mt, corresponding to approximately 4% of mineral reserves, out of which 19Mt due to mine depletion and 41Mt as a result of mine

design reviews at Apolo project. The mineral reserves of Mariana Complex decreased by 18Mt mainly due to mine depletion.

- In the Southern System, our mineral reserves decreased 9%, to 3.3Bt in 2022 from 3.6Bt in 2021. The mineral reserves of Vargem Grande Complex decreased by 328Mt, corresponding to approximately 10% of mineral reserves, being 157Mt as result of mine design reviews, 68Mt as a result of temporary constraints on waste and tailings disposal, 61Mt as a result of boundary constraints and 42Mt due to mine depletion. The mineral reserves of Paraopeba Complex decreased by 5Mt mainly due to mine depletion.

As a result of mine scheduling and production plan reviews, the estimated exhaustion of Vargem Grande Complex was extended up to 2120.

Iron Ore Mineral Resources as of December 31, ⁽¹⁾ ⁽²⁾												
Tonnage in metric million tons inclusive moisture and dry %Fe grade												
	Measured - 2022		Indicated - 2022		Measured and Indicated - 2022		Inferred - 2022		Measured and Indicated - 2021		Inferred - 2021	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Southeastern System</i>												
Itabira ⁽³⁾	175.9	52.9	303.6	45.5	479.5	48.2	257.7	41.9	474.1	48.0	257.7	41.9
Minas Centrais ⁽⁴⁾	195.4	46.5	579.1	44.5	774.6	45.0	875.1	43.1	765.3	44.9	873.5	43.0
Mariana ⁽⁵⁾	2,535.3	41.7	2,043.5	40.2	4,578.8	41.0	2,271.0	39.0	4,601.4	41.0	2,274.7	39.1
Southeastern System – total	2,906.6	42.7	2,926.2	41.6	5,832.9	42.1	3,403.8	40.3	5,840.8	42.1	3,405.9	40.3
<i>Southern System</i>												
Vargem Grande ⁽⁶⁾	1,420.5	41.0	1,883.9	39.2	3,304.4	40.0	2,153.1	37.7	3,218.1	39.8	2,147.6	37.6
Paraopeba ⁽⁷⁾	1,108.9	45.4	1,450.0	40.8	2,558.9	42.8	1,967.6	38.5	2,561.5	42.8	1,968.0	38.5
Southern System - total	2,529.4	43.0	3,333.9	39.9	5,863.3	41.2	4,120.7	38.1	5,779.6	41.2	4,115.6	38.0
<i>Northern System</i>												
Serra Norte ⁽⁸⁾	591.5	66.4	491.2	66.1	1,082.7	66.3	293.4	66.0	1,084.2	66.3	293.4	66.0
Serra Sul (S11) ⁽⁹⁾	479.9	66.0	388.0	64.6	867.8	65.4	123.5	64.3	867.8	65.4	123.5	64.3
Serra Leste (SL1)	295.1	50.9	197.2	48.3	492.3	49.9	56.7	49.5	492.3	49.9	56.7	49.5
Northern System - total	1,366.5	62.9	1,076.4	62.3	2,442.8	62.6	473.6	63.6	2,444.3	62.6	473.6	63.6
Total	6,802.5	46.9	7,336.5	43.8	14,139.0	45.3	7,998.1	40.5	14,064.7	45.3	7,995.1	40.5

(1) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves. Iron Ore mineral resources estimates stated as metric million tons inclusive moisture and dry %Fe grade; following moisture contents: 1.28% Itabira; 5.54% Minas Centrais; 3.92% Mariana; 3.71% Vargem Grande; 4.58% Paraopeba; 7.47% Serra Norte; 7.21% Serra Sul and 5.15% Serra Leste. Our Iron Ore mineral resources estimates are of in-situ material.

(2) The mineral resources prospects of economic extraction were determined based on a long-term price of US\$90/dmt for 62% iron grade.

(3) The Itabira integrated operation includes Conceição and Minas do Meio mines.

(4) Minas Centrais integrated operation includes Brucutu and Morro Agudo mines and the Apolo project. Figure have been adjusted to reflect our 98.7% ownership interest in the Minas Centrais complex.

(5) Mariana integrated operation includes Alegria, Fábrica Nova and Fazendão mines and Capanema project.

(6) Vargem Grande integrated operation includes Sapocado, Galinheiro, Tamanduá, Capitão do Mato and Abóboras mines.

(7) Paraopeba integrated operation includes João Pereira and Segredo, Mar Azul and Capão Xavier mines.

(8) Serra Norte integrated operation includes N3, N4W, N4E and N5 mines and N1, N2 projects.

(9) Serra Sul integrated operation includes S11D and S11C deposits.

No material changes have been identified to our iron ore mineral resources, other minor changes due to downgrading from mineral reserves to mineral resources.

In July 2022, we concluded the sale to J&F Mineração Ltda of all our assets in the Midwestern System. See *Overview—Business overview—Significant Changes in Our Business—Divestments*, therefore the Midwestern System mineral resource is no longer disclosure.

The mine exhaustion schedule has been adjusted due to our new production plan and our revision of project capacity.

	Type	Iron Ore integrated operations			Vale interest (%)
		Operating since	Projected exhaustion date – 2022 ⁽¹⁾	Projected exhaustion date – 2021 ⁽²⁾	
<i>Southeastern System</i>					
Itabira	Open pit	1957	2041	2041	100.0
Minas Centrais	Open pit	1994	2057	2061	98.7
Mariana	Open pit	1976	2039	2038	100.0
<i>Southern System</i>					
Vargem Grande	Open pit	1942	2120	2089	100.0
Paraopeba	Open pit	2003	2043	2042	100.0
<i>Northern System</i>					
Serra Norte	Open pit	1984	2038	2038	100.0
Serra Sul	Open pit	2016	2059	2062	100.0
Serra Leste	Open pit	2014	2049	2054	100.0

(1) Indicates the life-of-mine for the operating mine with the longest projected exhaustion date in the complex, as of December 31, 2022.

(2) Projected exhaustion dates estimated as of December 31, 2021. Projected exhaustion dates in this column are superseded by the estimates indicated under "Projected exhaustion date – 2022."

NICKEL MINERAL RESERVES AND MINERAL RESOURCES

Our nickel mineral reserve estimates are of in-situ material after adjustments for depletion, mining dilution and mining losses (or screening and drying in the case of PTVI), with no adjustments made for metal losses due to processing recoveries.

	Nickel Mineral Reserves as of December 31, ⁽¹⁾ ⁽²⁾								
	Tonnage in millions of dry metric tons. Grades in %								
	Proven – 2022		Probable – 2022		Total – 2022		Total – 2021		Recovery Range ⁽⁶⁾
Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade		
<i>Canada</i>									
Sudbury ⁽³⁾	18.1	1.55	54.3	1.44	72.4	1.47	53.8	1.33	75-85
Thompson	-	-	-	-	-	-	-	-	-
Voisey's Bay	13.0	1.89	17.6	1.84	30.6	1.86	26.8	1.95	75-85
<i>Indonesia</i>									
PTVI ⁽⁴⁾	29.2	1.70	20.3	1.70	49.4	1.70	49.9	1.72	85-90
<i>Brazil</i>									
Onça Puma ⁽⁵⁾	52.8	1.62	52.6	1.34	105.4	1.48	111.0	1.44	85-90
Total	113.1	1.66	144.8	1.49	257.8	1.56	241.5	1.53	

(1) Tonnage is in millions of dry metric tons. Ni grades are in (%). The point of reference for the mineral reserve estimate is the point of delivery to the process plant.

(2) The mineral reserve economic viability was determined based on a price curve with a long-term price of US\$17,725/t for Nickel.

(3) Sudbury mineral reserves includes material from Coleman, Copper Cliff, Creighton, Garson, Totten mines and Copper Cliff Pit project.

(4) PTVI mineral reserves are only from Sorowako operations and have been adjusted to reflect our 44.3% ownership interest. The reported mineral reserves may differ in quantity or quality from those reported in other jurisdictions, under different standards.

(5) Estimated consolidated nickel mineral reserves include 4.4 million dry metric tons of stockpile.

(6) Recovery range is overall metal recovered to point of first material sale.

At Sudbury operations our mineral reserves increased 34%, to 72.4Mt in 2022 from 53.8Mt in 2021 due to the addition of 21Mt related to mineral resource conversion after completion of pre-feasibility studies at Creighton Mine Phase 5 and at Copper Cliff Pit projects, as well as redesign evaluations at Garson and Totten mine, partially offset by 2.2Mt of mining depletion. The increase in Sudbury's mineral reserve is the result of our focus on developing mineral projects that can ensure the longevity of our operations or increase our production. Due to this material change we are the filing an updated Technical Report Summary for Sudbury, Ontario, as Exhibit 96.1 to this annual report.

At Voisey's Bay our mineral reserves increased 14%, to 30.6Mt in 2022 from 26.8Mt in 2021 due to the addition of 5.5Mt related to mine design and cut-off parameters updates, partially offset by 1.6Mt of mining depletion.

The mineral reserves at Onça Puma decreased 5.6 Mt in relation to 2021, corresponding to 5%, due to mining depletion and update of FeNi premiums and cost increases. The mineral reserves at PTVI slightly decreased by 1% due to mining depletion that was partially offset by mine design reviews.

We continue to operate and produce from our mine in Thompson, and we are also conducting technical studies aiming to convert mineral resource into mineral reserves.

Nickel Mineral Resources as of December 31, ⁽¹⁾⁽²⁾												
Tonnage in millions of dry metric tons. Grades in (%)												
	Measured - 2022		Indicated - 2022		Measured and Indicated- 2022		Inferred - 2022		Measured and Indicated- 2021 ⁽¹⁾		Inferred - 2021 ⁽¹⁾	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Canada</i>												
Sudbury ⁽³⁾	5.5	1.13	38.2	1.30	43.7	1.28	18.2	1.3	57.9	1.54	8.6	2.1
Thompson ⁽⁴⁾	4.1	2.11	13.1	1.95	17.2	1.99	7.5	1.7	18.6	1.98	7.3	1.7
Voisey's Bay	3.7	0.96	-	-	3.7	0.96	6.7	2.0	4.1	0.95	5.9	1.8
<i>Indonesia</i> ⁽⁵⁾												
PTVI												
Saprolite ⁽⁶⁾	1.5	1.57	80.1	1.71	81.6	1.71	46.6	1.9	80.9	1.71	45.7	1.9
Limonite ⁽⁷⁾	22.6	1.33	23.5	1.31	46.1	1.32	-	-	46.2	1.32	-	-
<i>Brazil</i>												
Onça Puma	10.8	1.54	14.0	1.43	24.8	1.47	3.8	1.3	38.6	1.32	5.1	1.2
Total	48.2	1.40	168.9	1.56	217.1	1.52	82.8	1.7	246.4	1.54	72.6	1.8

- (1) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves. Tonnage is in millions of dry metric tons. Ni grades are in (%). The point of reference for the resource estimate is in situ, for PTVI and Onça Puma the point of reference is dry recovered tons to the processing plant.
- (2) The mineral resource prospects of economic extraction were determined based on prices ranging from: US\$13,376/t - US\$18,800/t, depending on the mine. Variations in price for different mines are associated with timing of the associated estimate.
- (3) Sudbury mineral resources includes material from selected zones within the Coleman, Copper Cliff, Creighton, Stobie, Garson, Totten and Victor deposits.
- (4) Thompson mineral resources includes material from T1 and T3 deposits.
- (5) PTVI mineral resources have been adjusted to reflect our 44.3% ownership interest. The reported mineral resources may differ in quantity or quality from those reported in other jurisdictions, under different standards.
- (6) The PTVI nickel saprolite mineral resources includes material from Sorowako operations, Bahodopi 2-3 and Pomalaa projects.
- (7) The PTVI nickel limonite mineral resources include only Pomalaa project material.

At Sudbury, our mineral resource decreased by 5% in relation to 2021 due to conversion to mineral reserves from Creighton Mine Phase 5 and at Copper Cliff Pit projects, which was partially offset by new material converted to mineral resources.

At Voisey's Bay, our mineral resources increased by 4% in relation to 2021 mainly due to changes in mineral reserves, mine design and cut-off parameters updates, partially offset by milling capacity constraint. At Manitoba, our mineral resources decreased by 5% due to depletion and downgrade to exploration target.

The mineral resource at Onça Puma decreased by 34% (15Mt) due to updates on cut-off parameters, FeNi premiums and costs. The mineral resource at PTVI slightly increased in line with mineral reserves changes.

	Type	Nickel ore mines			Vale interest (%)
		Operating since	Projected exhaustion date – 2022 ⁽¹⁾	Projected exhaustion date – 2021 ⁽²⁾	
<i>Canada</i>					
Sudbury	Underground	1885	2043	2043	100.0
Thompson	Underground	1961			100.0
Voisey's Bay ⁽³⁾	Open pit/ Underground	2005	2036	2035	100.0
<i>Indonesia</i>					
PTVI	Open pit	1977	2045	2045	44.3
<i>Brazil</i>					
Onça Puma	Open pit	2011	2072	2074	100.0

(1) Indicates the life-of-mine for the operating mine with the longest projected exhaustion date in the complex, as of December 31, 2022.

(2) Projected exhaustion dates (Reserve Only) estimated as of December 31, 2022. Projected exhaustion dates in this column are superseded by the estimates indicated under "Projected exhaustion date – 2022."

(3) Voisey's Bay is transitioning from an open pit mine to an underground mine.

COPPER MINERAL RESERVES AND MINERAL RESOURCES

	Copper Mineral Reserves as of December 31, ⁽¹⁾ ⁽²⁾								
	Tonnage in millions of dry metric tons. Grades in (%)								
	Proven – 2022		Probable – 2022		Total – 2022		Total – 2021		Recovery Range ⁽⁶⁾
Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade		
<i>Canada</i>									
Sudbury ⁽³⁾	18.1	1.87	54.3	1.32	72.4	1.46	53.8	1.59	85-95
Voisey's Bay	13.0	0.81	17.6	0.80	30.6	0.80	26.8	0.85	85-95
<i>Brazil</i>									
Sossego ⁽⁴⁾	7.6	0.84	78.6	0.55	86.2	0.58	85.3	0.62	90-95
Salobo ⁽⁵⁾	251.8	0.69	860.6	0.60	1,112.4	0.62	1,133.4	0.62	80-90
Total	290.4	0.77	1,011.1	0.64	1,301.4	0.67	1,299.3	0.66	

(1) Tonnage is in millions of dry metric tons. Cu grades are in (%). Point of reference for the mineral reserve estimate is the point of delivery to the process plant.

(2) The mineral reserve economic viability was determined based on a price curve with a long-term price of US\$7,950/t for copper.

(3) Sudbury mineral reserves includes material from Coleman, Copper Cliff, Creighton, Garson, Totten mines and Copper Cliff Pit project.

(4) Estimated consolidated copper mineral reserves includes Sequeirinho, Sossego Mata II pits and 44.3 million dry metric tons of stockpile.

(5) Estimated consolidated copper mineral reserves include 220.6 million dry metric tons of stockpile.

(6) Recovery range is overall metal recovered to point of first material sale.

In Canada, the mineral reserves for Sudbury and Voisey's Bay have increased for the same reasons discussed above in connection with the nickel reserves. The mineral reserves for Sossego operations remained fairly stable due to conversion of the Mata II deposit, partially offsetting mining depletion and re-evaluation and mine plan updates.

At Salobo operations, our mineral reserves decreased by 2%, to 1,112.4Mt in 2022 from 1,133.4Mt in 2021 mainly due to mining depletion and minor changes related to model re-evaluation.

Copper Mineral Resources as of December 31, Tonnage in millions of dry metric tons. Grades in (%)												
	Measured - 2022 ⁽¹⁾⁽²⁾		Indicated - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2022 ⁽¹⁾⁽²⁾		Inferred - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2021 ⁽¹⁾		Inferred - 2021 ⁽¹⁾	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Canada</i>												
Sudbury ⁽³⁾	5.5	2.33	38.2	2.14	43.7	2.16	18.2	1.4	57.9	2.04	8.6	2.5
Voisey's Bay	3.7	0.77	-	-	3.7	0.77	6.7	0.8	4.1	0.77	5.9	0.8
<i>Brazil</i>												
Sossego ⁽⁴⁾	165.5	0.75	157.1	0.85	322.6	0.80	23.0	0.8	315.5	0.78	21.7	0.8
Salobo	37.7	0.37	492.1	0.47	529.8	0.46	216.1	0.6	469.7	0.48	268.9	0.5
Alemão	61.0	1.63	54.4	1.33	115.4	1.49	0.1	1.7	115.4	1.49	0.1	1.7
<i>Indonesia</i>												
Onto ⁽⁵⁾	-	-	851.7	0.96	851.7	0.96	793.7	0.7	851.7	0.96	793.7	0.7
Total	273.4	0.93	1,593.5	0.84	1,866.9	0.85	1,057.8	0.7	1,814.3	0.87	1,098.9	0.7

(1) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves. Tonnage is in millions of dry metric tons. Cu grades are in (%). Point of reference for the mineral resource estimate is in situ.

(2) The mineral resource prospects of economic extraction were determined based on prices ranging from US\$6,100/t - US\$8,150/t for copper, depending on the mine. Variations in price for different mines are associated with timing of the associated estimate.

(3) Sudbury mineral resources includes material from selected zones within the Coleman, Copper Cliff, Creighton, Stobie, Garson, Totten and Victor deposits.

(4) Sossego mineral resources includes material from Sossego Operation and Cristalino, Mata II, Bacaba, Barão and 118 projects.

(5) Onto mineral resource has been adjusted to reflect our 80% ownership interest. The reported mineral resources may differ in quantity or quality from those reported in other jurisdictions, under different standards.

The mineral resource for Sudbury and Voisey's Bay changed for the same reasons discussed above in connection with the nickel resources. The mineral resource for Sossego operations increased by 3% (8Mt) due to conversion of material from exploration target and block models updates.

At Salobo operations our mineral resource increased by 1% (7.3Mt) due to incorporation of new drilling data in block model.

	Type	Copper ore mines			Vale interest (%)
		Operating since	Projected exhaustion date – 2022 ⁽¹⁾	Projected exhaustion date – 2021 ⁽²⁾	
<i>Canada</i>					
Sudbury	Underground	1885	2043	2043	100.0
Voisey's Bay ⁽³⁾	Open pit/ Underground	2005	2036	2035	100.0
<i>Brazil</i>					
Sossego	Open pit	2004	2029	2028	100.0
Salobo	Open pit	2012	2054	2053	100.0

(1) Indicates the life-of-mine for the operating mine with the longest projected exhaustion date in the complex, as of December 31, 2022.

(2) Projected exhaustion dates estimated as of December 31, 2021. Projected exhaustion dates in this column are superseded by the estimates indicated under "Projected exhaustion date – 2022."

(3) Voisey's Bay is transitioning from an open pit mine to an underground mine.

PGMS AND OTHER PRECIOUS METALS MINERAL RESERVES AND MINERAL RESOURCES

We expect to recover significant quantities of precious metals as by-products of our concentrates from Sudbury, Sossego and Salobo operations.

	Precious Metals Mineral Reserves as of December 31, ⁽¹⁾⁽²⁾									
	Tonnage in millions of dry metric tons. Grade in grams per dry metric ton									
	Proven – 2022 ⁽¹⁾⁽²⁾		Probable – 2022 ⁽¹⁾⁽²⁾		Total – 2022 ⁽¹⁾⁽²⁾		Total – 2021 ⁽¹⁾		Recovery range ⁽⁷⁾ (%)	
Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade			
<i>Canada</i>										
Sudbury ⁽³⁾										
Platinum	18.1	1.15	54.3	0.84	72.4	0.92	53.8	1.16	70-75	
Palladium	18.1	1.14	54.3	1.11	72.4	1.11	53.8	1.38	70-80	
Gold	18.1	0.47	54.3	0.29	72.4	0.34	53.8	0.43	60-75	
<i>Brazil</i>										
Sossego ⁽⁴⁾										
Gold	7.6	0.26	78.6	0.18	86.2	0.19	85.4	0.18	75-80	
Salobo ⁽⁵⁾										
Gold	251.8	0.40	860.6	0.34	1,112.4	0.35	1,133.4	0.35	60-70	
Total Pt + Pd⁽⁶⁾	18.1	2.29	54.3	1.95	72.4	2.03	53.8	2.55		
Total Gold	277.4	0.40	993.5	0.32	1,271	0.34	1,272.6	0.34		

(1) Tonnage is in millions of dry metric tons. Grade is grams per dry metric ton. Point of reference for the mineral reserve estimate is the point of delivery to the process plant.

(2) The mineral reserve economic viability was determined based on long-term prices of: US\$1,175/oz for platinum, US\$1,175/oz for palladium, US\$1,525/oz for gold. Gold reserves are reported on 100% basis and do not deduct the streaming amounts. For a description of our streaming arrangements with Wheaton, see Section 2.3 PGM's and other Precious Metals.

(3) Sudbury mineral reserves includes material from Coleman, Copper Cliff, Creighton, Garson, Totten mines and Copper Cliff Pit project.

(4) Estimated consolidated mineral reserves includes Sequeirinho, Sossego Mata II pits and 44.3 million dry metric tons of stockpile.

(5) Estimated consolidated mineral reserves include 220.6 million dry metric tons of stockpile.

(6) Pt+Pd is the sum of platinum and palladium grades.

(7) Recovery range is overall metal recovered to point of first material sale.

In Sudbury, our mineral reserve estimates for platinum, palladium and gold have changed for the same reasons discussed above in connection with the nickel mineral reserves. Mineral reserve estimates for gold changed for the same reasons discussed above in connection with the copper mineral reserves.

Precious Metals Mineral Resources as of December 31, Tonnage in millions of dry metric tons. Grade in grams per dry metric ton												
	Measured – 2022 ⁽¹⁾⁽²⁾		Indicated - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2022 ⁽¹⁾⁽²⁾		Inferred - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2021 ⁽¹⁾		Inferred - 2021 ⁽¹⁾	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Canada</i>												
Sudbury ⁽³⁾												
Platinum	5.5	1.92	38.2	0.90	43.7	1.03	18.2	0.9	57.9	0.87	8.6	1.5
Palladium	5.5	2.39	38.2	1.12	43.7	1.27	18.2	1.0	57.9	1.10	8.6	1.8
Gold	5.5	0.90	38.2	0.35	43.7	0.42	18.2	0.3	57.9	0.35	8.6	0.6
<i>Brazil</i>												
Sossego ⁽⁴⁾												
Gold	165.5	0.13	157.1	0.11	322.6	0.12	23.0	0.1	315.4	0.11	21.7	0.1
Salobo												
Gold	37.7	0.15	492.1	0.24	529.8	0.23	216.1	0.3	469.7	0.24	268.9	0.3
Alemão												
Gold	61.0	1.26	54.4	0.95	115.4	1.11	0.1	1.1	115.4	1.11	0.1	1.1
<i>Indonesia</i>												
Onto ⁽⁵⁾												
Gold	-	-	851.7	0.58	851.7	0.58	793.7	0.4	851.7	0.58	793.7	0.4
Total Pt + Pd⁽⁶⁾	5.5	4.30	38.2	2.02	43.7	2.31	18.2	1.9	57.9	1.97	8.6	3.3
Total Gold	269.7	0.40	1,593.5	0.44	1,863.2	0.43	1,051.1	0.4	1,810.1	0.44	1,093.0	0.4

(1) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves. Tonnage is in millions of dry metric tons. Grade is grams per dry metric ton. Point of reference for the mineral resource estimate is in situ.

(2) The mineral resource prospects of economic extraction were determined based on prices of:US\$1,124 – 1,290/oz for platinum, US\$925-1,400/oz for palladium and US\$1,000- US\$1,650/oz for gold, in each case depending on the mine. Variations in price for different mines are associated with timing of the associated estimate.

(3) Sudbury mineral resources includes material from selected zones within the Coleman, Copper Cliff, Creighton, Stobie, Garson, Totten and Victor deposits.

(4) Sossego mineral resources includes material from Sossego Operation and Cristalino, Mata II, Bacaba, Barão and 118 projects.

(5) Onto mineral resource has been adjusted to reflect our 80% ownership interest. The reported mineral resources may differ in quantity or quality from those reported in other jurisdictions, under different standards.

(6) Pt+Pd is the sum of Platinum and Palladium grades.

In Sudbury, our mineral resource estimates for platinum, palladium and gold changed for the same reasons discussed above in connection with the nickel mineral resources. Mineral Resources estimates for gold changed for the same reasons discussed above in connection with the copper mineral resources. The mine exhaustion dates of the PGM's are the same as stated above for Sudbury, Sossego, and Salobo.

COBALT MINERAL RESERVES AND MINERAL RESOURCES

	Cobalt Mineral Reserves as of December 31, Tonnage in millions of dry metric tons. Grades in %								
	Proven – 2022 ⁽¹⁾⁽²⁾		Probable – 2022 ⁽¹⁾⁽²⁾		Total – 2022 ⁽¹⁾⁽²⁾		Total – 2021 ⁽¹⁾		Recovery Range ⁽⁵⁾ %
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	
<i>Canada</i>									
Sudbury ⁽³⁾	18.1	0.04	54.3	0.04	72.4	0.04	53.8	0.04	20-30
Voisey's Bay ⁽⁴⁾	13.0	0.12	17.6	0.12	30.6	0.12	26.8	0.12	70-80
Total	31.1	0.07	71.9	0.06	103.0	0.06	80.6	0.07	

(1) Tonnage is in millions of dry metric tons. Co grades are % of cobalt. The point of reference for the mineral reserve estimate is the point of delivery to the process plant. Recovery range is overall metal recovered to point of first material sale.

(2) The mineral reserve economic viability was determined based on long-term prices of: US\$56,250/t for cobalt.

(3) Sudbury mineral reserves includes material from Coleman, Copper Cliff, Creighton, Garson, Totten mines and Copper Cliff Pit project.

(4) Cobalt reserves are reported on 100% basis and do not deduct the streaming amounts. For a description of our cobalt streaming arrangements, see *Lines of Business–Energy transition metals–Cobalt*.

(5) Recovery range is overall metal recovered to point of first material sale.

Cobalt Mineral Resources as of December 31, Tonnage in millions of dry metric tons. Grades in %												
	Measured - 2022 ⁽¹⁾⁽²⁾		Indicated - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2022 ⁽¹⁾⁽²⁾		Inferred - 2022 ⁽¹⁾⁽²⁾		Measured and Indicated- 2021 ⁽¹⁾		Inferred - 2021 ⁽¹⁾	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
<i>Canada</i>												
Sudbury ⁽³⁾	5.5	0.03	38.2	0.03	43.7	0.03	18.2	0.04	57.9	0.04	8.6	0.05
Voisey's Bay	3.7	0.05	0.0	0.00	3.7	0.05	6.7	0.14	4.1	0.04	5.9	0.12
<i>Indonesia</i>												
PTVI ⁽⁴⁾⁽⁵⁾	22.6	0.15	59.6	0.08	82.3	0.10	8.3	0.05	82.3	0.10	8.3	0.05
Total	31.8	0.12	97.8	0.06	129.7	0.08	33.2	0.06	144.3	0.07	22.8	0.07

(1) Mineral resources are reported exclusive of those mineral resources converted to mineral reserves. Tonnage is in millions of dry metric tons. Co grades are % of cobalt. The point of reference for Sudbury and Voisey's Bay mineral resource estimate is in situ, for PTVI the point of reference is dry recovered tons to the process plant.

(2) The mineral resource prospects of economic extraction were determined based on prices ranging from: US\$45,000-US\$52,911/t, depending on the mine. Variations in price for different mines are associated with timing of the associated estimate.

(3) Sudbury mineral resources includes material from selected zones within the Coleman, Copper Cliff, Creighton, Stobie, Garson, Totten and Victor deposits

(4) The mineral resource for the PTVI property has been adjusted to reflect our 44.3% ownership interest.

(5) The PTVI cobalt mineral resources includes only Pomalaa project material.

Our cobalt mineral reserve estimates changed in 2022 for the same reasons discussed above in connection with the nickel mineral reserves.

The mine exhaustion dates for Cobalt the same as stated above for Sudbury and Voisey's Bay.

Our cobalt mineral resource estimates changed in 2022 for the same reasons discussed above in connection with the nickel mineral resource.

CAPITAL EXPENDITURES

Our investment guidance for capital expenditures in 2023 is approximately US\$6.0 billion, including operations sustaining, replacement and growth projects.

	2022 expenditures ⁽¹⁾	2021 expenditures ⁽¹⁾
	(US\$ million)	
Project execution (construction in progress)	1,587	999
Investments to sustain existing operations and replacement projects (property, plant and equipment)	3,859	4,034
Total	5,446	5,033

(1) Executed capital expenditures comprise the sum of cash outflows.

The following table sets forth total expenditures in 2022 for our main investment projects and expenditures budgeted for those projects in 2023, together with estimated total expenditures for each project and the actual or estimated start-up date of each project as of December 31, 2022.

Business area	Main projects ⁽¹⁾	Actual or Estimated start-up	Executed CAPEX		Expected CAPEX	
			2022 ⁽²⁾	Total executed ⁽³⁾	2023 ⁽⁴⁾	Total expected ⁽⁵⁾
(US\$ million)						
Iron solutions	Gelado	2H22	69	341	41	428
Iron solutions	Briqueting Tubarão	2H23	96	106	69	182
Iron solutions	Northern System 240 Mt Program	1H24	138	524	104	772
Iron solutions	Capanema Maximization	2H24	115	141	241	913
Iron solutions	Serra Sul 120	2H25	323	478	434	1,548
Energy	Sol do Cerrado	2H23	376	493	99	591
Energy transition metals: Copper	Salobo III	1H23	292	957	87	1,128
Energy transition metals: Nickel	VBME	1H24	557	2,031	238	2,690
Energy transition metals: Nickel	Onça Puma 2 nd furnace	1H25	16	16	115	555

(1) Projects approved by our Board of Directors.

(2) Executed capital expenditures comprise the sum of cash outflows.

(3) Total executed CAPEX through December 31, 2022, including capital expenditures in prior periods.

(4) Figure presented corresponds to the investment guidance for capital expenditures in 2023 of approximately US\$6 billion.

(5) Estimated total capital expenditure cost for each project, including capital expenditures in prior periods. Total expected CAPEX includes expenses, in line with the budget approved by our Board of Directors, while these expenses are not included in the expected CAPEX for the year or in the total executed CAPEX figures.

Our key investment projects are described in more detail below:

Gelado project. This project was approved in September 2018 by our Board of Directors and is expected to recover approximately 10 Mtpy of pellet feed with high iron content in the Carajás Complex, in order to feed the São Luís pellet

plant. In 2022, the project reached a physical progress of 98% and the start-up occurred in October of 2022. The project has total multiyear investments of US\$428 million.

Briqueting Tubarão. This project was approved in December 2020 by our Board of Directors and will convert the pelletizing plants 1 and 2 of Tubarão Unit into iron ore briquetting plants and build a new briquetting plant in the Complex of Vargem Grande. The initial production capacity will be of approximately 6 Mtpy. The operation start-up of the three plants is expected for the second half of 2023 and the total investment is US\$182 million.

Northern System 240 Mt Program. This project was approved in December 2018 by our Board of Directors and will expand the S11D's production capacity and the Northern System logistics capacity by 10 Mtpy. The mechanical phase of the S11D deliveries was concluded, with exception of the wagon loading silo, expected to be completed in January 2023. Regarding the logistics scope, the railroad was awarded the Installation License that was pending, thus allowing the implementation of the 13Km foreseen for the conclusion of the project, expected for the first semester of 2024. The works of the Ponta da Madeira Maritime Terminal are still within schedule, with the conclusion expected for the second semester of 2023. The project has total multiyear investments of US\$772 million.

Capanema project. This project was approved in December 2020 by our Board of Directors and was replaced in July 2022 by the Capanema Maximization project, which includes investments in the Capanema mine to reopen the facilities and acquire new equipment and to construct a long-distance conveyor belt, as well as adjustments in the Timbopeba stockyards, totaling expected multiyear investments of US\$913 million. The start-up is expected for the second half of 2024, with a production capacity by natural moisture (without tailings generation) of 18 Mtpy and in the first years will bring a net addition of 14 Mtpy of capacity with the expedition through the Timbopeba site.

Serra Sul 120 project. This project was approved by our Board of Directors in August 2020 and consists of increasing the S11D mine-plant capacity by 20 Mtpy, to a total of 120 Mtpy at site. The project is expected to result in an increase of the Northern System's mine-plant capacity to 260 Mtpy and has total multiyear investments of US\$1.548 million and its start-up is expected for the second half of 2024. The project includes: (i) the opening of new mining areas; (ii) the duplication of the existing long-distance belt conveyor; (iii) the implementation of new processing lines at the plant; and (iv) the expansion of storage areas, among other measures. Serra Sul 120 will create an important buffer of productive capacity, ensuring greater operational flexibility to face eventual production or licensing restrictions in the Northern System.

Solar Project – Sol do Cerrado. This project contemplates the construction of a photovoltaic plant, including 17 sub-parks that total an installed capacity of 766 megawatts peak ("MWp") in the municipality of Jaíba, in the state of Minas Gerais, Brazil. It also includes the implementation of an elevator substation, transmission line and connection bay at the 230 kV Jaíba substation, with contracts signed for connection to the Brazilian National Interconnected System. The project required investments of approximately US\$591 million and will produce approximately 193 average megawatts ("MWa") of energy per year for our operations, corresponding to 16% of our estimated demand in 2025. In November 2022, we announced the operational start-up of the project, and ramp up is expected until July 2023. Solar generation, located in the Southeastern region, also optimizes the generation profile of our portfolio, which is based on hydro generation.

Salobo III copper project. This project was approved in October 2018 by our Board of Directors and is a brownfield expansion of our Salobo operations, increasing processing through capacity. The project encompasses a third concentrator line and will use Salobo's existing infrastructure. Salobo III is expected to produce an average copper volume of approximately 67 ktpy in the first 5 years, 64 ktpy in the first 10 years and 59 ktpy throughout the life of mine. In 2022, the project achieved 99% of the physical progress completion, with civil works nearly complete, electromechanical assembly well advanced and the main substation commissioned energized. The project has total multiyear investments of US\$1,128 million.

Voisey's Bay underground mine expansion project ("VBME"). This project is expected to extend the mine life of Voisey's Bay and to increase Voisey's Bay production to an estimated annual production of around 45 kt of nickel, on average, about 20 kt of copper and about 2.6 kt of cobalt, in total. VBME will replace existing Voisey's Bay open-pit mine production, thus being recorded as a sustaining investment for the purpose of the dividend policy. The project

has experienced increased costs due to both internal and external factors. The total expected investment increased to US\$2,690 million, mainly due to: (i) COVID-19 impact and changes to the construction schedule, (ii) scope change to engineering design, (iii) higher than anticipated logistic and sourcing costs. In the second half of 2021, we achieved the first ore production of Reid Brook deposit, the first of two underground mines to be developed in the project. The start-up of the second deposit, Eastern Deeps, is expected by the second semester of 2023. The project is 81% complete.

Onça Puma second furnace. This project has been approved for construction and leverages Onça Puma's existing infrastructure. Once complete it is expected to decrease unit production costs for the overall Onça Puma complex by 15% and add 12-15 Ktpy capacity. The operation start-up is expected for the first half of 2025 and the total investment is US\$555 million.

We have also been developing the following projects:

Tecnored plant. In May 2022, we started the construction works of Tecnored's first commercial plant in Marabá, in the state of Pará. The plant will have an initial production capacity of 250 ktpy of green pig-iron with low carbon emissions and may reach 500 ktpy in the future. The start-up is planned for 2025 with an estimated investment of approximately US\$374 million.

Thompson Phase 1 Project. In June 2021, we approved a US\$123 million investment for the execution of the Thompson Phase 1 Project, which will extend current mining activities in Thompson, Manitoba for 10 years. The Thompson Mine Extension is a two-phase project and includes the construction of critical infrastructure, such as new ventilation raises and fans, increased backfill capacity and additional power distribution. The start-up of the project is expected by 2023, replacing capacity at a rate of 20 ktpy of nickel.

REGULATORY MATTERS

We are subject to a wide range of governmental regulations in all the jurisdictions in which we operate worldwide. The following discussion summarizes the kinds of regulation that have the most significant impact on our operations.

MINING RIGHTS AND REGULATION OF MINING ACTIVITIES

Mining and mineral processing are subject to extensive regulation. In order to conduct these activities, we are required to obtain and maintain some form of governmental or private permits, which may include concessions, licenses, claims, tenements, leases or permits (all of which we refer to below as “concessions”). The legal and regulatory regime applicable to the mining industry and governing concessions differs among jurisdictions, often in important ways. In most jurisdictions, including Brazil, mineral resources belong to the government and may only be exploited pursuant to a governmental concession. In other jurisdictions, such as Ontario in Canada, a substantial part of our mining operations is conducted pursuant to mining rights we own (private permits). Government agencies are typically in charge of granting mining concessions and monitoring compliance with mining law and regulations.

The table below summarizes our main mineral rights and mining concessions for our operations, not limited to areas within the mineral reserves and mineral resources footprint.

Location	Mining title	Approximate area covered (in hectares)	Expiration date
Brazil		515,894	Indefinite
	Mining Concessions	280,913	Indefinite
	Application for Mining concessions	234,981	-
Canada⁽¹⁾		435,923	2021 – 2042
Ontario		105,469	2024 – 2042
	Patented mineral rights	81,145	Indefinite
	Mineral Leases	21,188	2024-2042
	Mining Licenses of occupation	3,136	Indefinite
Manitoba		111,693	2021 – 2034
	Order in Council leases	109,043	2021-2025
	Mineral Leases	2,650	2034
Newfoundland and Labrador	Mining Leases	1,599	2027
Indonesia⁽²⁾	Contract of work	137,277	2025
Sorowako	Contract of work	118,017	2025
Nusa Tenggara Barat (Hu'u Poject)	Contract of work	19,260	2023

(1) Applications submitted in 2022 are still in the process of being approved. All conditions required for the renewal were fulfilled. This process usually takes several months, and we can continue to operate while the approval process is ongoing. Order in Council Leases (OIC's) in Manitoba are currently being converted to mining claims and mining leases through a Transition Agreement allowing Vale to retain ownership until the transition is complete. Some OIC's will show past their expiration dates until the transition is complete.

(2) Sorowako - The contract of work entered by PTVI and the Indonesian government will expire in 2025. PTVI is entitled to two 10-year extensions, subject to government approval. Nusa Tenggara Barat – Contract of Work on Exploration stage which is annually renewed. Operation and Production Stage will be valid for 30 years with two 10 years extensions, subject to government approval.

In addition to the concessions listed above, we have licenses and applications that allow us to explore 2.75 million hectares in Brazil and 1.6 million hectares for our mineral projects in other countries.

In February 2022, the Brazilian national mining agency (*Agência Nacional de Mineração – “ANM”*) published Resolution No. 95/2022, consolidating the content of several rules related to mining dams’ safety. The new regulation presents some new features relating to mining dam safety obligations, such as: (i) a new classification of dams in terms of operational management; (ii) the regulation of the existing prohibition of communities and workers located in Self-Rescue Zones; (iii) compatibilization of deadlines for de-characterization of upstream dams provided for in federal and state regulations; (iv) objective criteria for each level of Alert and Emergency situation; (v) requirement for the designation of an engineer of record for all dams with high associated potential damage (“DPA”); (vi) requirement for dams with high DPA to implement a Risk Management Process for the Mining Dam (“PGRBM”), by December 31, 2022; (viii) requirements for the agreement and acknowledgement by highest-ranking executive in connection with documents related to the dam safety plan; (ix) mandatory de-characterization of dams and operational structures located downstream of a dam which existence compromises their safety, until August 15, 2022; (x) possibility of embargo and suspension of dams and mining complexes in certain situations.

In December 2022, ANM published Resolution no. 122/2022, which regulates the administrative process and establishes new sanctions, including fines of up to R\$1 billion. The rule is under discussions by the mining sector and ANM, due to the impacts resulting from the high values of fines and other sanctions and the criteria for its calculation, which is based on the company's total revenues and research budget. While still under discussion, Resolution no. 122/2022 is already effective and applicable for infractions that occurred after the entry into force of the Resolution.

We are implementing tailings filtration and storage methods that do not rely on dams to continue operating some of our mines and plants. We have approved projects and further studies are in progress, to apply a technology for residue disposal that filters and stocks partially or totally dewatered tailings, which will reduce our reliance on tailing dams in the medium and long-term. These technologies may increase our production costs and require additional investments in our mines and plants.

In Canada, we negotiated with the Government of Manitoba the renewal of its mining rights, originally explored under Order in Council Leases, through the conversion to the regime of Mining leases and Claims in accordance with the applicable law. The process of conversion started in 2021 and will continue until 2025.

In Indonesia, the government issued new regulation in September 2021 on the implementation of mineral and coal mining business activities. Such regulations may have a material impact on the operations of PTVI, including with respect to the total area that can be exploited by PTVI after the expiration of the Contract of Work and period of operation.

ROYALTIES AND OTHER TAXES ON MINING ACTIVITIES

We are required in many jurisdictions to pay royalties or taxes on our revenues or profits from mineral extractions and sales. These payments are an important element of the economic performance of a mining operation. The following royalties and taxes apply in some of the jurisdictions in which we have our largest operations:

Brazil. We are required to pay a royalty known as CFEM (*Compensação Financeira pela Exploração de Recursos Minerais*) on the revenues from the sale of minerals we extract. The calculation of the CFEM is done as follows: (i) for domestic sales, the basis for calculation of CFEM is the revenue from sales, net of sales taxes levied; (ii) for exports, the basis for calculation of CFEM is the highest amount between the revenue from the exports and the amount equivalent to the transfer pricing in federal income tax legislation; and (iii) for a company’s internal mineral consumption, the basis for calculation of CFEM is the value equivalent to the current price of the ore in the domestic market, the international markets or a reference value, as to be determined by ANM. The current CFEM rates are: 3.5% for iron ore; 2% for copper, nickel and other materials; 3% for bauxite and manganese ore.

Brazilian states and municipalities. Several Brazilian states, including Minas Gerais and Pará, impose a tax on mineral production (*Taxa de Fiscalização de Recursos Minerais—“TFRM”*), which is currently assessed at rates ranging from R\$4.37 to R\$5.03 per metric ton of minerals produced in or transferred from the state. In March 2021, a state decree increased the TFRM rate in the state of Pará to R\$13.12 per metric ton, with effectiveness as of April 2021. We have not implemented the new rates for 2021, as we understand that, under applicable principles of Brazilian constitutional law, the tax increase would only come into force in the year subsequent to its enactment.

In November 2022, we adhered to the state tax program entitled as “Programa Estrutura Pará”, which aims to promote infrastructure investments in the State of Pará, pursuant to the conversion of 50% of the TFRM payments into construction projects, calculated at the rate of R\$13.12 per metric ton of ore produced in the State of Pará. The related constructions will be delivered to the local communities and, therefore, will not be owned by us. For joining the program, we have disbursed R\$1,176 million related to the TFRM for 2022, which was calculated based on the rate of R\$13.12 per metric ton and we will prospectively adopt this rate in the State of Pará.

In December 2021, the municipality of Ourilândia do Norte, in the state of Pará, enacted a law imposing TFRM on nickel ore extracted or processed in their territory, currently at a rate of R\$5.14 per metric ton. The municipalities of Marabá, Curionópolis and São Félix do Xingu, in the state of Pará and the state of Maranhão have recently enacted a law imposing TFRM on ore extracted or transported in their territories and we consider that we have solid arguments to contest these taxes.

In August 2022, the Supreme Court of Justice decided that the Brazilian states of Minas Gerais and Pará are authorized to impose the TFRM, the decision is not final, and an appeal is still pending.

Canada. The Canadian provinces in which we operate charge us a tax on profits from mining operations. Profit from mining operations is generally determined by reference to gross revenue from the sale of mine output and deducting certain costs, such as mining and processing costs and investment in processing assets. The statutory mining tax rates are 10% in Ontario; with graduated rates up to 17% in Manitoba; and a combined mining and royalty tax rate of 16% in Newfoundland and Labrador. The mining tax paid is deductible for corporate income tax purposes.

Indonesia. PTVI pays mining royalties of 2% on its nickel matte revenues when LME nickel prices are below US\$21,000 per metric ton and 3% of its nickel matte revenues when LME nickel prices are above or equal to US\$21,000 per metric ton.

ENVIRONMENTAL REGULATIONS

We are also subject to environmental regulations that apply to the specific types of mining and processing activities we conduct. We are required to obtain approvals, licenses, permits or authorizations from governmental authorities to construct and operate. In most jurisdictions, the development of new facilities requires us to submit environmental and social impacts assessments for approval and often to make investments to mitigate environmental and social impacts, and we must operate our facilities in compliance with the terms of the approvals, licenses, permits or authorizations.

Environmental legislation is becoming stricter worldwide, which could lead to greater costs for environmental compliance. Environmental regulations affecting our operations relate, among other matters:

- Emissions of pollutants into the air, soil and water, including greenhouse gases and climate change regulations
- Recycling and waste management
- Protection and preservation of forests, coastlines, caves, cultural heritage sites, watersheds and other features of the ecosystem
- Water use
- Financial provisions and closure plans required for mining licenses, including de-characterization, decommissioning, environmental liabilities and reclamation and remediation costs.

Below is a discussion of some key regulatory matters:

Protection of caves. In Brazil, we are subject to extensive environmental regulation for protection of caves. In 2008, a federal decree amended the regulation for protection of caves that had been enacted in 1990 and established criteria for the classification of caves based on their relevance (maximum, high, medium or low), prohibiting interventions in areas of maximum relevance and allowing impact on areas of other degrees of relevance with proper environmental license. We are required to conduct extensive technical studies to identify the existence of caves and to determine degree of relevance of each identified cave. We are also required to negotiate compensatory measures with Brazilian environmental regulators in order to continue to operate in certain sites. In certain iron ore mining operations or

projects, we may be required to limit or modify our mining plans or to incur additional costs to preserve maximum relevance caves or to compensate for the impact on non-maximum relevance caves, with potential consequences for our production volumes, costs or reserves in our iron ore business. In January 2022, a new federal decree was enacted, amending the regulation for the protection of caves, in particular with respect to relevance classifications and forms of compensation, and the impact on our operations is under review. This 2022 decree is currently being challenged in the Supreme Court of Justice by a political party claiming that it is unconstitutional, and it has been temporarily suspended until further decision of the court.

Protection of indigenous peoples' rights. Brazilian regulation enacted in 2011 and revised in 2015 requires us to conduct impact assessments and define specific programs for the mitigation and/or compensation of impacts of our operations and projects that are close to the Indigenous Lands and Quilombola's Territories. The approval of the studies and environmental management plans from those communities is mandatory.

Other environmental regulations in Brazil. There are also environmental regulatory obligations that could affect our operations or lead to compensatory measures related to the suppression of native vegetation such as in the state of Minas Gerais, in the Atlantic Forest biome, flora species protected by law, permanent preservation areas and archaeological and cultural heritage sites. In addition, all new projects that include activities with a significant environmental impact must collect financial resources to support the implementation and maintenance of conservation areas, in order to comply with the environmental compensation obligation.

Climate change. We expect heightened attention from various governments on the reduction of greenhouse gas emissions, stemming from global concerns over climate change and as expressed by the obligations undertaken by many countries, as signatories to the Paris Agreement. The entry into effect of the Paris Agreement in late 2016 increased global pressure for the establishment of carbon pricing, on single-jurisdiction, multi-jurisdiction, and global scales. This regulatory evolution, along with civil society and investor-driven concerns, has added pressure on companies to adopt carbon pricing strategies. In 2021, a Rulebook was approved at the COP26, with the goal to provide practical guidance for and to accelerate the implementation of the Paris Agreement and therein, the creation of a global carbon market. Negotiations among the nation-state signatories to the Paris Agreement regarding the Rulebook continued in 2022, and it is expected that by COP28 (November 2023) or in the near-term thereafter, further clarity including as to new, binding carbon pricing mechanisms will have matured substantially. COP27 reinforced our view that the increased focus on greenhouse gas emissions pricing and the expansion of carbon markets around the world may impact our operational costs, mainly through carbon taxes, higher price for fossil fuels and higher costs for international freight. Conversely, the pricing of greenhouse gas emissions may also present business opportunities for investments and innovations which rely on a higher baseline cost curve (such as expressed through the Marginal Abatement Cost Curve – "MACC"), and we have partnered with other entities, bringing such initiatives to scale and to the market. During COP27, we announced together with other Brazilian companies the creation of Biomax, a new company focused on the restoration, conservation and preservation of Brazilian biomes such as the Amazon, the Atlantic Forest and the Cerrado.

Regulation of chemicals. Some of our products are subject to regulations applicable to the marketing, distribution and use of chemical substances present in their composition. For example, the European Commission has adopted a European Chemicals Policy, known as REACH ("Registration, Evaluation and Authorization of Chemicals"). Under REACH, European manufacturers and importers are required to register substances prior to their entry into the European market and in some cases may be subject to an authorization process. A company that fails to comply with the REACH regulations could face fines and penalties. We are compliant with the requirements of the EU REACH regulations. In addition, the U.K. and South Korea are currently implementing a regulation similar to EU REACH, and we anticipate further expansion of REACH-like regulations in other Asian countries.

Regulation of international maritime transportation. We are subject to health, safety and environmental regulation by the International Maritime Organization ("IMO"). IMO rules apply not only to the international shipping categories, but also to the types of cargoes transported, including special rules for iron ore, nickel and copper. The IMO is currently discussing further measures for enhancing the energy efficiency of international shipping and reducing its overall greenhouse gas emissions. In April 2018, reduction targets were defined as part of the IMO's initial strategy for curbing the sector's emissions. These targets include a 50% reduction in greenhouse gas emissions by 2050, based on 2008

levels. In June 2021, the IMO adopted amendments that became effective in 2023 and that combine technical and operational approaches to improve the energy efficiency of ships. The new measures require all ships to calculate their Energy Efficiency Existing Ship Index ("EEXI") – a one-time certification, targeting design parameters – and to establish their annual operational Carbon Intensity Indicator, which will have to comply with gradually decreasing carbon intensity parameters. The IMO will revise and further detail its strategy and the measures to be adopted by 2023. These new requirements may increase our freight cost in the future. In 2016, the IMO approved regulation establishing limits for sulfur oxides emission, which became effective in 2020. This regulation may increase freight cost due to the need to use bunker with low sulfur content or to install additional pollutant control equipment (*i.e.*, scrubbers) to limit air emissions. It is expected that further discussions on scrubber wash water regulations will be concluded in 2023, which could restrain the use of open loop scrubbers. Also, the International Convention for the Control and Management of Ships' Ballast Water and Sediments requires compliant ships during their international voyages to manage their ballast water and sediments in accordance with certain parameters. The convention became effective in September 2017 for new ships (those with keels laid after that date) and, for existing ships, the convention became effective in stages with specific deadlines depending on the vessel, beginning in September 2019, with the global fleet required to be fully compliant by September 2024. Such requirements may also result in increases in our freight and port operation costs. In 2022, the European Commission approved the proposals to regulate international shipping emissions. Starting in 2024, over a 3-year phase-in period shipping will be gradually introduced into the EU's Emissions Trading System ("ETS"), a carbon market that operates in all EU countries targeting climate neutrality in the EU by 2050. That will require ship operators to pay for the greenhouse gas emissions during their voyages to, from and between EU ports, and incentivize them to improve their fuels greenhouse gas intensity (GHG). These measures may increase our freight cost in the future.

Other environmental laws and regulations. Environmental laws and regulations are becoming stricter around the world, which can lead to higher compliance costs. There are several examples of environmental laws and regulations, and compliance initiatives that may affect our operations:

Canada. Canadian laws and policies to address climate change continue to evolve with stricter controls on greenhouse gas emissions. The Supreme Court of Canada upheld the Greenhouse Gas Pollution Pricing Act, a federal law to regulate greenhouse gas emissions, and confirmed this Act will apply in provinces that have not enacted equivalent legislation. In June of 2021, the federal government enacted the Canadian Net-Zero Emissions Accountability Act which enshrines Canada's 2050 target of reaching net-zero emissions with a framework to set and report on milestone emissions reduction targets. Heightened enforcement for contravention of environmental legislation is also a trend. For instance, in Ontario, the government has proposed to expand the use of administrative penalties with enhanced fines for various environmental contraventions. Certain of our operations in Ontario are over 100 years old which give rise to potential impacts to water from legacy operations. We have invested in a Water Quality Management Program that is designed to be a proactive plan, involving hazard screening and a risk evaluation process, to guide with the identification, prioritization and execution of remedial activities to address potential water impacts from historical operations.

Indonesia. Under the Indonesian Government Regulation of 2014 on B3 waste (Toxic and Hazardous Materials), PTVI slag is classified as hazardous waste, and PTVI submitted a formal request to the regulatory body for approval. In February 2021, a new Government Regulation was issued and as result PTVI slag is currently no longer classified as hazardous waste; however, it is required to report the use and the management of the slag to the government.

China. In 2020, the Law on the Prevention and Control of Environmental Pollution Caused by Solid Waste was revised and as a result the Administrative Measures for the Prevention and Control of Environmental Pollution from Tailings became effective as of July 1, 2022. Those laws and regulations impose more stringent obligations on prevention and control of pollution caused by solid waste, including tailings, in addition to imposing more severe penalties.

BRAZILIAN REGULATION OF MINING DAMS

Under a 2022 regulation of ANM, companies operating mining dams in Brazil are required to comply with specific rules, including:

Audit. Companies operating mining dams covered by National Dam Safety Policy must conduct two annual stability audits for each dam and prepare a stability report and the corresponding Stability Condition Statement (“DCE”). In our Brazilian operations, an engineer of record, not directly involved in the day-to-day operations, is responsible for conducting this audit regularly, as part of our governance procedures to evaluate safety and performance.

Dam Periodic Safety Reviews (*Revisão Periódica de Segurança de Barragem*–“RPSB”). The report must include detailed analysis of all dam’s documentation, including projects and procedures, stability analysis of the structures and the impacts on surrounding communities, including hazards and collapse impact studies. The RPSB reports must be renewed each 3, 5 and 7 years for high, medium and low associated potential damage (“DPA”) respectively, and whenever any structural modifications are made. The RPSB is performed by an external company not linked to the engineer of record.

Emergency Action Plan of Mining Dams. All mining dams covered by National Dam Safety Policy must have an Emergency Action Plan for Mining Dam (“PAEBM”) by June 2023, and employees and local communities must be trained.

In 2019, ANM issued a resolution on dam safety requiring companies that own upstream dams to submit a technical de-characterization project and to fully de-characterize such structures within the upcoming years. Also, a wide range of measures were imposed to ensure the stability and safety of mining dams and their monitoring and warning systems. In addition, the resolution sets forth a minimum safety factor and the obligation for a DCE to be signed by an individual at a higher level in the hierarchy of the company jointly with the technical individual responsible for its preparation.

Also in 2019, the state of Minas Gerais enacted a law prohibiting the increase and the construction of any upstream dam. The statute also prohibits the increase, modification or construction of any dam if communities are established within its Self-Rescue Zone, an area which encompasses the portion of the valley downstream of the dam where timely evacuation and intervention by the competent authorities in emergency situations is not possible.

In 2020, a federal law modified the National Dam Safety Policy, reinforcing the prohibition of constructing and raising upstream dams in Brazil. The statute also requires companies to de-characterize the structures built using the upstream method by 2022, or by a later date if it is demonstrated that the de-characterization is not technically feasible by 2022. As made available to the relevant authorities, a substantial portion of our de-characterization projects will be completed after 2022 due to the characteristics and safety levels of the geotechnical structures.

For dams already installed or in operation with communities in Self-Rescue Zones, the law requires (a) the de-characterization of the structure, (b) the resettlement of the population and recovery of the cultural heritage, or (c) carry out reinforcement works to ensure the structural stability.

In 2020, a state decree was enacted in the state of Minas Gerais to establish the procedures of analysis and approval of the emergency action plan. In addition, in 2020, ANM published a resolution requiring an audit of the emergency action plan. This audit has to be conducted by external auditors who will be responsible for issuing an annual Conformity and Operability Report (“RCO”) and a Conformity and Operability Statement (“DCO”) of the PAEBM.

In 2021, a new decree was enacted in the state of Minas Gerais to rule some obligations related to the audits and the de-characterization of upstream dams. In addition, many other resolutions were published in the state in order to regulate the emergency action plan.

In 2022, ANM published a new resolution that revoked prior rules about mining dam safety and established new rules to be observed by miners who own mining dams under the National Dam Safety Policy. Also in 2022, a new federal decree modified the mining regulations to increase the sanctions in case of non-compliance with such regulations, including the dam safety rules. Besides, another federal decree was enacted to complement the regulation of the National Dam Safety Policy and create a new committee subordinated to the President.

Recently, in February 2023, ANM issued a resolution that modifies the current dam safety regulation. The main changes are new rules in connection with (i) the active and passive monitoring during the de-characterization of dams, (ii) the

simplified dam collapse study and simplified emergency action plan for specific cases, (iii) the dam safety plan (“PSB”) and (iv) the RCO/DCO.

REGULATION OF OTHER ACTIVITIES

We are subject to comprehensive regulatory regimes for some of our other activities, including rail transport, port operations and electricity generation. We are also subject to more general legislation on workers’ health, safety, and support of communities near mines, and other matters. The following descriptions relate to some of the other regulatory regimes applicable to our operations:

Brazilian railway regulation. Our Brazilian railroad business operates pursuant to concession agreements granted by the federal government, and our railroad concessions are subject to regulation and supervision by the Brazilian Ministry of Roads and Railroads and the Brazilian Land Transportation Regulatory agency (*Agência Nacional de Transportes Terrestres* – “ANTT”). The concessions for EFC and EFVM were renewed for 30 years, and will expire in 2057, upon commitment of investments (such as urban and infrastructure works) and payment of grant. Such investments are subject to risks inherent to the execution of works, including delays. Delays may result in sanctions by ANTT, as provided in the concession agreements. VLI’s subsidiary, Ferrovia Norte Sul S.A. (“FNS”) has also been awarded a subconcession contract for commercial operation of a 720-kilometer segment of the FNS railroad in Brazil, which expires in 2037. In July 2022, MRS signed an amendment to the concession agreement providing for the early extension of its concession for another 30 years, until 2056. FCA concession expires in 2026 and may be renewed for 30 years at the federal government’s discretion. Rail transportation prices can be negotiated directly with the users of such services, subject to a price cap set forth in the concession agreements and annually reviewed by ANTT for each of the concessionaires and for the different products transported. ANTT regulations also require concessionaires to give trackage rights to other railway operators, to make investments in the railway network, and to meet certain productivity and safety requirements, among other obligations.

Brazilian port regulation. Port operations in Brazil are subject to regulation and supervision by ANTAQ, the federal agency in charge of maritime transportation services, and by the Ministry of Ports and Airports through the National Secretary of Ports and Aquatic Transport (“SNPTA”), whose purpose is to formulate policies and guidelines. The agreements to operate our private terminals are valid until 2039 and may be renewed for equal periods, with the exception of the Leases for the Copper Terminal (Itaqui port, state of Maranhão) and the CPBS and for the Iron Ore Export Terminal at Itaguaí Port, state of Rio de Janeiro. The lease for the Copper Terminal expired in January 2023 and we are now operating under a Court decision which authorizes operations to continue until the contract is renewed or a new contract is in place. An administrative procedure is being carried out by SNPTA for the potential renewal of the contract for 20 years, yet to be concluded. CPBS’s (Itaguaí Port, state of Rio de Janeiro) lease expires in 2026 and is currently under the process of being renewed for additional 25 years, at the discretion of the Federal Government.

III. OPERATING AND FINANCIAL REVIEW AND PROSPECTS

OVERVIEW

In 2022, we recorded net income from continuing operations of US\$16,810 million, compared to US\$24,844 million in 2021. Our Adjusted EBITDA from continuing operations decreased to US\$19,760 million in 2022 from US\$31,343 million in 2021, mainly due to lower iron ore average realized prices, which had an impact of US\$9,768 million.

Adjusted EBITDA is a non-GAAP measure, which is calculated using operating income or loss and adding dividends received and interest from associates and joint ventures, and excluding the amounts charged as (i) depreciation, depletion and amortization and (ii) impairment reversal (impairment and disposals) of non-current assets. For more information and the reconciliation of our Adjusted EBITDA to our net income (loss), see *Operating and Financial Review and Prospects—Results of operations—Results of operations by segment—Adjusted EBITDA*.

MAJOR FACTORS AFFECTING PRICES

Iron ore and iron ore pellets

Iron ore and iron ore pellets are priced based on a wide array of quality levels and physical characteristics. Price differences derive from various factors, such as the iron content of specific ore deposits, the beneficiation processes required to produce the desired final product, particle size, moisture content and the type and concentration of contaminants (such as phosphorus, alumina, silica and manganese ore) in the ore. Also, fines, lump ore and pellets typically command different prices.

Demand for our iron ore and iron ore pellets is a function of global demand for carbon steel. Demand for carbon steel, in turn, is strongly influenced by real estate, infrastructure construction and global industrial production. Demand from China has been the main driver of world demand and prices.

In 2022, the iron ore average price closed at US\$120.16t/dmt (Platts IODEX 62% Fe iron ore prices), 24.6% lower than in 2021. During 2022, prices fluctuated following global economy, including changes from the COVID-19 pandemic in China and measures to control inflation elsewhere. The combination of a tighter seaborne market together with a significant upward in steel demand and prices in China and periods when the entire commodity market negatively reacted to higher interest rates among major economies and lockdown cycles in China increased volatility. The reduction in steel margins, even in a scenario where pellets inventories at Chinese ports remained stable through the year, lead to a decrease on the level of high-grade premiums.

Excluding China, the effects of the war in Ukraine over their regional steel production, high energy prices, inflation, declining steel prices, supply chain issues and negative market sentiment have heavily affected steel demand in 2022, as result, steel production was cut drastically in the fourth quarter in view of a weak demand scenario, and what followed was a significant steel destocking. As result, total world crude steel production was 1,878.5 Mt in 2022, a 4.2% decrease compared to 2021 as per World Steel Association, while steel production ex-China totaled 865.5 Mt in 2022, a 6.5% decrease compared to 2021.

Steel production decreased in all major producing regions, with higher drops in the Commonwealth of Independent States ("CIS") and the European Union, followed by Japan and North America. In comparison to 2021, steel production decreased year-on-year: 20% in the CIS, with Ukraine going from 21Mt produced in 2021 to 6Mt in 2022; 10% in Europe; 7% in JKT (Japan, Korea and Taiwan), with weak demand in Japan and the auto sector continuing to suffer from the lack of chips, and weak demand and production in Korea due to typhoons and heavy flooding events; 5% in North and

South America; and 3% in Southeast Asia, as property market in Vietnam cooled down on anticorruption probes in the property sector which scared both real estate companies and investors, and higher interest rates.

The price differentials between high- and low-grade iron ores are a structural change that should continue to impact the market in the coming years. The move towards a more efficient steel industry, with the enforcement of stricter environmental policies in China and decarbonization pursuit in Europe, should support the demand for high-quality ores that enable productivity and lower emission levels like pellets and Carajás fines (“IOCJ”).

Nickel

Nickel is an exchange-traded metal, listed on the London Metals Exchange (“LME”) and, starting in 2015, on the Shanghai Futures Exchange (“SHFE”). Most nickel products are priced based on a discount or premium to the LME price, depending mainly on the nickel product’s physical and technical characteristics. High volatility in the LME nickel price led to increased volatility in premiums and discounts in 2022, as several fundamental and technical factors impacted trading and reduced liquidity. We expect liquidity to normalize on the LME in 2023, resulting in lower volatility compared to 2022. The nickel market is strongly affected by stainless steel production, which represented 64% of global primary nickel consumption in 2022.

We have short-term fixed-volume contracts with customers for the majority of our expected annual nickel sales, which vary in term. These contracts provide stable demand for a significant portion of our annual production. In 2022, 84% of our refined nickel sales were made for non-stainless steel applications (alloy steels, high nickel alloys, plating and batteries), compared to the industry average for nickel producers of 36%, bringing more diversification and stability to our sales volumes. As a result of our focus on such higher-value segments, our average realized nickel prices for refined nickel have typically exceeded LME cash nickel prices.

Stainless steel is a significant driver of demand for nickel, particularly in China. In 2022, stainless steel production in China represented 40% of total nickel demand. Therefore, changes in Chinese stainless-steel production have a large impact on global nickel demand. In 2022, Chinese stainless-steel production decreased 3% year-on-year compared to an increase of 8% in 2021. The decrease in stainless steel production in China is expected to recover in 2023 with melt shop capacity additions and the reopening of the China economy from pandemic lockdowns. While stainless steel production is a major driver of global nickel demand, stainless steel producers can obtain nickel with a wide range of nickel content, including secondary nickel (scrap). The choice between primary and secondary nickel is largely based on their relative prices and availability. On average between 2018 and 2022, secondary nickel accounted for approximately 37% of total nickel used for stainless steel. Regional availability and consumption of secondary nickel varies. In China, due to low availability of scrap, the use of secondary nickel represented 23% of the total nickel used for stainless steel in 2022.

Historically, Chinese domestic production of nickel pig iron accounted for the majority of world nickel supply growth using unprocessed nickel ore from the Philippines and Indonesia. However, Chinese nickel pig iron production was adversely affected by export restriction of unprocessed ores from Indonesia, recommencing in 2020, allowing Indonesia to emerge as the largest producer of nickel pig iron. In 2022, approximately 13% of world primary nickel supply was produced as nickel pig iron in China. Approximately 37% of world primary nickel supply was produced as nickel pig iron in Indonesia, with much of it integrated directly to produce stainless steel. In 2021, Indonesia commenced converting nickel pig iron into nickel matte for further conversion into battery-suitable material. We expect nickel pig iron production as well as the conversion into nickel matte in Indonesia to continue to grow.

In addition, the high-value segment, which consists of both Upper Class and Lower Class I products, and includes nickel used in batteries, is the second largest market, making up 36% of nickel demand in 2022. Global high-value demand increased by 17% year-on-year in 2022 led by growth in the battery sector compared to an increase of 23% in 2021 as markets recovered from pandemic lows.

The nickel market was in surplus in 2022 by approximately 205 kt. Global exchange inventories (LME and SHFE) decreased 49kt from December 31, 2021 to December 31, 2022, despite the oversupplied market as the LME-deliverable

Class I nickel remained in deficit while the Class II market was in surplus. For 2023, we expect the market to remain in a slight surplus primarily due to supply of Class II nickel outpacing stainless steel growth.

The battery segment is showing important upside demand as electric vehicle production continues to attract significant investments. This is positively affecting the nickel price and our nickel premiums. Commercially viable electric vehicle battery technologies utilize nickel, increasing nickel content in such batteries results in improved energy density and longer range. As a result, nickel demand is growing, particularly given the expected increase in production of electric vehicles and the trends towards increased battery size and increased nickel content in batteries to improve performance.

Copper

Copper demand in recent years has been driven primarily by China, given the important role copper plays in construction in addition to electrical and consumer applications. Copper prices are determined on the basis of (i) prices of copper metal on terminal markets, such as the London Metal Exchange ("LME"), Shanghai Future Exchange ("SHFE") and the Commodities Exchange ("COMEX"), and (ii) in the case of intermediate products, such as copper concentrate (which comprise most of our sales) and copper anode, treatment and refining charges negotiated with each customer.

Demand for refined copper increased 1% year-on-year in 2022, with China responsible for approximately 54% of worldwide consumption. For 2023, the market is expected to be relatively balanced on stable supply and demand.

TAILINGS DAM COLLAPSE IN BRUMADINHO

Tailings Dam Collapse in Brumadinho

The Brumadinho dam collapse had a significant impact on our financial performance and operational results as of and for the year ended December 31, 2022. The key impacts are summarized below:

Impact on our income statement. The impact of the dam collapse in our income statement for the year ended December 31, 2022 was US\$1,079 million, including US\$620 million in expenses, related with tailings management, humanitarian assistance, payroll, legal services, water supply, among other items and US\$303 million in expenses related with tailing containment and geotechnical safety, compared to US\$851 million in 2021, including US\$650 million in expenses related with tailing management, humanitarian assistance, payroll, legal services, water supply, among other items.

Impact on our balance sheet. The total amount of provisions recognized in our balance sheet as of December 31, 2022 in connection with Brumadinho dam collapse, including provisions for remediation and reparation obligations under the Integral Reparation Agreement, individual indemnification and other commitments was US\$3,312 million compared to US\$3,537 million in 2021.

Dam de-characterization

As a result of the Brumadinho dam collapse and the new regulation introduced by the Brazilian national mining agency (*Agência Nacional de Mineração – "ANM"*), we are required to de-characterize all tailings dams built under the upstream method, certain "centerline structures" and dikes containment facilities located in Brazil. The main impacts on our financial statements are summarized below:

Impact on our balance sheet. The total amount of provisions recognized in our balance sheet as of December 31, 2022 in relation to the de-characterization of dams was US\$3,378 million compared to US\$3,523 in 2021. These structures are in different stages of maturity, some of them still in the conceptual engineering phase, for which the estimation of expenditures includes in its methodology a high degree of uncertainty in the definition of the total cost of the project in accordance with best market practices.

Operational stoppages. We have suspended some operations due to judicial decisions or technical analysis performed

by us on our upstream dam structures located in Brazil. We recorded losses in relation to the operational stoppage and idle capacity of the Iron Solutions segment in the amounts of US\$269 million for the year ended December 31, 2022 compared to US\$376 million in December 31, 2021. We are working on legal and technical measures to resume all operations at full capacity.

FUNDAÇÃO RENOVA AND SAMARCO FUNDING

We own a 50% interest in Samarco and account for it under the equity method. Under Fundação Renova's bylaws and the Framework Agreement among Samarco, its shareholders and certain other public authorities, Fundação Renova must be funded by Samarco, but to the extent that Samarco is unable to fund, Vale and BHP Brasil must ratably bear the funding requirements.

In order to implement the projects approved under the Framework Agreement, Samarco will be required to provide funding to Fundação Renova based on the amounts required for such projects on a yearly basis, subject to an annual minimum of US\$145 million. Fundação Renova must be funded by Samarco, but to the extent that Samarco is unable to fund, Vale and BHP Brasil must ratably bear the funding requirements under the Framework Agreement.

Additionally, Fundação Renova must allocate a minimum annual amount of US\$45 million over 15 years (from 2016) to the implementation of compensation programs. Under the Framework Agreement, Fundação Renova must spend an additional amount of at least US\$90 million on sewage collection and treatment and solid waste disposal.

Below is a summary of the impact of the collapse of Samarco's dam, which occurred in November 2015, in our financial statements:

- The carrying value for our investment in Samarco was reduced to zero in 2015.
- The amount of provisions related to Samarco as of December 31, 2022 is US\$3,321 million, 6.72% higher than in 2021, mainly due to the new court decisions issued during the fiscal year related to individual indemnities, impacting the provision related to Fundação Renova, as these decisions changed and expanded types, categories and amounts of indemnifiable damages to affected municipalities. This provision represents the present value of our best estimate of the amounts we may incur to comply with our obligations under the Framework Agreement, considering our 50% stake in Samarco. At each reporting period, we reassess the key assumptions used by Samarco in the preparation of its projected future cash flows and adjust the provision, if required.
- In 2022, we contributed US\$338 million, compared to US\$392 million in 2021 to Fundação Renova to be used in the reparation programs in accordance with the Framework Agreement, which were deducted from the provision. In addition, ongoing discussions in the context of the Judicial Reorganization of Samarco may lead to the loss of the deductibility of part of the expenses we incurred with the Fundação Renova and of the deferred taxes over the total provision, depending on the method determined for restructuring Samarco's debts. The total exposure as of December 31, 2022 was US\$1,620 million, compared to US\$1,519 million in 2021.

Since the creation of Fundação Renova in 2016 until December 31, 2022, Samarco, BHP Brasil and we made contributions directly to Fundação Renova in the total aggregate amount of US\$6 billion.

EFFECT OF CURRENCY EXCHANGE VARIATION

Our results are affected in several ways by changes in the value of the Brazilian *real* which is the currency of the primary economic environment in which we operate. Year-end exchange rate variations impact our financial results, while the average exchange rate impacts our operational performance.

In 2022, the Brazilian *real* appreciated 6.45% against the U.S. dollar, from an exchange rate of R\$5.58 to US\$1.00 on December 31, 2021 to R\$5.22 to US\$1.00 on December 31, 2022. The most important effects were non-cash gains, as described below.

We had *real* denominated debt of US\$513 million as of December 31, 2022, compared to US\$754 million in 2021, excluding accrued charges. Since most of our revenues are in U.S. dollars, we used swaps and forward transactions to convert part of our debt service from Brazilian *reais* to U.S. dollars. Changes in the value of the U.S. dollar against the Brazilian *real* result in fair value variation on these derivatives, affecting our financial results. As a result of the appreciation of the Brazilian *real* against the U.S. dollar in 2022, we had fair value gain on our currency derivatives of US\$1,130 million compared to a fair value loss of US\$159 million in 2021 due to depreciation of the Brazilian *real* against the US\$ in 2021. For more information on our use of derivatives, see *Operating and Financial Review and Prospects—Risk management*.

In 2022, the annual average exchange rate for Brazilian *reais* against the U.S. dollar appreciated by 4.3%, from an average exchange rate of R\$5.40 to US\$1.00 in 2021 to R\$5.17 to US\$1.00 in 2022. This had a negative impact on our operational result and cash flows. The most important effect is described below:

Most of our revenues are denominated in U.S. dollars, while our cost of goods sold are denominated in various currencies, including the U.S. dollar (51.83 % in 2022), the Brazilian *real* (42.26% in 2022), the Canadian dollar (5.7 % in 2022) and other currencies (0.21% in 2022). As a result, the appreciation of the Brazilian *real* and other currencies against the U.S. dollar increased our costs and expenses by US\$260 million, compared to a decrease by US\$262 million in 2021 due to depreciation of the Brazilian *real* against the U.S.\$ in 2021.

In 2022, we recognized a gain of US\$1,543 million, compared to US\$2,413 million in 2021, due to the reclassification of portion of the cumulative translation adjustments to net income due to the capital reduction we approved in Vale International, which was characterized as a partial disposal following our accounting policy for transactions of this nature.

RESULTS OF OPERATIONS

For commentary on our results of operations for the year 2021 compared with 2020, please see pages 113-120 of our Form 20-F for the year ended December 31, 2021. Consolidated income statement data:

	<i>For the year ended December 31,</i>		
	2022	2021	% change
	<i>(US\$ million)</i>		
Net operating revenue	43,839	54,502	(19.6)
Cost of goods sold and services rendered	(24,028)	(21,729)	10.6
Selling, administrative and other operating expenses, net	(2,237)	(3,457)	(35.3)
Research and evaluation expenses	(660)	(549)	20.2
Pre-operating and operational stoppage	(479)	(648)	(26.1)
Impairment reversal (impairment and disposals) of non-current assets, net	773	(426)	281.5
Operating income	17,208	27,693	(37.9)
Non-operating income (expenses):			
Financial income (expenses), net	2,268	3,119	(27.3)
Equity results and other results in associates and joint ventures	305	(1,271)	124.0
Income before income taxes	19,781	29,541	(33.0)
Income taxes	(2,971)	(4,697)	(36.7)
Net income from continuing operations	16,810	24,844	(32.3)
Net income attributable to non-controlling interests	82	108	(24.1)
Net income from continuing operations attributable to Vale's shareholders	16,728	24,736	(32.4)
Net income (loss) from discontinued operations	2,060	(2,376)	186.7
Loss attributable to non-controlling interests	-	(85)	100.0
Net income (loss) from discontinued operations attributable to Vale's shareholders	2,060	(2,291)	189.9
Net income	18,870	22,468	(15.9)
Net income attributable to non-controlling interests	82	23	256.5
Net income attributable to Vale's shareholders	18,788	22,445	(16.3)

CONSOLIDATED REVENUES

In 2022, our net operating revenues from continuing operations decreased by US\$10,663 million or 19.56% to US\$43,839 million, from US\$54,502 million in 2021. The decrease was mainly due to (i) lower prices of Iron Solutions products due to the lower realized prices in the sale of iron ore, which reflects the drop in the market reference price (impact of US\$9,768 million) and (ii) lower volume of iron ore sales (impact of US\$837 million).

Our revenue depends, among other factors, on the volume of production at our facilities and the prices for our products. For more information on our production, see *Information on the Company—Lines of business*. Increases in the capacity of our facilities resulting from our capital expenditure program have an important effect on our performance. Our production is also affected by acquisitions and dispositions.

The following table summarizes, for each of the years indicated, the distribution of our net operating revenues based on the geographical location of our customers.

	Net operating revenues by destination			
	2022		2021	
	(US\$ million)	(% of total)	(US\$ million)	(% of total)
<i>Asia</i>				
China	22,203	50.6	28,603	52.5
Japan	3,535	8.1	4,523	8.3
South Korea	1,311	3.0	1,744	3.2
Taiwan	621	1.4	1,000	1.8
Other	1,187	2.7	1,757	3.2
Asia – total	28,857	65.8	37,627	69.0
<i>Europe</i>				
Germany	1,521	3.5	2,034	3.7
England	204	0.5	116	0.2
Italy	708	1.6	652	1.2
France	454	1.0	583	1.1
Other	2,470	5.6	3,345	6.1
Europe – total	5,357	12.2	6,730	12.3
<i>South and Central America</i>				
Brazil	4,137	9.4	5,164	9.5
Other	603	1.4	916	1.7
South and Central America - total	4,740	10.8	6,080	11.2
Rest of the world	2,646	6.0	2,155	4.0
<i>North America</i>				
Canada	596	1.4	367	0.7
United States	1,643	3.7	1,543	2.8
North America - total	2,239	5.1	1,910	3.5
Total	43,839	100	54,502	100

CONSOLIDATED OPERATING COSTS AND EXPENSES

Our cost of goods sold and services rendered from continuing operations increased by 10.6%, to US\$24,028 million in 2022 from US\$21,729 million in 2021, mainly due (i) increase in costs with bunker and fuel of the segment of Iron Solutions, resulting in higher costs with oil and gas (impact of US\$993 million), and (ii) goods and services.

Our research and development expenses totaled US\$660 million in 2022, a 20.2% increase from US\$549 million recorded in 2021, mainly due to projects of drilling and geology exploration and mineral exploration in all segments.

Our pre-operating and operational stoppage expenses totaled US\$479 million in 2022, a 26.1% decrease from the US\$648 million recorded in 2021, mainly due to lower idle capacity in stopped Iron Solutions operations related to the Brumadinho dam collapse.

Our selling administrative and other operating expenses, net, totaled US\$2,237 million in 2022, a 35.3% decrease from US\$3,457 million recorded in 2021, mostly due to lower expenses with obligations for dam de-characterization.

RESULTS OF OPERATIONS BY SEGMENT

In 2022, we renamed our main operating segments. The operating segment previously named “Ferrous Minerals” is now disclosed as “Iron Solutions” while the “Base Metals” operating segment is now disclosed as “Energy Transition Metals.”

Net operating revenue by segment

The following table summarizes our net operating revenues by-product for the years indicated.

	Year ended December 31,		
	2022	2021	% change
	<i>(US\$ million, except for %)</i>		
Iron Solutions:			
Iron ore	28,188	38,324	(26.4)
Iron ore pellets	6,256	7,053	(11.3)
Other ferrous products and services	472	548	(13.9)
Iron Solutions - total	34,916	45,925	(24.0)
Energy Transition Metals:			
Nickel and other products ⁽¹⁾	6,619	5,377	23.1
Copper concentrate ⁽²⁾	1,779	2,589	(31.3)
Energy Transition Metals - total	8,398	7,966	5.4
Other products and services	525	611	(14.1)
Total from continuing operations	43,839	54,502	(19.6)
Discontinued operations - Coal	448	1,083	(58.6)
Net operating revenues	44,287	55,585	(20.3)

(1) Includes nickel co-products (copper) and by-products (precious metals, cobalt and others).

(2) Does not include copper produced in our nickel operations.

Sales volumes

The following table sets forth our principal products and the total volumes sold of each product in each of the years indicated:

	Year ended December 31,		
	2022	2021	% change
	<i>(thousand metric tons, except where indicated)</i>		
Iron Solutions:			
Iron ore fines	260,663	270,885	(3.8)
Iron ore pellets	33,164	32,306	2.7
ROM (run of mine)	8,216	2,052	300.4
Energy Transition Metals:			
Nickel	181	182	(0.5)
Copper	166	216	(23.1)
Copper as nickel co-product	78	68	14.7
PGMs (000' oz.) ⁽¹⁾	215	173	24.3
Gold (000' oz.) ⁽¹⁾	277	340	(18.5)
Silver (000' oz.) ⁽¹⁾	1,611	1,399	15.2
Cobalt (metric tons) ⁽¹⁾	2,361	2,017	17.1

(1) By-product contained in our nickel and copper concentrates.

Average realized prices

The following table sets forth our average realized prices for our principal products for each of the years indicated. We determine average realized prices based on our net operating revenues, which consist of the price charged to customers, excluding certain items that we deduct in arriving at net operating revenues, mainly value-added tax.

	Year ended December 31,		
	2022	2021	% change
	<i>(US\$ per metric ton, except where indicated)</i>		
Iron Solutions:			
Iron ore	108	141	(23.5)
Iron ore pellets	188	218	(13.6)
Energy Transition Metals:			
Nickel	23,670	18,004	31.5
Copper	8,052	9,337	(13.8)
Copper as nickel by-product	7,459	9,237	(19.2)
Gold (US\$/oz)	1,785	1,768	0.9
Silver (US\$/oz)	21	24	(12.5)
Cobalt	58,865	51,907	13.4

Cost of goods sold by segment (excluding depreciation, depletion and amortization)

The following table presents, for each year indicated, our cost of goods sold and services rendered (excluding depreciation, depletion and amortization) by segment and the percentage change from year to year.

	Year ended December 31,		
	2022	2021	% change
	<i>(US\$ million, except for %)</i>		
Iron Solutions:			
Iron ore	11,929	11,199	6.5
Iron ore pellets	2,682	2,231	20.2
Other ferrous products and services	335	400	(16.3)
Iron Solutions – total	14,946	13,830	8.1
Energy Transition Metals:			
Nickel and other products ⁽¹⁾	4,541	3,606	25.9
Copper ⁽²⁾	1,049	878	19.5
Energy Transition Metals – total	5,590	4,484	24.7
Others	443	558	(20.6)
Total of continuing operations (excluding depreciation, depletion and amortization)	20,979	18,872	11.2
Depreciation, depletion and amortization	3,049	2,857	6.7
Total of continuing operations (including depreciation, depletion and amortization)	24,028	21,729	10.6

(1) Includes nickel co-products (copper) and by-products (precious metals, cobalt and others).

(2) Does not include copper produced in our nickel operations.

Expenses by segment (excluding depreciation, depletion and amortization)

The following table summarizes, for each year indicated, our expenses (consisting of selling, general and administrative, research and evaluation, pre-operating, stoppage and other expenses, net of other revenues) by operating segment (excluding depreciation, depletion and amortization) and the percentage change from year to year.

RESULTS OF OPERATIONS

	<i>Year ended December 31,</i>		
	2022	2021	% change
	<i>(US\$ million, except for %)</i>		
Iron Solutions:			
Iron ore	604	664	(9.0)
Iron ore pellets	26	20	30.0
Other ferrous products and services	17	12	41.7
Iron Solutions – total	647	696	(7.0)
Energy Transition Metals:			
Nickel and other products ⁽¹⁾	154	195	(21.0)
Copper ⁽²⁾	161	94	71.3
Energy Transition Metals -total	315	289	9.0
Others	2,292	3,492	(34.4)
Total from continuing operations (excluding depreciation, depletion and amortization)	3,254	4,477	(27.3)
Depreciation, depletion and amortization	122	177	(31.1)
Total from continuing operations (including depreciation, depletion and amortization)	3,376	4,654	(27.5)

(1) Includes nickel co-products (copper) and by-products (precious metals, cobalt and others).

(2) Does not include copper produced in our nickel operations.

Adjusted EBITDA by segment

The following table summarizes our Adjusted EBITDA for each of our segments.

	<i>Year ended December 31,</i>	
	2022	2021
	Adjusted EBITDA	Adjusted EBITDA
	<i>(US\$ million)</i>	
Iron Solutions:		
Iron ore	15,670	26,471
Iron ore pellets	3,653	4,873
Other ferrous products and services	120	136
Iron Solutions – total	19,443	31,480
Energy Transition Metals:		
Nickel and other products ⁽¹⁾	1,924	1,576
Copper ⁽²⁾	569	1,617
Energy Transition Metals - total	2,493	3,193
Other ⁽³⁾	(2,176)	(3,330)
Adjusted EBITDA from continuing operations	19,760	31,343
Adjusted EBITDA from discontinued operations (coal)	171	(189)
Adjusted EBITDA	19,931	31,154

(1) Includes nickel co-products (copper) and by-products (precious metals, cobalt and others).

(2) Does not include copper produced in our nickel operations.

(3) Includes sales and expenses of other products, services, research and development, investments in joint ventures and associates of other business and unallocated corporate expenses.

The table below shows a reconciliation of our Adjusted EBITDA with our net income for the years indicated. Our management uses Adjusted EBITDA as the measure to assess the contribution of each segment to our performance and to support decision-making in allocating resources. Adjusted EBITDA is a non-GAAP measure, which is calculated for each segment using operating income or loss from continuing operations plus dividends received and interest from associates and joint ventures and adding back the amounts charged as (i) depreciation, depletion and amortization and

(ii) impairment and reversal (impairment and disposal) of non-current assets. For more information, see note 4 to our consolidated financial statements.

	<i>Year ended December 31,</i>	
	2022	2021
	<i>(US\$ million)</i>	
Net Income from continuing operations attributable to Vale's shareholders	16,728	24,736
Net Income attributable to non-controlling interests	82	108
Net Income from continuing operations	16,810	24,844
Depreciation, depletion and amortization	3,171	3,034
Income taxes	2,971	4,697
Financial results, net	(2,268)	(3,119)
Equity results and other results in associates and joint ventures	(305)	1,271
Dividends received and interest from associates and joint ventures	154	190
Impairment and disposals (impairment reversal) of non-current assets	(773)	426
Adjusted EBITDA from continuing operations	19,760	31,343
Adjusted EBITDA from discontinued operations (coal)	171	(189)
Adjusted EBITDA	19,931	31,154

We discuss below, for each segment, the changes in our net operating revenues, cost of goods sold and services rendered (excluding depreciation, depletion and amortization), expenses (excluding depreciation, depletion and amortization and excluding impairment charges) and Adjusted EBITDA. The expenses incurred in connection with remediation, indemnification and donations in respect of the collapse of the Brumadinho dam are not directly related to our operating activities and are therefore not allocated to any operating segment.

Iron Solutions

Net operating revenues from sales of Iron Solutions. Total of US\$ 34,916 million in 2022, a 24.0% decrease from US\$45,925 million in 2021, mainly reflecting (i) lower realized average prices from iron ore, reflecting the drop of the reference index of the iron ore price, the Platts IODEX 62% that was 24.6% lower with respect to 2021, with an impact on the Iron Solutions segment of US\$9,768 million, and (ii) lower Iron solutions products volumes sold (US\$837 million).

Cost of goods sold and services rendered from Iron Solutions. Excluding depreciation, depletion and amortization, increased by 8.1% in 2022, to US\$14,946 million in 2022 from US\$13,830 million in 2021. This increase primarily reflects higher costs with (i) oil and gas, mainly due to the increase in costs with bunker (impact of US\$993 million), and (ii) materials and services impact of US\$330 million.

Net expenses from Iron Solutions. Total of US\$647 million in 2022, in line with the US\$696 million recorded in 2021.

Adjusted EBITDA from Iron Solutions. Total of US\$19,443 million in 2022, a decrease of US\$12,037 million or 38.2%, compared to our Adjusted EBITDA of US\$31,480 million in 2021. This decrease mainly reflects (i) reduction of the iron solution products average realized price and sales volume.

Energy Transition Metals

Net operating revenues from sales of Energy Transition Metals. Total of US\$8,398 million in 2022, in line with the US\$7,966 million recorded in 2021.

Cost of goods sold from Energy Transition Metals. Excluding depreciation, amortization and depletion, increased by 24.7% in 2022, to US\$5,590 million in 2022 from US\$4,484 million in 2021, mainly due to higher costs associated with (i) maintenance shutdown in Sossego (impact of US\$151 million), (ii) goods and services (impact of US\$459 million) and (iii) fuel (impact of US\$307 million).

Net expenses from Energy Transition Metals. Total of US\$315 million in 2022, in line with the US\$289 million recorded in 2021.

Adjusted EBITDA from Energy Transition Metals. Total of US\$2,493 million in 2022, a decrease of US\$700 million or 21.9% compared to our Adjusted EBITDA of US\$ 3,193 million in 2021. This decrease primarily reflects higher costs associated to (i) maintenance shutdown in Sossego, (ii) goods and services and (iii) fuel.

FINANCIAL RESULTS, NET

The following table details our financial results, net, for the years indicated.

	Year ended December 31,	
	2022	2021
	<i>(US\$ million)</i>	
Financial income ⁽¹⁾	520	337
Financial expenses ⁽²⁾	(1,179)	(1,249)
Derivatives financial instruments	1,154	(23)
Net foreign exchange gains (losses)	(398)	408
Reclassification of cumulative translation adjustments	1,608	4,326
Indexation losses, net	(577)	(276)
Financial guarantees	481	312
Participative shareholders' debentures	659	(716)
Financial results, net	2,268	3,119

(1) Includes short-term investments and other financial income (see note 6 to our consolidated financial statements).

(2) Includes loans and borrowings gross interest, capitalized loans and borrowing costs, expenses of REFIS, interest on lease liabilities and others financial expenses (see note 6 to our consolidated financial statements).

In 2022, our financial results, net, was an income of US\$2,268 million compared to an income of US\$3,119 million in 2021. The most relevant impacts were as follows:

Reclassification of cumulative translation adjustments. In 2022, we recognized gains of US\$1,608 million compared with gains of US\$4,326 million in 2021. The effect recorded in 2022 refers mainly to the reclassification of the cumulative translation adjustments arising from a capital reduction of Vale International SA ("VISA"), which resulted in a gain of US\$1,543 million, compared with a gain of US\$2,413 million recognized in 2021 (see note 16 to our consolidated financial statements).

Gains on derivatives. Total of US\$1,154 million in 2022, compared to a loss of US\$23 million in 2021. This variation was mainly due to our currency and interest rate swaps. We recognized a net gain of US\$1,130 million in 2022 compared to a net loss of US\$159 million in 2021 due the Brazilian *real* appreciation by 4.3% against the U.S. dollar in 2022, compared to a 4.6% depreciation of the Brazilian *real* in 2021. These swaps are primarily used to convert debt denominated in Brazilian Reais into U.S. dollars to protect our cash flow from exchange rate volatility.

The non-cash effect of the fair value changes in participative shareholders' debentures. Represented a gain of

US\$659 million in 2022, compared to a loss of US\$716 million in 2021. This variation was derived from the decrease on the weighted average trading price of the secondary market in 2022 compared to 2021.

EQUITY RESULTS AND OTHER RESULTS IN ASSOCIATES AND JOINT VENTURES

In 2022, the equity results and other results in associates and joint ventures totaled a gain of US\$305 million compared to a loss of US\$1,271 million in 2021, representing a positive impact of R\$1,576 million, mainly caused by lower provisions related to Fundação Renova and Samarco.

INCOME TAXES

In 2022, we recorded an income tax net expense of US\$2,971 million, compared to US\$4,697 million in 2021. Our effective tax rate differed from our statutory tax rate of 34%, principally due to tax incentives resulting from our iron ore, copper and nickel operations in the North and Northeast regions of Brazil (impact of US\$1,247 million), resulting in an effective tax rate of 15.0%. Our effective tax rate also differed from our statutory tax due to the effect of the reclassification of cumulative adjustments to the income statement (with an impact of US\$547 million). The reconciliation from statutory tax rate to our effective tax rate is presented in note 8 to our consolidated financial statements.

NET INCOME AND LOSSES FROM CONTINUING OPERATIONS

For the reasons discussed above, our net income from continuing operations in 2022 was US\$16,810 million, compared to US\$24,844 million in 2021.

INCOME FROM DISCONTINUED OPERATIONS

In 2022, we had a gain from discontinued operations attributable to Vale's shareholders of US\$2,060 million compared to a loss of US\$2,291 million in 2021. In 2021, as part of the sustainable mining strategic agenda, we announced our intention to divest from coal assets. In order to achieve this objective, we carried out a corporate reorganization through the acquisition of the interests held by Mitsui in these assets, which, upon completion, allowed us to reach an agreement with Vulcan in December 2021, for the sale of all of our coal assets.

For more information on our discontinued operations, see note 16 to our consolidated financial statements. For more information on the sale of our coal business, see *Overview—Business Overview—Significant Changes in Our Business—Divestments and Information on the company—Discontinued Operations*, and note 16 to our consolidated financial statements.

LIQUIDITY AND CAPITAL RESOURCES

Our principal funding requirements are for capital expenditures, dividends payments, share buybacks, debt service, tax payments, dam de-characterization and satisfaction of our obligations relating to the remediation and compensation of damages in connection with the Brumadinho dam collapse and any contribution we may be required to make to Fundação Renova, pursuant to the Framework Agreement. We expect to meet these requirements, in line with our historical practice, by using cash generated from operating activities and financing activities.

Our investment guidance for capital expenditures in 2023 is approximately US\$6 billion and after 2023 our average estimated capital expenditures ranges between US\$6 billion and US\$6.5 billion per year. A principal amount of US\$160 million of our debt matures in 2023. We expect to incur a total amount of US\$3,486 million relating to the remediation and compensation in connection with the Brumadinho dam collapse, de-characterization of dams and contributions to Fundação Renova in 2023 and after 2023 our aggregate expected expenses with provision is US\$7,074 million. We have an aggregate principal amount of US\$1,910 million debt maturing between 2024 and 2026, and US\$8,964 million maturing after 2026. We expect that our existing cash and cash equivalents and our operating cash flows will be sufficient to satisfy our obligations due in 2023 and thereafter. We are constantly evaluating opportunities for additional cash generation. Finally, we are committed to continue the reduction in our costs and expenses, maintain our debt leverage and discipline in capital allocation.

SOURCES OF FUNDS

Our principal sources of funds are our operating cash flow and financing activities. The amount of operating cash flow is strongly affected by global prices for our products. In 2022, net cash flow generated by operating activities amounted to US\$11,485 million, compared to US\$25,679 million in 2021. In 2022, our cash, cash equivalents and short-term investments totaled US\$4,797 million compared to US\$11,905 million in 2021.

In 2022, we borrowed US\$1,275 million, compared to US\$930 million in 2021, including US\$775 million in pre-export financing agreements with commercial banks and US\$500 million in loan agreements with development banks and agencies. In addition, we amended certain existing credit agreements in the total amount of US\$1,550 million to replace Libor with SOFR and for a portion of those also to extend the maturity.

USES OF FUNDS

In addition, in 2022, we used a total amount of cash of US\$1,713 million (US\$1,898 million in 2021) in matters related to the collapse of our dam in Brumadinho, of which US\$904 million (US\$1,056 million in 2021) in connection with obligations assumed under settlement agreements, US\$189 million (US\$192 million in 2021) in individual indemnification and other commitments and US\$620 million (US\$650 million in 2021) was in connection with communication services, accommodation and humanitarian assistance, equipment, legal services, water, food aid, taxes, among others. In 2022, we also used a total amount of cash of US\$349 million in matters related to the de-characterization of dams, compared to US\$392 million in 2021.

In 2022, we also used a total amount of cash of US\$338 million in matters related to the collapse of Samarco's dam, which has been entirely contributed to Fundação Renova to be used in the reparation programs in accordance with the Framework Agreement.

Capital expenditures

Our capital expenditures in 2022 amounted to US\$5,446 million, including US\$3,859 million dedicated to sustaining our existing operations and US\$1,587 million for project execution (construction in progress). For more information about the specific projects for which we have budgeted funds, see *Information on the Company—Capital expenditures*.

Distributions and repurchases

Distributions. In 2022, we paid dividends and interest on shareholders' equity in the total amount of US\$6,615 million, of which US\$3,254 million was based on the anticipation of the income for the year ended December 31, 2022. On February 16, 2023, the Board of Directors approved a dividend payment of US\$1,569, which was paid on March 22, 2023.

Repurchases. In 2022, we repurchased 357,442,577 shares at an average price of US\$16.89 per share, including 187,807,077 through wholly owned subsidiaries and 169,635,500 directly by Vale S.A. The total amount acquired was US\$6,036 million, of which US\$3,160 million were acquired through wholly owned subsidiaries and US\$2,876 million by Vale S.A.

Tax payments

We paid US\$4,274 million in income tax in 2022, excluding the payments in connection with REFIS tax settlement, compared to US\$4,053 million in income tax in 2021. In 2022, we paid a total of US\$363 million, in connection with the REFIS, compared to US\$332 million in the same period in 2021.

Liability Management

In 2022, we repaid US\$2,300 million (US\$1,927 million in 2021) under our financing agreements, including US\$1,291 million through a cash repurchase of certain debt securities consummated in June 2022 and other repayments in loans with commercial banks.

DEBT

As of December 31, 2022, our total outstanding debt was US\$11,181 million (including US\$11,034 million of principal and US\$147 million of accrued interest) compared with US\$12,180 million as of December 31, 2021. As of December 31, 2022, we had loans and financing amounting to US\$101 million secured by fixed assets, which were terminated on April 22, 2022. As of December 31, 2022, the weighted average of the remaining term of our debt was 8.7 years, the same as in 2021.

As of December 31, 2022, our short-term debt and the current portion of long-term debt was US\$307 million compared to US\$1,030 million in 2021, including accrued interest.

Our major categories of long-term indebtedness are described below. The principal amounts shown below, excluding accrued interest.

- U.S. dollar-denominated loans and financings (US\$4,212 million as of December 31, 2022 and US\$3,136 million as of December 31, 2021). This category includes export financing lines, loans from export credit agencies, and loans from commercial banks and multilateral organizations;
- U.S. dollar-denominated fixed rate notes (US\$6,157 million as of December 31, 2022 and US\$7,448 million as of December 31, 2021). We have issued in public offerings several series of fixed rate debt securities, directly by Vale and through our wholly owned finance subsidiary Vale Overseas Limited (debt securities guaranteed by Vale) totaling US\$5,878 million, compared to US\$6,631 million in 2021. Our subsidiary Vale Canada has outstanding fixed rate note in the amount of US\$279 million as of December 31, 2022, compared to US\$297 million as of December 21, 2021;
- Other debt (US\$505 million as of December 31, 2022 and US\$566 million as of December 31, 2021). We have outstanding debt, principally owed to BNDES, Brazilian commercial banks and holders of infrastructure debentures, denominated in Brazilian reais and other currencies.

As of December 31, 2022, we have two revolving credit facilities with syndicates of international banks, which will mature in 2024 and 2026. The revolving credit lines, which are committed, allow more efficient cash management, consistent

with our strategic focus on reducing cost of capital. We currently have US\$5 billion available under these two revolving credit lines which can be drawn by Vale, Vale Canada and Vale International.

Some of our long-term debt instruments contain financial covenants and most include cross acceleration provisions. 22.39% of the aggregate principal amount of our total debt require that we maintain, as of the end of each quarter, (i) a consolidated ratio of total debt to adjusted EBITDA for the past 12 months not exceeding 4.5 to one and (ii) a consolidated interest coverage ratio of at least 2.0 to one. These covenants appear in our financing agreements with BNDES, with other export and development agencies and with some other lenders. As of December 31, 2022, we were in compliance with our financial covenants.

As of December 31, 2022, the corporate financial guarantees we provided (within the limit of our direct or indirect interest) for certain associates and joint ventures totaled US\$1,522 million, compared to US\$1,513 million in 2021.

In a broader view, the sum of our net debt, with other commitments with respect to leases, currency swaps, and provisions for Brumadinho and Mariana reparations, increased in 2022 by US\$5,092 million to US\$14,140 million as of December 31, 2022, from US\$9,048 million as of December 31, 2021.

RISK MANAGEMENT

We continuously seek to enhance our integrated framework for managing the risks to which we are exposed, in order to support the achievement of our objectives, financial strength and flexibility and business continuity. In 2022, we reviewed our Integrated Risk Map, which contains our risk priority themes, and our risk management policy to provide a clear definition of risk management roles and responsibilities to further increase synergies among our lines of defense and ensure a process simplification. In 2022, we also created our Risk Appetite Statement, an internal-use document proposed by our Executive Committee and approved by our Board of Directors, in which we define the risk appetite for each category of risk in the Integrated Risk Map to guide management in their business decisions, in the capital allocation and in the efforts applied towards managing and mitigating risk.

In addition, we enhanced our mapping process of emerging risks, which are defined as new risks or risks already known, but under new or different conditions and/or circumstances that have a high degree of uncertainty regarding their trend, severity and probability. The emerging risks are normally influenced by external factors and, therefore, their potential impact, if any, is more difficult to predict.

Our risk management strategy considers the impact on our business of market risk factors (market risk), risks associated with dams, slopes and ore piles collapses (geotechnical risk) risks associated with inadequate or failed internal processes, people, systems or external events (operational risk), risks that may suspend or materially affect the performance of our operations (production planning and continuity risk), risks associated with our business model, ESG, political and regulatory conditions in countries in which we operate (strategic risk), risks associated with social and human rights, climate change (sustainability risk), risks from exposure to legal penalties, fines or reputational losses associated with failure to act in accordance with applicable laws and regulations, internal policies or best practices (compliance risk), risk associated to information security (cyber risk), risk associated to credit from trade receivables, derivative transactions, guarantees, down payment for suppliers and cash investments (financial risk), among others.

RISK GOVERNANCE STRUCTURE

Our Board of Directors has established five permanent advisory committees, one of them, in particular, with major roles in advising the Board on and monitoring our risks: the Audit and Risks Committee, which evaluates and monitors the effectiveness and sufficiency of our controls and risk management system. For more information, see *Management and Employees—Other advisory committees to the Board of Directors*.

Our Executive Committee has established five advisory committees (the Risk Executive Committees) to advise our management with respect to each of these risks: (i) operational risks, (ii) geotechnical risks, (iii) strategy, finance and cyber risks, (iv) compliance, institutional relations and communication risks and (v) sustainability risks. The main responsibilities of these committees are, among others: promoting and spreading the culture of risk management throughout the company; supporting the first line of defense; supporting our Executive Committee in monitoring risks of the Integrated Risk Map categories, as well as making preventive recommendations regarding potential risks presented in the Committees' meetings; and recommending revisions of risk management principles and tools for the continuous improvement of the process; evaluating and suggesting, when necessary, changes in the risk management strategy and submitting them for the approval of the Executive Committee.

The Audit and Compliance Department, which reports directly to the Board of Directors and is supervised by the Audit and Risks Committee, is composed of the Internal Audit, Corporate Integrity and Whistleblower Channel areas, the latter two being responsible for our Ethics & Compliance Program.

Our Ethics & Compliance Program has six main elements: (1) **Governance** to ensure autonomy and independence from others executive structures of the company; (2) **Guidelines** based on the principles detailed in our Code of Conduct, Anti-Corruption normative documents, policies and procedures; (3) **Communication & Training** to guide employees on how to overcome challenging situations and make the best decisions in a responsible and ethical way; (4) **Risks & Monitoring** to guarantee the company's adherence to the Program's guidelines; (5) **Whistleblower Channel** to report

cases of suspicion or ethical misconduct; and (6) **Consequence Management** to enable the application of disciplinary measures for confirmed misconduct inside the company.

The Whistleblower Channel is structured to guarantee confidentiality, protect whistleblower anonymity and the information for a fair investigation. The Whistleblower Channel offers all conditions for a report to be independently verified, and prohibits breaches of confidentiality, intimidation or retaliation against whistleblowers.

Any breaches of our Code of Conduct, policies and standards can be reported by anyone, including employees, contractors, suppliers, members of affected communities and other stakeholders, via our Whistleblower Channel. More information about Vale's Ethics & Compliance Program and its Whistleblower Channel, including the number of employees dismissed for misconduct, can be found in the Ethics & Compliance Annual Report, available on the company's website.

Our risk governance structure is based on the Risk Management Policy, which has the main purpose of: (i) promoting the culture of risk management throughout the company (ii) supporting the strategic planning and sustainability of our business; (iii) optimizing capital allocation and strengthening the asset management of our business; (iv) strengthening our governance practices, based on lines of defense model; (v) using ISO 31000, ISO 55000 and COSO-ERM standards as references for risk management; (vi) adopting the RBPS (Risk Based Process Safety) as the operational safety management system; (vii) employing the risk appetite methodology as a tool to guide our executives in the decision-making process, in capital allocation and in formulating preventive and mitigation actions for the potential risks; (viii) measuring and monitoring our potential risks, on a consolidated basis, considering the effect of diversification, when applicable, of our entire business; (ix) establishing a specialized structure for specific and independent performance, as Second Line of Defense Specialist, in the assessment of potential operational risks, including geotechnical risks; (x) assessing the impact of new investments, acquisitions and divestitures on our risk map, and (xi) mapping emerging risks in order to seek solutions that might timely mitigate possible negative impacts on company's business objectives.

In December 2022, we revised our Risk Management Policy turning it into a more principles-oriented policy and further clarifying roles and responsibilities of the three lines of defense in our risk management process in order to facilitate its application in our daily operations. We also revised our Risk Management Rules to update our Risk Rulers and Matrices and include concepts of business and emerging risks, priority risk themes and risk appetite, and to reinforce the roles and responsibilities of the three lines of defense.

Our integrated risk governance practice is based on a three lines of defense model. We reevaluate our risk practices from time to time to ensure the alignment between strategic decisions, performance and the risk approach determined by our Board of Directors.

MANAGEMENT OF SPECIFIC RISKS

Market Risk

We are exposed to various market risk factors that can impact our cash flow. An assessment of the potential impact of the consolidated market risk exposure is performed periodically to support the decision-making process regarding the risk management strategy, which may incorporate financial instruments, including derivatives. The financial instrument portfolio is monitored on a monthly basis, enabling us to properly evaluate financial results and their impact on cash flow, and ensure correlation between the strategies implemented and the proposed objectives.

Considering the nature of our business and operations, the main market risk factors that we are exposed to are:

Product prices and input costs. We are exposed to market risks associated with commodities price volatilities. We may enact risk mitigation programs in situations such as the following: (i) where there is a risk of financial distress; (ii) to support commercial activities and specific needs of our business segments; (iii) to ensure a minimum cash and/or value generation for certain businesses; and (iv) to protect from the increase of certain cost items, such as fuel oil used on ships and freight chartering. These programs include predominantly forward transactions, futures contracts and options.

Foreign exchange rates. Our cash flows are also exposed to the volatility of several currencies against the U.S. dollar and of interest rate on loans and financings. While part of our product prices is indexed to U.S. dollars, most of our investments and other disbursements, and a relevant portion of our costs are indexed to other currencies other than the U.S. dollar, principally the Brazilian *real* and the Canadian dollar. We also have debt instruments denominated in currencies other than U.S. dollars, mainly in Brazilian *reals*. We may use swaps and forward transactions to convert into U.S. dollars a portion of the cash outflows of these debt instruments, and of some other assets or liabilities denominated in currencies other than U.S. dollars.

Interest rates. Our floating rate debt consists mainly of loans including export prepayments, commercial bank loans and multilateral organization loans. In general, the U.S. dollar floating rate debt is subject to changes to LIBOR (London Interbank Offer Rate) and SOFR (Secured Overnight Financing Rate).

See note 20 to our consolidated financial statements for quantitative information about risks relating to financial instruments, including financial instruments entered into pursuant to our risk management policies.

Geotechnical Risk

Geotechnical risk management is the structured approach we take to manage the risks of dams, slopes and ore piles collapses, with the potential to cause fatalities and impact the communities and the environment and/or interrupt our activities. Geotechnical risks are very significant to our business and are continuously monitored and duly integrated to our enterprise risk management.

We have been working on the improvement of our tailings management practices by implementing our Tailings and Dam Management System ("TDMS"). This system is based on the adoption of multiple layers of protection, including our three internal lines of defense and external lines of defense, such as the engineer of record and the Independent Qualified Person ("IQS").

The risks imposed by geotechnical structures are also evaluated by the Hazard Identification and Risk Assessment ("HIRA") process. The HIRA methodology was tailored to reflect the particularities of our geotechnical structures and allow critical control tools to be implemented based on the risks identified.

Operational Risk

Operational risk management is the structured approach we take to manage uncertainty related to internal and external events. Internal events consist of inadequate or failed internal processes, people and systems, while external events include natural and operational catastrophes caused by third parties.

We conduct HIRA, a process that identifies and analyzes operational risks and defines performance criteria and establishes assurance to the associated critical controls. We implemented the HIRA process to strengthen our risk management discipline. In the first cycle, from 2019 to 2021, we assessed 100% of all mines, processing plants, railroads, and ports, and, in 2022, we concluded the assessment of 100% of the tailing dams. The first cycle focused on scenarios with potential consequences to human life and to the environment. A second cycle started in 2022 and is not only reassessing scenarios covered in the first cycle but also adding business interruption scenarios to the analysis. The process is part of the Element #4 of our Management System and will run in a 3 to 5-year cycle continuously.

We reduce operational risk by implementing new controls, improving existing ones, and monitoring their effectiveness. Our response plans include the high risks scenarios and identify the necessary resources to mitigate the impacts. We seek a clear view of the major risks we are exposed to, the cost-benefit on mitigation plans and the controls in place to closely monitor the impact of operational risks and to efficiently allocate capital to reduce it.

Production Planning and Continuity Risk

Production planning and continuity risk include risks that may paralyze or materially affect the performance of our operations such as the unavailability of critical resources and of place for disposal of tailings, risks of not obtaining or not renewing licenses, concessions and mining rights, logistics risks and risks of availability and quality of reserves. Our performance may also be affected by political, geopolitical, regulatory, economic and social conditions in the regions in which we operate.

The achievement of our production guidance depends on several factors (internal and external to us). To mitigate these risks, our long-term planning monitors the lifecycle of mineral resources and geotechnical structures as well as timelines for development, licensing and implementation of new projects. Based on this, we work to prioritize engineering efforts of engineering and strengthen relationship with communities and environmental agencies in order to evolve with authorizations, environmental and social licenses to operate. In order to mitigate impact and support the Master Plan, we also invest in studies and research to support the sustainability of our operations.

Additionally, according to our in-house developed methodology to assess physical risks related to climate change, "Vale Climate Forecast," based on Task Force on Climate-related Financial Disclosures recommendations, physical impacts on our assets caused by climate events are also considered operational impacts and these impacts are assessed as operational, planning and continuity risks.

Strategic Risk

Strategic risk involves risk factors that our business is subject to in particular along the lines such as the following: governance, business model, external environment issues, regulatory, political, geopolitical economic or social actions taken by governments or other stakeholders, which may impact our global operations, the global profile of our client portfolio and related supply chains.

We are exposed to a number of external factors that may hinge our ability to achieve our long-term goals. Such risks can be attributed to changes in industry dynamics, as per acceleration or delays in market trends, new entrants, creation of product substitutes and/or changes in the dynamic of the supply chain. As such, we need to identify and when possible, anticipate and reposition ourselves to respond to those changes on a timely manner.

Sustainability Risk

Social and Human Rights Risks

In 2020, following our governance and risk management review, social and human rights risks management was incorporated into the business risk management process.

Social risks management involves the assessment of the socioeconomic characteristics of the communities with which we interact, how we fulfill our commitments to them, and how the potential impacts of our operations are perceived by these communities, including Indigenous Peoples and Traditional Communities. Human rights risk management involves the analysis of issues such as degrading working conditions and modern slavery, child labor and sexual exploitation of children and adolescents, violations in labor relations, violations in communities and violation of human rights on a large scale.

In 2022, we continued to improve our social and human rights risk management. Based on the risks registered by the operational teams into the risk management system, we develop action plans and carry out inspections with a focus on risks that could affect communities, their safety and ways of living and human rights. In addition, human rights due diligence is conducted in our project's operations and suppliers. The results are integrated into action plans, which are monitored. We have also made progress the human rights risk management related to suppliers in Brazil and Canada, including the increase of human rights inspections in suppliers in Brazil and the development of further human rights

standards for suppliers. We maintain grievance mechanism channels to receive, register, and address the demands from stakeholders. The identification of risks can also occur from the communications made through these channels.

Climate Change Risk:

We assess transition risks (*i.e.*, emerging regulation at state, national and transnational levels related to carbon pricing, issues of a reputational nature that may potentially arise from the perception of our performance on addressing climate change, and issues related to emerging technology which may disrupt or materially alter business routes, planning), as well as physical risks (*i.e.*, operational impacts from extreme weather the intensity of which is heightened as a consequence of climate change) pursuant to the recommendations of the Task-Force on Climate-Related Financial Disclosures recommendation.

Our Climate Change Team identifies and monitors the risks with the support from our Risk Management Team to constantly map the transition risks related to climate change.

For transition risks, we have a systematic approach to monitoring the regulatory landscape and emerging trends related to climate-related proposals, initiatives, laws etc., the potential impacts of which are calculated and qualified within our Executive Committee and through the company's "Low Carbon Forum" governance. In parallel, we seek cutting-edge information and stakeholder alignment, as well as advance company positioning on relevant climate-related policies, through participation in global forums such as the International Council on Mining and Metals, the World Economic Forum, the World Business Council on Sustainable Development as examples), and through international events such as annual Conference of the Parties ("COP"), the annual UN General Assembly gathering and associated "Climate Week NYC", and other events in critical jurisdictions such as Brazil, Canada, China, the US, Europe, Indonesia, Middle East. OP 27 and (e.g., the "Low-Carbon Forum").

For physical risks, we have developed a methodology called "Vale Climate Forecast" to deal with short and long-term risks related to physical impacts on our assets due to climate changes.

For more information, please, see <https://www.vale.com/web/esg/climate-change>. Information in our website is not incorporated by reference in this annual report on Form 20-F.

Compliance Risk

Corruption Risk

Our Ethics & Compliance Program has specific anti-corruption rules, which are stated in the Code of Conduct, the Global Anti-Corruption Policy, and detailed in an internal Global Anti-Corruption Manual.

Our main anti-corruption rules are:

- Political contributions directly or indirectly on behalf of Vale are prohibited. This includes company donations or contributions to political parties, political candidates, and election campaigns.
- Facilitation payments are prohibited.
- Socioenvironmental and institutional external expenditures must be previously analyzed by Corporate Integrity through an internal tool and must have a contract with anti-corruption and accountability clauses.
- Gifts, meals, and entertainment involving Government officials above a specific value must be previously approved by Corporate Integrity through an internal tool, and gifts in cash or equivalent are prohibited at Vale, regardless of the amount.
- All suppliers, entities, associations, and any other third parties that receive funds from us, before being registered, must go through due diligence, where a background check is performed, and the risk of corruption is defined. Anti-corruption clauses must be included in the contracts.
- The process of recruiting and selecting employees and leaders who are related to any public official must also be previously approved by Corporate Integrity.

- Any conflict of interest must be disclosed by our employees (with computer access) through a global campaign carried out from time to time.
- We provide regular training and communications on our global anti-corruption rules, as well as specialized training to employees who have substantive compliance related responsibilities.

Cyber Risk

Cyber risk management is the approach taken to manage information security risks, such as theft and leakage of information, technology assets unavailability and compromising data integrity. The increase on the threat landscape is a natural trend in our industry and the evolving risks in this space come from a variety of cyber threat actors like nation states, cyber criminals, hacktivists and insiders. We have experienced threats to the security of our information, but none of these had an impact on our business in 2022.

We employ several measures to manage this risk in order to protect, detect and respond to cyber events including information security policies and standards, security protection technologies, detection and monitoring of threats, as well as testing of response and recovery procedures. To encourage vigilance among our employees we create a culture of cybersecurity awareness in the organization through a training program covering topics such as email phishing, information classification and other information security best practices.

Financial Risk

We are exposed to credit risk arising from trade receivables, derivative transactions, guarantees, down payment for suppliers and cash investments. Our credit risk management process provides a framework for assessing and managing counterparties' credit risk and for maintaining our risk at an acceptable level.

We assign an internal credit rating and a credit limit to each counterparty using our own quantitative methodology for credit risk analysis, which is based on market prices, external credit ratings and financial information of the counterparty, as well as qualitative information regarding the counterparty's strategic position and history of commercial relations.

Based on the counterparty's credit risk, risk mitigation strategies may be used to manage our credit risk. The main credit risk mitigation strategies include non-recourse discount of receivables, insurance instruments, letters of credit, corporate and bank guarantees, mortgages, among others.

From a geographic standpoint, we have a diversified accounts receivable portfolio, with Asia, Europe and Brazil, the regions with the most significant exposure. According to each region, different guarantees can be used to enhance the credit quality of the receivables. We monitor the counterparty exposure in the portfolio periodically and we block additional commercial credit to customers in delinquency.

To manage the credit exposure arising from cash investments and derivative instruments, credit limits are approved to each counterparty to which we have credit exposure. We control the portfolio diversification and monitor different indicators of solvency and liquidity of our different counterparties that were approved for trading.

IV. SHARE OWNERSHIP AND TRADING

MAJOR SHAREHOLDERS

As of March 31, 2023, our corporate capital was composed of 4,539,007,580 common shares, including 12 golden shares issued to the Brazilian government. The 12 golden shares have veto powers over certain actions, such as changes to our name, the location of our headquarters and our corporate purpose as it relates to mining activities.

The following table sets forth information regarding ownership of Vale shares by the shareholders we know beneficially own more than 5% of our outstanding capital stock, and by our directors and executive officers as a group, as of March 31, 2023, unless otherwise indicated.

Shareholders	Common shares owned	% of class ⁽⁶⁾
Caixa de Previdência dos Funcionários do Banco do Brasil ("PREVI") ⁽¹⁾	393,946,556	8.9
BlackRock, Inc. ⁽²⁾	302,602,159	6.8
Capital World Investors ⁽³⁾	294,061,122	6.6
Mitsui & Co., Ltd. ⁽⁴⁾	286,347,055	6.4
Capital Research Global Investors ⁽³⁾	214,791,969	4.8
Capital International Investors ⁽³⁾	134,097,229	3.0
Board of directors and executive officers as a group ⁽⁵⁾	2,363,008	0.1

(1) Previ is a shareholder of Litel Participações S.A. ("Litel") and Litela Participações S.A. ("Litela"), which were part of our former control group.

(2) Number of shares as reported in BlackRock, Inc.'s Schedule 13G/A, filed with the SEC on February 3, 2022.

(3) Capital World Investors ("CWI"), Capital Research Global Investors ("CRGI") and Capital International Investors ("CII") are investment divisions of Capital Research and Management Company. Number of shares as of December 30, 2022, as reported in Schedule 13G/A of CWI, CRGI and CII, each filed with the SEC on February 13, 2023.

(4) Mitsui & Co. Ltd. ("Mitsui") was part of our former control group.

(5) Number of shares as of December 30, 2022.

(6) All percentages are based on 4,439,999,503 common shares outstanding as of March 31, 2023. We held 99,008,077 shares in treasury as of March 31, 2023.

In October 2022, Cosan S.A. announced that it acquired 4.9% of our outstanding shares, and an option to acquire an additional 1.6%.

We were informed of the following significant changes in the percentage ownership held by our major shareholders during the past three years:

Litel, Litela and PREVI: In January 2020, Litela transferred to its shareholders as a result of its capital reduction 386,040,325 common shares, representing an aggregate of 7.5% of our outstanding share capital (based on a total outstanding share capital of 5,129,910,942 common shares outstanding as of June 30, 2019). In February 2021, Litela transferred to its shareholders as a result of a distribution of assets to its shareholders, 504,801,150 common shares, representing an aggregate of 9.8% of our outstanding share capital (based on a total outstanding share capital of 5,129,910,942 common shares outstanding as of January 31, 2021). As a result, Litela reduced its shareholding in Vale to 0.29%. In this distribution, PREVI received 406,981,677 common shares, increasing its interest to 10.2%.

- Bradespar: In January 2022, Bradespar S.A. ("Bradespar") transferred to its shareholders, as a result of a capital reduction, 130,654,877 common shares. Consequently, Bradespar reduced its shareholding interest in Vale to 163,252,389 common shares, representing an aggregate of 3.3% of our outstanding share capital (based on a total outstanding share capital of 4,821,642,536 common shares outstanding as of January 31, 2022). From 2017 and 2020, Litel, Litela, Mitsui, Bradespar and BNDES Participações S.A. were parties to a shareholders agreement, pursuant to which they voted together on certain matters. Since 2020, there are no shareholders' agreements filed at our headquarters and we no longer have a controlling shareholder.

- Capital Research and Management Company: Capital World Investors reported 294,061,122 shares as of December 31, 2022, 360,598,669 shares as of December 31, 2021, and 302,201,922 shares as of December 31, 2020. Capital Research Global Investors reported 214,791,969 shares as of December 31, 2022, 293,135,748 shares as of December 31, 2021, and 294,934,543 shares as of December 31, 2020. Capital International Investors reported 134,097,229 shares as of December 31, 2022 and 249,790,017 shares as of December 31, 2021.

RELATED PARTY TRANSACTIONS

In 2021, we released our revised policy on related party transactions. The policy sets forth rules and principles to ensure transparency and arm's-length terms in our transactions with related parties and other situations of potential conflicts of interest. Pursuant to our new policy:

- The definition of related party is based on applicable accounting standards and on this policy, which may be more restrictive than applicable laws and regulations under certain circumstances.
- Our revised policy introduced the concept of "Reference Shareholders," which are shareholders we consider to be related parties, based on the standards set forth in the policy such as, the effective influence over Vale through a direct or known relationship, the existence of common management with such shareholder or a company that is part such shareholder's group, among others. The list of our Reference Shareholders will be annually reviewed by the Audit and Risks Committee.
- Our Audit and Risks Committee is responsible for issuing reports about potential conflicts of interest between us and our shareholders or management and for reviewing the procedure and terms of related party transactions that are submitted to our Board of Directors for approval.
- If we identify a conflict of interest with a shareholder, then that shareholder or its representative may not participate in any discussions related to the transaction at any shareholders' meeting and will only have access to publicly available information about the matter.
- If a director or an executive officer has a conflict of interest with the company in connection with any proposed transaction, such director or executive officer may not vote in any decision of the Board of Directors or of the Executive Committee regarding such transaction and must disclose the nature and extent of the conflicting interest for transcription in the minutes of the meeting. Any director or executive officer who has a conflict of interest cannot receive any relevant documentation or information and may not participate in any related discussions. None of our directors or executive officers can transact any business with us, except on reasonable or fair terms and conditions that are identical to the terms and conditions prevailing in the market or offered by unrelated parties.
- The policy also prohibits the extension of any loans to related parties other than our subsidiaries and affiliated companies.

We have engaged, and expect to continue to engage, in arm's length transactions with certain entities controlled by, or affiliated with, our major shareholders.

- Previ, a pension fund of the employees of Banco do Brasil S.A. ("Banco do Brasil"), owns 100% of the investment fund BB Carteira Ativa, which holds 80.62% of the common equity of Litela Participações S.A. and Litel Participações S.A., which in turn hold together 9.9% of the common shares of Vale as of January 31, 2023. Banco do Brasil appoints three out of the six members of Previ's senior management. An affiliate of Banco do Brasil is the manager of BB Carteira Ativa. Banco do Brasil is also a full-service financial institution, and Banco do Brasil- and its affiliates have performed, and may perform in the future, investment banking, advisory or general financing and banking services for us and our affiliates, from time to time, in the ordinary course of business.
- We have commercial relationships in the ordinary course of our business with Mitsui, a large Japanese conglomerate. Mitsui has direct investments in some of our subsidiaries, joint ventures and associated companies. Mitsui is also our joint venture partner at VLI.

We have provided in the past, and may continue to provide, funding for Samarco and Fundação Renova. See *Operating and Financial Review and Prospects—Overview—Fundação Renova and Samarco Funding*.

We have engaged, and expect to continue to engage, in arm's length transactions with certain of our associates and joint ventures. For information regarding investments in associate companies and joint ventures and for information regarding transactions with major related parties, see notes 15, 30 and 31 to our consolidated financial statements.

DISTRIBUTIONS

Under Brazilian law and our bylaws, we are required to distribute to our shareholders an annual amount equal to not less than 25% of the distributable amount, referred to as the mandatory dividend, unless the Board of Directors advises our shareholders at our shareholders' meeting that payment of the mandatory dividend for the preceding year is inadvisable in light of our financial condition. For a discussion of dividend distribution provisions under Brazilian corporate law and our bylaws, see *Additional Information—Bylaws*.

The tax regime applicable to distributions to non-resident shareholders and holders of ADRs will depend on whether those distributions are classified as dividends or as interest on shareholders' equity. See *Additional Information—Taxation—Brazilian tax considerations*.

By law, we are required to hold an annual shareholders' meeting by April 30 of each year at which an annual dividend may be declared. Additionally, our Board of Directors may declare interim dividends. Under Brazilian corporate law, dividends are generally required to be paid to the holder of record on a dividend declaration date within 60 days following the date the dividend was declared, unless a shareholders' resolution sets forth another date of payment, which, in either case, must occur prior to the end of the fiscal year in which the dividend was declared. A shareholder has a three-year period from the dividend payment date to claim dividends (or payments of interest on shareholders' equity) in respect of its shares, after which we will have no liability for such payments.

We make cash distributions on the common shares underlying the ADSs in *reais* to the custodian on behalf of the depository. The custodian then converts such proceeds into U.S. dollars and transfers such U.S. dollars to be delivered to the depository for distribution to holders of ADRs net of the depository's fees. For information on taxation of dividend distributions, see *Additional Information—Taxation—Brazilian tax considerations*.

The following table sets forth the cash distributions we paid to holders of common shares and preferred shares for the years indicated. Amounts have been restated to give effect to stock splits that we carried out in subsequent periods. Amounts are stated before any applicable withholding tax.

Year	Payment date	Reais per share			U.S. dollars	U.S. dollars
		Dividends	Interest on equity	Total	per share ⁽¹⁾	total ⁽¹⁾
					Total	(US\$ million)
2019 ⁽²⁾	August 7, 2020	–	1.41	1.41	0.25	1,324
2020	September 30, 2020	1.41	1.00	2.41	0.45	2,329
2021	March 15, 2021	3.42	0.83	4.26	0.77	3,972
	June 30, 2021	2.19	–	2.19	0.43	2,200
	September 30, 2021	8.20	–	8.20	1.53	7,644
2022	March 16, 2022	3.72	–	3.72	0.72	3,500
	September 1, 2022	2.03	1.54	3.57	0.65	3,000
2023	March 22, 2023	1.83	0.29	2.12	0.41	1,823

(1) As approved by the Board of Directors.

(2) Amounts were approved by the Board of Directors on December 19, 2019, and payment of the amounts was approved on July 29, 2020.

TRADING MARKETS

Our publicly traded share capital consists of common shares, without par value. Our common shares are publicly traded in Brazil on the B3, under the ticker symbol VALE3. Our common shares also trade on the LATIBEX, under the ticker symbols XVALO. The LATIBEX is a non-regulated electronic market created in 1999 by the Madrid stock exchange in order to enable trading of Latin American equity securities.

Our common ADSs, each representing one common share, are traded on the NYSE, under the ticker symbol VALE. Citibank N.A. serves as the depository for the common ADSs. On December 31, 2022, there were 1,286,543,896 common ADSs outstanding, representing 26.92 % of our total share capital.

DEPOSITARY SHARES

Citibank N.A. serves as the depositary for our ADSs. ADR holders are required to pay various fees to the depositary, and the depositary may refuse to provide any service for which a fee is assessed until the applicable fee has been paid.

ADR holders are required to pay the depositary amounts in respect of expenses incurred by the depositary or its agents on behalf of ADR holders, including expenses arising from compliance with applicable law, taxes or other governmental charges, facsimile transmission or conversion of foreign currency into U.S. In this case, the depositary may decide in its sole discretion to seek payment by either billing holders or by deducting the fee from one or more cash dividends or other cash distributions. The depositary may recover any unpaid taxes or other governmental charges owed by an ADR holder by billing such holder, by deducting the fee from one or more cash dividends or other cash distributions, or by selling underlying shares after reasonable attempts to notify the holder, with the holder liable for any remaining deficiency.

ADR holders are also required to pay additional fees for certain services provided by the depositary, as set forth in the table below.

Depositary service	Fee payable by ADR holders
Issuance of ADSs upon deposit of shares, excluding issuances as a result of distributions described in the following item	Up to US\$5.00 or less per 100 ADSs (or fraction thereof) issued
Distribution of securities other than ADSs or rights to purchase additional ADSs (i.e., spin-off shares)	Up to US\$5.00 or less per 100 ADSs (or fraction thereof) held
Distribution of cash dividends or other cash distributions (i.e., sale of rights and other entitlements)	Up to US\$5.00 or less per 100 ADSs (or fraction thereof) held
Distribution of ADSs pursuant to (i) stock dividends or other free stock distributions, or (ii) exercise of rights to purchase additional ADSs	Up to US\$5.00 or less per 100 ADSs (or portion thereof) held
Delivery of deposited property against surrender of ADSs	Up to US\$5.00 or less per 100 ADSs (or portion thereof) surrendered
ADS services	Up to US\$5.00 per 100 ADSs (or fraction thereof) held on the applicable record date(s) established by the depositary

The depositary may deduct applicable depositary fees and charges from the funds being distributed in the case of cash distributions. For distributions other than cash, the depositary will invoice the amount of the applicable depositary fees to the applicable holders.

ADDITIONAL CHARGES

The holders, beneficial owners, persons depositing shares and persons surrendering ADSs for cancellation and for the purpose of withdrawing deposited securities are also subject to the following charges: (i) taxes (including applicable interest and penalties) and other governmental charges; (ii) registration fees as may be applicable from time to time; (iii) reimbursement of certain expenses as provided in the deposit agreement; (iv) the expenses and charges incurred by the depositary in the conversion of foreign currency; (v) certain fees and expenses incurred by the depositary in connection with compliance with exchange control regulations and other regulatory requirements; and (vi) certain fees and expenses incurred in connection with the delivery or servicing of deposited shares, as provided for under the deposit agreement.

The depositary reimburses us for certain expenses we incur in connection with the ADR program and other expenses, subject to a ceiling agreed between us and the depositary from time to time. These reimbursable expenses currently

include legal and accounting fees, listing fees, investor relations expenses and fees payable to service providers for the distribution of material to ADR holders. The depositary also agreed to make an additional reimbursement annually based on the issuance and cancellation fees, dividend fees and depositary service fees charged by the depositary to our ADS holders. For the year ended December 31, 2022, Citibank N.A. reimbursed us US\$3 million.

PURCHASES OF EQUITY SECURITIES BY THE ISSUER AND AFFILIATED PURCHASERS

The table below sets forth the information of our share buyback programs in 2022. See note 30 to our consolidated financial statements for further information about our share buyback programs.

	Total number of common shares purchased ⁽¹⁾	Average price paid per common share (US\$)	Total number of common shares purchased as part of publicly announced programs ⁽²⁾⁽³⁾	Maximum number of shares that may yet be purchased under the programs
January 2022	17,974,400	15.10	17,974,400	160,841,100
February 2022	13,302,150	16.07	13,302,150	147,538,950
March 2022	68,879,812	18.92	68,879,812	78,659,138
April 2022	46,843,778	20.45	46,843,778	31,815,360
May 2022	41,941,674	16.08	41,941,674	489,873,686
June 2022	60,317,484	15.97	60,317,484	429,556,202
July 2022	43,965,581	14.22	43,965,581	385,590,621
August 2022	3,205,100	13.05	3,205,100	382,385,521
September 2022	1,500,000	12.53	1,500,000	380,885,521
October 2022	6,974,211	14.31	6,974,211	373,911,310
December 2022	52,538,387	16.50	52,538,387	321,372,923
Total	357,442,577	16.89	357,442,577	321,372,923

(1) Includes common shares represented by ADSs.

(2) On October 28, 2021, our Board of Directors approved a share buyback program, limited to a maximum of 200,000,000 common shares or their respective ADRs and in May 2022, we announced the completion of the share buyback program.

(3) On April 27, 2022, our Board of Directors approved a share buyback program, limited to a maximum of 500,000,000 common shares or their respective ADRs, still ongoing.

Summary of purchases made by Vale S.A. and its wholly owned subsidiaries in 2022

Company	Quantity	Amount US\$
Vale S.A.	169,635,500	2,876
Wholly owned subsidiaries	187,807,077	3,160
Total	357,442,577	6,036

V. MANAGEMENT AND EMPLOYEES

MANAGEMENT

BOARD OF DIRECTORS

Our Board of Directors sets general guidelines and policies for our business and monitors the implementation of those guidelines and policies by our executive officers.

- Our bylaws provide for a Board of Directors consisting of 11 to 13 members, including one member of the Board of Directors directly elected by our employees, in a separate election. Our employees also elect an alternate for the director elected by them. In the event of any vacancy or impediment of a member of the Board of Directors, the remaining members may appoint a substitute member until the next general shareholders' meeting.
- Our shareholders vote to elect the members of our Board of Directors on an individual basis (as opposed to voting for a slate of candidates).
- Our shareholders elect the chairperson and vice-chairperson of our Board of Directors directly.
- We currently have eight independent members in our Board of Directors, out of a total of 13 members.
- Our chief executive officer is not a member of our Board of Director.
- In the event that the chairperson of the Board of Directors is not an independent member, the independent directors shall appoint a lead independent director ("LID"). As of the date hereof, our chairperson is an independent director.
- Under the rules of the Novo Mercado, to be considered independent, a director may not (i) be a controlling shareholder of Vale; (ii) have its vote subject to a shareholder's agreement; (iii) be a relative, to the second degree, of any director or executive of Vale; or (iv) have been an employee or executive of Vale in the past three years. The Novo Mercado rules also provide for other situations that require a case-by-case analysis of the independence of a director. Since March 2021, our bylaws provide that, in addition to the Novo Mercado independence standards, to be considered independent, a director may not (i) hold more than 5% of our share capital or have any formal or declared relation with any shareholder holding more than 5% of our share capital; or (ii) have been a director of Vale for five or more consecutive or non-consecutive terms or for 10 or more consecutive or non-consecutive years. The current independent members of our Board of Directors are in compliance with the rules established by the Novo Mercado special segment of B3 and our bylaws.

The current members of the Board will hold office until the general shareholders' meeting to be held in 2023. The Board of Directors holds regularly scheduled meetings at least eight times per year and holds additional meetings when called by the chairperson, vice-chairperson or one-third of the directors. Decisions of the Board of Directors require a quorum of a majority of the directors and are taken by majority vote.

The following tables lists the current and alternate members of the Board of Directors.

Director	Year first elected
José Luciano Duarte Penido (chairman) ⁽¹⁾	2019
Fernando Jorge Buso Gomes (vice-chairman)	2015
Daniel André Stieler	2021
Eduardo de Oliveira Rodrigues Filho	2019
Ken Yasuhara	2021
Lucio Azevedo ⁽²⁾	2015
Manuel Lino Silva de Sousa Oliveira ⁽¹⁾	2021
Marcelo Gasparino da Silva ⁽¹⁾	2019
Mauro Gentile Rodrigues da Cunha ⁽¹⁾	2021
Murilo Cesar Lemos dos Santos Passos ⁽¹⁾	2019

Director	Year first elected
Rachel de Oliveira Maia ⁽¹⁾	2021
Roberto da Cunha Castello Branco ⁽¹⁾	2021
Roger Allan Downey ⁽¹⁾	2019

(1) Independent directors.

(2) Appointed by our employees.

Alternate Director	Year first elected
André Viana Madeira ⁽¹⁾	2021

(1) Appointed by our employees as alternate of Lucio Azevedo.

Below is a summary of the business experience, activities, and areas of expertise of our current directors.

JOSÉ LUCIANO DUARTE PENIDO

CHAIRMAN (INDEPENDENT DIRECTOR), COORDINATOR OF THE NOMINATION AND GOVERNANCE COMMITTEE, AND MEMBER OF THE PEOPLE AND COMPENSATION COMMITTEE

Born:	1948
First elected	2019
Business experience:	<p>Coordinator of Vale's Sustainability Committee Member of Vale's former Operational Excellence and Risk Committee Independent Director and member of the People and Audit and Risks Committees of Algar S.A. Independent Director of Algar S.A. Independent Director of Copersucar S.A. Independent Director of Banco Santander Brasil Independent Director of Química Amparo Ypê Chairman of the Board of Directors of Fibria Celulose</p>

FERNANDO JORGE BUSO GOMES

VICE CHAIRMAN, MEMBER OF THE CAPITAL ALLOCATION AND PROJECTS COMMITTEE AND MEMBER OF THE PEOPLE AND COMPENSATION COMMITTEE

Born:	1956
First elected	2015
Other current activities and director or officer positions:	<p>Director, CEO, and Investor Relation Officer of Bradespar S.A. Executive Officer of Millennium Security Holding Corp</p>
Business experience:	<p>Coordinator of the Sustainability Committee Chairman of the Board of Directors of Bradespar S.A. Director, Executive Officer, and CEO of 2B Capital S.A. Vice-Chairman of Board of Directors, Director and Executive Officer of Valepar S.A. Member of Vale's former Strategy Committee</p>

DANIEL ANDRÉ STIELER

DIRECTOR, COORDINATOR OF THE CAPITAL ALLOCATION AND PROJECTS COMMITTEE AND MEMBER OF THE NOMINATION AND GOVERNANCE COMMITTEE

Born:	1965
First elected	2021

Other current activities and director or officer positions:	Member of the Deliberative Council of ABRAPP Director of Tupy
Business experience:	President of PREVI CEO, Chairman of the Deliberative Council and Member of the Fiscal Council of Economus Instituto de Seguridade Social Director of Alelo S.A. Director of Livelô S.A. Director of Controllershîp of Banco do Brasil S.A. Member of the Advisory and Finance Council of Banco Votorantim S.A. Member of the Financial Institutions Accounting Affairs Committee at Febraban Member of the Deliberative Council of UniAbraap Executive Manager of the Financial Disclosure department of Banco do Brasil S.A.

EDUARDO DE OLIVEIRA RODRIGUES FILHO

DIRECTOR AND MEMBER OF THE PEOPLE AND COMPENSATION COMMITTEE

Born:	1954
First elected	2019
Other current activities and director or officer positions:	Managing Partner of CWH Consultoria em Gest�o Empresarial
Business experience:	Member of Vale's former Finance Committee Member of Vale's Sustainability Committee Member of Vale's former Operational Excellence and Risk Committee Director and Alternate Director of Valepar S.A. Commercial Director of Rio Tinto Brasil Commercial Manager at Minera�es Brasileiras Reunidas S.A.

KEN YASUHARA

DIRECTOR AND MEMBER OF THE SUSTAINABILITY COMMITTEE AND MEMBER OF INNOVATION COMMITTEE

Born:	1978
First elected	2021
Other current activities and director or officer positions:	Officer of Mitsui & Co. (Brasil) S.A.
Business experience:	Alternate Member of the Board of Directors of Alumina do Norte do Brasil S.A. Member of Vale's Finance Committee Alternate Member of Vale's Board of Directors

LUCIO AZEVEDO

DIRECTOR

Born:	1958
First elected	2015
Other current activities and director or officer positions:	Employee of Vale (currently released for union activity)

Business experience: President of the Employees' Union of Railway Companies of the Brazilian states of Maranhão, Pará and Tocantins

MANUEL LINO SILVA DE SOUSA OLIVEIRA

INDEPENDENT DIRECTOR, COORDINATOR AND FINANCIAL EXPERT OF THE AUDIT AND RISKS COMMITTEE, MEMBER OF THE NOMINATION AND GOVERNANCE COMMITTEE

Born: 1952

First elected 2021

Other current activities and director or officer positions: Chairman of the Board of Directors of Jubilee Metals Group PLC

Business experience: Senior Independent Member of the Board of Directors of Polymetal International PLC
Senior Independent Member of the Board of Directors of Antofagasta PLC
Senior Non-Executive Independent Member of the Board of Directors Blackrock World Mining Investment Trust PLC

MARCELO GASPARINO DA SILVA

INDEPENDENT DIRECTOR AND COORDINATOR OF THE SUSTAINABILITY COMMITTEE AND MEMBER OF THE NOMINATION AND GOVERNANCE COMMITTEE

Born: 1971

First elected 2020 (Alternate since 2019)

Other current activities and director or officer positions: Chairman of the Health, Safety and Environment Committees and the Minorities Committee of Petrobras
Member of the Audit Committee of companies of the Petrobras conglomerate
Member of the Investment Committee and the People Committee of Petrobras
Director and Vice President of the Strategy and Sustainability Committee of Centrais Elétricas Brasileiras S.A. – Eletrobras

Business experience: Member of Vale's former Operational Excellence and Risk Committee
Chairman of the Board of Directors of ETERNIT S.A.
Director of Companhia Energética de Minas Gerais – CEMIG
Director and Member of the Fiscal Council of Petróleo Brasileiro S.A – Petrobras
Professor at Fundação Escola de Governo ENA
Director of Kepler Weber S.A.
Director of Companhia Catarinense de Águas e Saneamento – CASAN
Director of Centrais Elétricas Brasileiras de Santa Catarina – CELESC
Director of Battistella
Director of GASMIG
Member of the Fiscal Council of Braskem
Member of the Fiscal Council of Petrobras
Director of AES Eletropaulo

MAURO GENTILE RODRIGUES DA CUNHA

INDEPENDENT DIRECTOR, MEMBER OF THE SUSTAINABILITY COMMITTEE, COORDINATOR OF THE PEOPLE AND COMPENSATION COMMITTEE

Born: 1971

First elected 2021

Other current activities and director or officer positions:	Director and Member of the Risks and Audit Committees of brMalls Director of Klabin
Business experience:	Member and interim Coordinator of Vale's former Audit Committee Director and Member of the Audit, People and Compensation and the Nomination and Governance Committees of Totvs Chairman of the Board of Directors of Caixa Econômica Federal President of AMEC Director of Eletrobras and Chairman of the Audit Committee Director of Mahle Metal Leve Director of Cia Energética do Estado de São Paulo Independent Director of Petrobras Chairman of the Board of Directors of IBGC

MURILO CÉSAR LEMOS DOS SANTOS PASSOS

DIRECTOR, MEMBER OF THE CAPITAL ALLOCATION AND PROJECTS COMMITTEE AND MEMBER OF THE AUDIT AND RISKS COMMITTEE

Born:	1947
First elected	2019
Other current activities and director or officer positions:	Director of Odontoprev S.A. Chairman of the Board of Directors of São Martinho S.A. Chairman of the Board of Directors of Tegma Gestão e Logística S.A.
Business experience:	Member of Vale's former Nomination Committee Director, Member of the Audit Committee and Member of the Managing Committee of Suzano Holding S.A. Chairman of the Board of Directors of CCR S.A. Chairman of the Board of Directors of CPFL Energia

RACHEL DE OLIVEIRA MAIA

INDEPENDENT DIRECTOR, MEMBER OF THE AUDIT AND RISKS COMMITTEE AND MEMBER OF THE SUSTAINABILITY COMMITTEE

Born:	1971
First elected	2021
Other current activities and director or officer positions:	Independent Director of Banco do Brasil Independent Director of CVC Corp. Founder and CEO of RM Consulting Founder of the non-profit organization INSTITUTO CAPACITA-ME Member of the Grupo Mulheres do Brasil Member of the Social and Economic Committee of the Conselho de Desenvolvimento

Business experience:	<p>Independent Director of Grupo Soma Counsel for Diversity and Inclusion of Carrefour Management Advisor of SumUp Chairwoman of Consultant Council of UNICEF Member of General Board of the Danish Consulate Member of Danish Chamber of Commerce CEO of Lacoste S.A. (Brasil) Member of the Committee of the President of the American Chamber of Commerce (AmCham) General Director of Pandora Brasil Member of the Instituto para o Desenvolvimento do Varejo Director of the Americas of the Executive Leadership Group (ELG) CFO of Tiffany & Co. Brasil</p>
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ROBERTO DA CUNHA CASTELLO BRANCO

INDEPENDENT DIRECTOR, MEMBER OF THE CAPITAL ALLOCATION AND PROJECTS COMMITTEE, AND COORDINATOR OF THE INNOVATION COMMITTEE

Born:	1944
First elected	2021
Other current activities and director or officer positions:	<p>Vice Chairman of Omega Energia S.A. Chairman and Director of 3R Petroleum</p>
Business experience:	<p>Member of Vale's former Nomination Committee Officer of Vale CEO and Director of Petrobras Officer of the Getulio Vargas Foundation's Center for Economic Growth and Development Studies Director of Invepar S.A. Director of GRU Airport Member of the CEO Steering Committee of the Oil and Gas Climate Initiative (OGCI) and the US Brazil CEO Forum</p>

ROGER ALLAN DOWNEY

DIRECTOR, MEMBER OF THE INNOVATION COMMITTEE

Born:	1967
First elected	2019
Business experience:	<p>Coordinator of Vale's former Operational Excellence and Risk Committee CEO of Vale Fertilizantes S.A. Executive Officer of Coal, Fertilizer and Strategy at Vale Vale's Manager for Strategy Marketing Market Coordinator of MBR Director of Tupy S.A. Director and CEO of Fertimar S.A. (PrimaSea)</p>

EXECUTIVE COMMITTEE

Our Chief Executive Officer and Vice-Presidents are our executive officers and are responsible for day-to-day operations and the implementation of the general policies and guidelines set forth by our Board of Directors. Our bylaws provide for a minimum of six and a maximum of eleven executive officers. The executive officers hold weekly meetings and hold additional meetings when called by any executive officer. Under Brazilian corporate law, an executive officer that resides

or is domiciled in another country is required to appoint a representative residing in Brazil, with powers until least three years after the end of such executive officer's term of office. The executive officers are appointed and may be removed by our Board of Directors at any time. Our executive officers are appointed for three-year terms.

In December 2022, we implemented a new configuration for our Executive Committee (formerly named Board of Executive Officers), including a redesign of the attributions and responsibilities among the executive officers to accelerate the achievement of our strategic objectives. The following table lists our current executive officers.

Officer	Year of appointment	Position
Eduardo de Salles Bartolomeo	2019	Chief Executive Officer
Gustavo Duarte Pimenta	2021	Executive Vice-President, Finance and Investor Relations
Alexandre Silva D'Ambrósio	2021	Executive Vice-President, Corporate and External Affairs
Alexandre Gomes Pereira	2017	Executive Vice-President, Projects
Carlos Henrique Senna Medeiros	2019	Executive Vice-President, Operations
Marcello Magistrini Spinelli	2019	Executive Vice-President, Iron Solutions
Maria Luiza de Oliveira Pinto e Paiva	2021	Executive Vice-President, Sustainability
Marina Barrenne de Artagão Quental	2021	Executive Vice-President, People
Rafael Jabur Bittar	2022	Executive Vice-President, Technical

Below is a summary of the business experience, activities and areas of expertise of our current executive officers.

EDUARDO DE SALLES BARTOLOMEO

CHIEF EXECUTIVE OFFICER

Born: 1964

Appointed: 2019

Business experience: Chairman of the Board of Directors of Login Logística Intermodal
Executive Officer for Base Metals of Vale Canada
Director of Vale
CEO of Nova Transportadora do Sudeste
CEO of BHG—Brazilian Hospitality Group
Various positions at Vale, including Head of Logistical Operations

GUSTAVO DUARTE PIMENTA

EXECUTIVE VICE-PRESIDENT, FINANCE AND INVESTOR RELATIONS

Born: 1978

Appointed: 2021

Business experience: CFO of The AES Corporation
CFO of AES Mexico, Central America & Caribbean
VP Strategy and M&A of Citibank

ALEXANDRE SILVA D'AMBRÓSIO

EXECUTIVE VICE-PRESIDENT, CORPORATE AND EXTERNAL AFFAIRS

MANAGEMENT

Born:	1962
Appointed:	2021
Other current activities and director or officer positions:	Executive Officer at Vale International
Business experience:	Executive Officer Legal & Taxes of Vale General Counsel of Vale Executive Vice-President of Banco Santander S.A. General Counsel and Global Vice-President of Grupo Votorantim

ALEXANDRE GOMES PEREIRA

EXECUTIVE VICE-PRESIDENT, PROJECTS

Born:	1969
Appointed:	2017
Business experience:	Executive Officer for Global Business Solutions of Vale Senior Vice-President and Global Chief Information Officer of Vale based in Canada Global IT Services Director of Vale Global Chief Information Officer, Energy transition metals, of Vale Inco

CARLOS HENRIQUE SENNA MEDEIROS

EXECUTIVE VICE-PRESIDENT, OPERATIONS

Born:	1963
Appointed:	2019
Business experience:	Executive Officer for Safety and Operational Excellence of Vale Executive President for North and Central America of Ball Corporation Chairman of the Board of Directors of Envases de Centro América

MARCELLO MAGISTRINI SPINELLI

EXECUTIVE VICE-PRESIDENT, IRON SOLUTIONS

Born:	1973
Appointed:	2019
Business experience:	Executive Officer for Iron Ore of Vale CEO of VLI Logística S.A. CEO of Ferrovia Centro Atlântica Director of Ferrovia Norte e Sul Officer for Logistics of VLI Multimodal S.A. Officer for Logistics of VLI Operações Ferroviárias Independentes

MARIA LUIZA DE OLIVEIRA PINTO E PAIVA

EXECUTIVE VICE-PRESIDENT, SUSTAINABILITY

Born:	1963
Appointed:	2021

Business experience:	Executive Officer for Sustainability of Suzano S.A. Executive Officer for Communication, Sustainability and Government Relations of Fibria S.A. Executive Officer for Sustainability of ABN AMRO/Banco Real
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MARINA BARRENNE DE ARTAGÃO QUINTAL

EXECUTIVE VICE-PRESIDENT, PEOPLE

Born: 1964

Appointed: 2021

Business experience: Officer for People at Vale
Vice President for Human Resources at Raízen Energia S.A.
President of Raízen Foundation
Human Resource director of Shell Brasil
Member of Deliberative Board of the Rio de Janeiro Sectional of the Brazilian Association of Human Resources Professionals (ABRH/RJ) – professional class association

RAFAEL JABUR BITTAR

EXECUTIVE VICE-PRESIDENT, TECHNICAL

Born: 1980

Appointed: 2022

Business experience: Geotechnical Officer at Vale
Senior Global Director (Tailings and Waste Management) at Yamana Gold

AUDIT AND RISKS COMMITTEE

On March 11, 2020, our Board of Directors established an audit committee in accordance with the governance rules of Novo Mercado segment of B3.

Under our bylaws and internal regulations, the Audit and Risks Committee shall have three to five members. The terms of the members of the Audit and Risks Committee expire at the end of the term of the members of the Board of Directors, upon removal approved by the Board of Directors or resignation.

Until December 2022, each member was required to comply with the independence requirements of our bylaws and the requirements of the Novo Mercado listing rules, according to which at least one member must be an independent member of our Board of Directors, at least one member must not be a member of our Board of Directors and at least one member must be an accounting/financial expert. In this regard, until December 2022, the Committee had two external experts that were not members of our Board of Directors.

In our last general shareholders meeting held on December 21, 2022, our Bylaws were amended and our committees restructured. The audit committee was renamed to “Audit and Risks Committee” and overtook all matters related to risks to which we are subject, in addition to the goal of overseeing the quality and integrity of our financial reports, the compliance with legal, statutory, and regulatory standards, the adequacy of risk management-related processes and overseeing the activities of our internal and independent auditors.

Currently, pursuant to our amended Bylaws and the Audit Risks and Committee’s charter: (i) all members of the Audit and Risks Committee must be independent members of our Board of Directors, as provided by the Regulations of the Novo Mercado listing segment of B3 S.A. – Brasil, Bolsa, Balcão (“Novo Mercado Regulations”), and (ii) at least one

member of the Audit and Risks Committee must have demonstrated experience in corporate accounting matters pursuant to the requirements of the Brazilian Securities and Exchange Commission (*Comissão de Valores Mobiliários – “CVM”*), as per the regulations applicable, and such member shall be appointed as “Financial Expert” upon his/her nomination. All members of our Audit and Risks Committee are appointed by the Board of Directors.

We are subject to Rule 10A-3 under the Exchange Act, which requires, absent an exemption, that a listed company maintain an Audit and Risks Committee composed of members of the Board of Directors that meet specified requirements. Our current Audit and Risks Committee, elected on December 22, 2022, is comprised only by independent members of the Board of Directors and complies with Rule 10A-3.

The following table lists the current members of the Audit and Risks Committee:

Member ⁽¹⁾	Year first elected
Manuel Lino Silva de Sousa Oliveira ⁽²⁾⁽³⁾	2021
Murilo César Lemos dos Santos Passos	2021
Rachel de Oliveira Maia	2021

(1) Members after December 21, 2022

(2) Coordinator

(3) Financial Expert

For a summary of the business experience, activities and areas of expertise of the members of our Audit and Risks committee please see summary under “Board of Directors.”

OTHER ADVISORY COMMITTEES TO THE BOARD OF DIRECTORS

Our bylaws provide five permanent advisory committees to the Board of Directors, each governed by its own internal rules: the **Audit and Risks Committee**, the **Capital Allocation and Projects Committee**, the **People and Compensation Committee**, the **Sustainability Committee** and the **Nomination and Governance Committee**. We also have an operating non-permanent committee, the **Innovation Committee**. Additional committees may be created by the Board of Directors, at their discretion.

Audit and Risks Committee. For further information on our Audit and Risks Committee, please see *Audit and Risks Committee* in this section.

Capital Allocation and Projects Committee. Responsible for advising the Board of Directors on matters related to long-term capital allocation strategies, including investments and divestment projects; guidelines on the remuneration of shareholders, capital structure strategy and financial guidelines; funding and indebtedness strategy; guidelines for implementation, management and monitoring the capital and investment projects portfolio; annual and multiannual budget, among other matters. Until December 2022, this committee was named Finance Committee. The new name reflects the committee’s focus on project-related matters, aiming to provide guidance on capital allocation, new projects and monitoring the existing project portfolio. Its current members are Daniel André Stieler (Coordinator), Fernando Jorge Buso Gomes, Murilo César Lemos dos Santos Passos and Roberto da Cunha Castello Branco.

People and Compensation Committee. Responsible for assisting the Board in long-term strategies concerning people; recommending and monitoring the implementation of the guidelines to foster initiatives related to organizational culture, specifically as it refers to diversity, equity and inclusion and people health and safety; defining performance assessment goals for the Executive Committee and other officers directly reporting to the CEO; nominating the CEO, and recommending the succession plan for the Executive Committee and other officers directly reporting to the CEO, including their successors, among other responsibilities. Its current members are Mauro Rodrigues da Cunha (Coordinator), Eduardo de Oliveira Rodrigues Filho, Fernando Jorge Buso Gomes and José Luciano Duarte Penido.

Sustainability Committee. Responsible for advising on the sustainability strategy and the integration thereof into our strategic planning, aiming the at creation of value, competitiveness and socio-economic and environmental sustainability; our corporate sustainability policies related to safety, environment, health, education and relationship with

communities, indigenous peoples and other stakeholders, human rights, communication and institutional relations; the direction of our strategic sustainability indicators and the communication and disclosure thereof, also through Integrated Report; the guidelines for our adherence to or permanence in initiatives, technical standards or agreements, in the domestic or international sphere, regarding sustainability issues, that may be under competence of the Board of Directors; guidelines for long-term social and environmental commitments that are under the competence of the Board of Directors; among other responsibilities. Its current members are Marcelo Gasparino da Silva (Coordinator), Rachel de Oliveira Maia, Ken Yasuhara and Mauro Rodrigues da Cunha.

Nomination and Governance Committee. Responsible for assessing and recommending our internal policies and norms regarding the nomination of members of the Board of Directors, Advisory Committees and the CEO, in compliance with the applicable legal requirements and best corporate governance practices; evolution and continuous improvement of our corporate governance practices, also regarding the structure, duties, size and composition of the Board of Directors and the Advisory Committees, aiming at a balance of experiences, knowledge and diversity in the profile of its members; the strategy and guidelines for our corporate governance documents, including Corporate Policies, Bylaws, Code of Conduct and the Internal Regulations of the Advisory Committees and the Board of Directors, among other matters. Our last Nomination and Governance Committee was elected on May 26, 2022 to advise on the nomination of the candidates for the election of the Board of Directors at the general shareholders' meeting to be held in April 2023. Its current members are José Luciano Duarte Penido (Coordinator), Daniel André Stieler, Marcelo Gasparino da Silva and Manuel Lino da Silva de Sousa Oliveira.

Innovation Committee. Established in March 2021, responsible for assessing the Board of Directors in the strategic guidelines related to "Digital Transformation, Research, Development and Innovation"; the strategic direction regarding new technologies and new products aiming at competitiveness and sustainability. It is also responsible for our strategic projects and investment proposals from an innovation standpoint; the overall budget dedicated to Digital Transformation, Research, Development and Innovation, among other matters. Its current members are Roberto da Cunha Castello Branco (Coordinator), Roger Allan Downey, Ken Yasuhara and André Viana Madeira. Since December 21, 2022, the Innovation Committee is a non-permanent Advisory Committee of the Board of Directors.

FISCAL COUNCIL

We have a Fiscal Council established in accordance with Brazilian law. The primary responsibilities of the Fiscal Council under Brazilian corporate law are to supervise management's activities, review the company's financial statements, and report its findings to the shareholders.

Brazilian law requires the members of a Fiscal Council to meet certain eligibility requirements. A member of our Fiscal Council cannot (i) hold office as a member of the Board of Directors, Fiscal Council or advisory committee of any company that is a competitor of Vale or otherwise has a conflicting interest with Vale, unless compliance with this requirement is expressly waived by shareholder vote, (ii) be an employee or member of senior management or the Board of Directors of Vale or its subsidiaries or affiliates, or (iii) be a spouse or relative within the third degree by affinity or consanguinity of an officer or director of Vale.

Members of the Fiscal Council are elected by our shareholders for one-year terms. The current members of the Fiscal Council and their respective alternates were elected on April 29, 2022. The terms of the members of the Fiscal Council expire at the next annual shareholders' meeting following election. Our Fiscal Council shall be composed of three to five members. The holders of our golden shares are entitled to appoint one member.

The following table lists the current and alternate members of the Fiscal Council.

Current member	Year first elected	Alternate	Year first elected
Esteves Pedro Colnago Junior ⁽¹⁾	2022	Adriano Pereira de Paula ⁽¹⁾	2022
Heloísa Belotti Bedicks ⁽²⁾	2022	Rodrigo de Mesquita Pereira ⁽²⁾	2022
Márcio de Souza ⁽²⁾	2022	Nelson de Menezes Filho ⁽²⁾	2019
Raphael Manhães Martins ⁽²⁾	2015	Adriana de Andrade Solé ⁽²⁾	2022

Current member	Year first elected	Alternate	Year first elected
Robert Juenemann ⁽²⁾	2022	Jandaraci Ferreira de Araujo ⁽²⁾	2022

(1) Appointed by the holder of golden shares.

(2) Appointed by shareholders of common shares.

Below is a summary of the business experience, activities and areas of expertise of the members of our Fiscal Council.

ESTEVES PEDRO COLNAGO JUNIOR

Born:	1973
Appointed:	2022
Other current activities and director or officer positions:	-
Business experience:	Member of SESC's Fiscal Council Special Secretary of Treasury and Budget of the Ministry of Economy Head of the Special Advisory for Institutional Relations at the Ministry of Economy Special Assistant Secretary of Treasury at the Ministry of Economy Minister of State at the Ministry of Planning, Development and Management Executive Secretary of the Ministry of Planning, Development and Management Deputy Executive Secretary of the Ministry of Planning, Development and Management

HELOÍSA BELOTTI BEDICKS

Born:	1960
Appointed:	2022
Other current activities and director or officer positions:	Member of the Audit Committee of Brasileg Director of the MAPFRE Group
Business experience:	Director of BNDES Member of the Fiscal Council of Braskem General Director of IBGC Director ACAF Member of the ICGN Council President of ICGLA Director of MAPFRE Member of the Advisory Board of the Ethical Fund of ABN AMRO Asset Management Member of the Advisory Board of the Center for Sustainability Studies at the Getúlio Vargas Foundation Member of the Advisory Board of the BMF&Bovespa's Corporate Sustainability Index (ISE)

MÁRCIO DE SOUZA

Born:	1966
Appointed:	2022
Other current activities and director or officer positions:	Management Director at Caixa de Previdência dos Funcionários do Banco do Brasil - PREVI Director and Member of the Remuneration and Succession Committee of Neoenergia

Business experience:	Director and Member of the Audit, Ethics and Risks Committee of Embraer Executive Manager at PREVI
RAPHAEL MANHÃES MARTINS	
Born:	1983
Appointed:	2015
Other current activities and director or officer positions:	Attorney for Faoro Advogados Director of OI S.A. – Em Recuperação Judicial Member of the Fiscal Council of COPEL Member of the Fiscal Council of Bradespar S.A.
Business experience:	Director and Member of the Fiscal Council of companies of Grupo Light S.A. Member of the Fiscal Council of OI S.A. – Em Recuperação Judicial Director of Eternit S.A. Member of the Fiscal Council of Cielo S.A. – Instituição de Pagamento Member of the Fiscal Council of companies of the JHSF Participações S.A. Group
ROBERT JUENEMANN	
Born:	1965
Appointed:	2022
Other current activities and director or officer positions:	Founding partner of Robert Juenemann Advocacia Alternate Member of the Fiscal Council of Petrobrás S.A. Member of the Technology, Strategy and Innovation Committee at Banco do Brasil
Business experience:	Director of IBGC Member of the Board of IESBA Alternate member of the Fiscal Council of Eletrobrás S.A. Director of Cortel Holding S.A., where he also held the position of Coordinator of the Audit Committee Member of the Fiscal Council of Raia Drogasil S.A. Member of the Fiscal Council of AES Tietê Energia S.A. Alternate Member of the Audit Committee of Banco do Brasil S.A. Member of the Audit Committee of JBS S.A.

MANAGEMENT COMPENSATION

Under our bylaws, our shareholders are responsible for establishing annually the aggregate compensation we pay to the members of our Board of Directors, Executive Committee, Fiscal Council and Board Committees. Once the total compensation has been approved at our annual shareholders' meeting, the Board of Directors, with the support of the People, and Remuneration Committee, allocates the compensation among its members and the members of the Executive Committee, Fiscal Council and Board Committees. Compensation proposals and policies are prepared with the support of the People, and Remuneration Committee, which makes recommendations to our Board of Directors regarding the annual global compensation of the executive officers.

As a global company, we require management with a deep knowledge of our business and market and unlimited dedication. Attracting and retaining talent, and engaging and motivating the professionals holding strategic positions, especially our executive officers, is critical for our success.

The compensation proposals are based on benchmarking against the compensation policies and practices of the top global mining companies and large global companies in other similar industries, and various other factors, such as the directors' and officers' responsibilities, time devoted to their duties, professional competence and reputation, market practices in the places where we operate, and the alignment of short- and long-term strategies, shareholder returns and the sustainability of the business.

In 2020, we implemented a number of improvements to our Compensation Policy with respect to the compensation of our executive officers, including (a) an increased focus on Environmental, social, and corporate governance ("ESG") matters, with impacts on compensation, (b) a more robust process of evaluating the individual performance of executive officers with compensation impacts, (c) a new governance model for the approval of compensation matters, (d) discussions on cultural transformation and human capital and (e) a comprehensive action plan involving relevant and significant improvements in the compensation of executive officers for 2021.

In 2021, relevant and significant improvements in the executive compensation were implemented, such as (a) the inclusion of clawback clauses, (b) the review of benefits and severance packages, (c) changes in the organizational structure, with new executive officers positions, (d) the early renewal process of contracts, and (e) the increase in the long-term incentive portion of the compensation of the executive officers.

In 2022, our performance shares unit program ("PSU") was reviewed to be more aligned with international market practices and the interests of shareholders, with a focus on generating long-term value and sustainable results. We expect to further implement the following in 2023: (i) revision of the Total Shareholder Return ("TSR") indicators peer group to further align it with our business and to the market, with less volatility and reduced risk of outliers; (ii) adjustments in the relative TSR reward curve, to further align it to international market percentiles and shareholders' interests; (iii) exclusion of the payment trigger, so that TSR results do not derail the results achieved in ESG metrics. For 2024, we envision the inclusion of Return of Invest Capital ("ROIC") to add internal value metrics, reducing the weight of the TSR and further aligning it to the KPIs/weights used in the international market.

EXECUTIVE COMMITTEE

2022 Compensation Reporting

As of December 31, 2022, we had nine executive officers: the Chief Executive Officer and eight Vice-Presidents. For the year ended December 31, 2022, including severance payments made to former executive officers, the average annual compensation to our executive officers was R\$21.4 million, the highest annual compensation to an executive officer was R\$59.9 million and the lowest annual compensation was R\$7.4 million, in each case net of taxes. The average annual compensation corresponds to the total aggregate compensation to executives in 2022, divided by the monthly average number of active officers that received compensation during the year. The monthly average number of active officers that received compensation during 2022 was 9.59.

For the year ended December 31, 2022, the total payments related to executive officers' compensation packages is set forth in the table below.

	For the year ended December 31, 2022
	<i>(R\$ million)</i>
Annual fixed compensation	31.30
In-kind benefits and pension plans	8.34
Variable compensation	140.32
Other expenses ⁽¹⁾	14.78
Total amount paid in 2022 to active executive officers	194.74
Severance	10.25
Total amount paid in 2022 to active and former executive officers	204.99

(1) Additional compensation (spot payments) related to attraction, retention and incentives for deliveries and initiatives relevant to the company, according to Vale's Executive Compensation Policy

Principles and components of executive's compensation policy

The executive compensation is based on the principles below:

- Align executives' priorities and efforts with shareholders' vision, constantly striving for balance in stakeholder relations;
- Leverage and reward value creation and sustainable results, with a long-term perspective, considering our vision to lead the transition to a low carbon economy, generating social progress and respect for the environment;
- Strengthen meritocracy and other forms of performance enhancement, balanced with good management and mitigation of business risks;
- Align our compensation practices to the best international governances' practices;
- Promote clarity and simplicity;
- Provide competitive compensation to attract and retain highly skilled executives in the global talent market under appropriate compensation levels pursuant to market practices.

The total compensation for executives is composed by (i) Fixed Compensation, (ii) Short-Term Incentive - Bonus, (iii) Long-Term Incentives - Matching and PSU and (iv) Private Pension and Benefits standards based on the local market. Additionally, the executives may be individually entitled to additional compensation pursuant to exceptional arrangements approved by the Board of Directors.

The executive's compensation also includes a severance package to be paid after contract termination.

Fixed compensation

Fixed compensation and in-kind benefits include a base salary in cash, paid on a monthly basis, reimbursement for certain investments in private pension plans, health care, relocation expenses, meal allowance, life insurance, driver and car expenses. In addition, we contribute to private pension plans in an amount of up to 9% of their fixed compensation either to Vale's private pension plan, Valia – Fundação Vale do Rio Doce de Seguridade Social, or to other supplementary pension plan of the choice of the executive officers.

Variable compensation - Short and Long-Terms Incentives

Variable compensation consists of: (i) Short-Term Incentive – Bonus, based on specific goals for each executive officer and collective goals, all approved by our Board of Directors, and (ii) payments tied to the performance of our shares under two Long-Term Incentives programs, the Matching Program and the PSU.

Short-Term Incentive - Bonus:

- The short-term variable compensation component is based on collective goals and specific goals for each executive, taking into account economic and financial goals that reflect operating performance, as well as ESG-driven performance goals, directly related to health, safety, risk management and sustainability targets, and other goals related to strategic initiatives such as cultural transformation.
- In the last years, short-term compensation, besides being in line with our ambition to be a leader in low-carbon mining, has included a Risk Management element for all executives and employees, directly connecting it to our goals associated with Health, Safety, Sustainability and Risk Management.
- In 2021, collective goals of Productivity, Vale Production System ("VPS") and Cultural Transformation were extended to executives and all senior leadership. Executives working for Security and Risk areas no longer have financial goals, in order to increase focus on health and safety initiatives.
- In 2022, we sought to encourage mutual collaboration based on the key behavior "Sense of ownership," through a model with more relevance in collective goals, linked to non-financial indicators, ESG themes and financial goals. For 2023, we will include goals related to capital allocation, safety events related to processes, black people in leadership position and volume guidance besides keeping the cost indicator, among others that make alignment with Vale's ambitions.

Long-Term Incentive – Matching:

- Matching is a program that seeks to retain talents, acts as a lever for executives' shareholding position and encourages the feeling of ownership.
- Under the program, the Executive Committee shall purchase in the market and/or use their own vested shares to accumulate a specific number of shares/ADRs. At the end of a three-year cycle, participants who continue to hold shares/ADRs are entitled to receive a reward in at least the same number of shares/ADRs they hold since the beginning.
- Participation is mandatory for the Executive Committee in the years in which we pay a certain level of cash bonuses. They cannot sell or transfer their shares or ADRs at any time during the vesting period and must observe the Securities Trading Policy in order to sell or transfer Matching Program shares after the vesting period.
- The program also includes the payment, during the cycle, of "virtual dividends" of the same net value per share that is distributed to shareholders upon payment of dividends and interest on equity.

Long-Term Incentive – PSU:

- PSU is a program that seeks to align senior management priorities with the shareholders' vision, encourage performance and reinforce a long-term culture, with sustainable development indicators.
- Under the program, the executive officers receive payments tied to our performance, based on: (1) our Total Shareholder Return ("TSR") indicator compared to a preselected group of mining companies, during the three-year cliff vesting period and (2) the achievement of long-term ESG targets related to health & safety and sustainability metrics.
- For cycles starting from 2021, PSU will be rewarded in shares/ADRs (instead of payment in cash linked to the share price) and will include the payment, at the end of each cycle, of "virtual dividends" of the same net value per share that is distributed to shareholders upon payment of dividends/interest on shareholder's equity to the market during the cycles, conditioned to the program performance.
- For cycles starting from 2022, we increased our focus on ESG metrics, changed the weight of this KPI from 20% to 25%.
- For cycles starting from 2023, we revised the relative TSR peer group, adjusting the reward curve and excluding the payment trigger.
- For cycles starting from 2024, we plan to include the ROIC metric.

Other Practices:

- Since 2019, a stock ownership guidelines (“SOG”) requisite has been introduced, requiring executives to accumulate (through the share-based compensation programs) and maintain ownership of our shares, in an amount equivalent to at least 36 times the monthly fixed compensation for the CEO and 24 times the monthly fixed compensation for other executive officers.
- We also have “Malus” and “Clawback” clauses, according to which the Board of Directors may suspend or request the return of payment of short or long-term variable installments, in the event of exceptionally serious events.

As such, a large portion of the executive compensation package is at risk, and the mix offered can vary according to the performance achieved and the return to our shareholders (pay-for-performance) in each year.

Severance package

Our severance packages for qualified terminations may comprise: (i) a lump-sum severance payment, that may vary up to one-half the annual fixed compensation for executive officers and up to the annual fixed compensation for the CEO, paid shortly after the termination date; (ii) a potential non-compete agreement compensation, that may vary up to the annual fixed compensation, to be paid in equal quarterly installments after termination; (iii) payment of any long-term variable compensation grants (Matching and PSU programs), in the vesting of each current cycle; and (iv) payment of any short-term incentive plan (bonus), to be paid in April following the termination date.

Other benefits and payments

Pension, retirement or similar benefits consist of our contributions to Valia, the manager of the pension plans sponsored by us. Social security contributions are mandatory contributions we are required to make to the Brazilian government for our executive officers.

BOARD OF DIRECTORS

As of December 31, 2022, our Board of Directors had thirteen members and one alternate. For the year ended December 31, 2022, the average annual compensation paid to the members of our Board of Directors was R\$1.34 million, the highest annual compensation paid to a member of the Board of Directors was R\$2.58 million and the lowest annual compensation was R\$0.76 million. The monthly average number of members that received compensation during 2022 was 13.42.

In 2022, we paid R\$18.05 million in aggregate to the members of our Board of Directors for services in all capacities, all of which was fixed compensation. There are no pension, retirement or similar benefits for the members of our Board of Directors. We have also entered into indemnification agreements with our directors. The numbers above do not include social security taxes.

As of December 31, 2022, the total number of common shares owned by our Board of Directors was 98,797 and by executive officers was 2,264,211. None of our directors or executive officers beneficially owns 1% or more of any class of our shares.

FISCAL COUNCIL

As of December 31, 2022, our Fiscal Council had five elective members and five alternate members. We paid an aggregate of R\$1.63 million to members of the Fiscal Council in 2022. In addition, the members of the Fiscal Council are reimbursed for travel expenses related to the performance of their functions. The numbers above do not include social security taxes.

BOARD COMMITTEES

We paid an aggregate of R\$8.20 million to members of our permanent advisory committees in 2022. Directors who participate in advisory committees are entitled to receive, in addition to the compensation as a board member,

compensation for participating in one or more committees. In 2022, we paid an aggregate of R\$6.24 million to the committee members that are also members of our Board of Directors and R\$1.96 million to other committee members. No compensation was due to former members of independent ad hoc advisory committees as such committees were extinguished in 2021. The numbers above do not include social security taxes.

EMPLOYEES

The following tables set forth the number of our employees (total, by groups based on the activity performed and by geographic location) as of the dates indicated.

By business:	As of December 31,		
	2022	2021	2020
Iron Solutions	41,816	44,235	44,342
Coal ⁽¹⁾	-	5,492	3,320
Energy Transition Metals	13,318	12,903	13,762
Energy ⁽²⁾	-	-	3,954
Corporate Activities	9,382	9,636	8,938
Total	64,516	72,266	74,316

(1) Discontinued operations.

(2) Consists of Biopalma employees.

By location:	As of December 31,		
	2022 ⁽¹⁾	2021 ⁽¹⁾	2020 ⁽¹⁾
South America (except Brazil)	41	153	190
Brazil	53,341	55,067	58,249
North America	6,565	6,448	6,169
Europe	270	279	293
Asia	4,287	4,382	4,454
Oceania	12	10	1,263
Africa	-	5,927	3,698
Total	64,516	72,266	74,316

(1) Since January 2017, we include in our total workforce figures all fixed-term contract employees, trainees and employees hired through our affirmative action program for Persons with Disabilities.

We negotiate wages and benefits with a large number of unions worldwide that represent our employees. We have collective agreements with unionized employees at our operations in Brazil, Canada, Indonesia, UK, and Oman.

The following tables set forth the number of third-party employees (total, by groups based on the activity performed and by geographic location) as of the dates indicated.

By business:	As of December 31,		
	2022 ⁽³⁾	2021 ⁽²⁾⁽³⁾⁽⁴⁾	2020 ⁽⁵⁾
Iron Solutions	59,373	60,921	34,042
Energy Transition Metals	18,901	18,778	10,395
Coal ⁽¹⁾	-	7,416	6,076
Others ⁽²⁾	72,557	101,199	61,408
Total	150,831	188,314	111,921

(1) Discontinued Operations.

(2) Corporate Services and Biopalma.

(3) Calculated based on the new classification for third-party employees, with occasional and short-term employment in Brazil, adopted in 2022.

(4) Number of third-party employees in 2021 was adjusted from 141,147 to 188,314, based on the new classification described in item (3).

(5) The number of third-party employees in 2020 is reported based on the classification valid until 2021.

By location	As of December 31,		
	2022 ⁽³⁾	2021 ⁽²⁾⁽³⁾⁽⁴⁾	2020 ⁽⁵⁾
Brazil	136,467	161,924	90,877

EMPLOYEES

Canada	4,633	4,311	4,617
Indonesia	7,278	7,515	6,499
New Caledonia	-	-	192
Australia	6	6	6
Mozambique	-	11,085	8,016
Others ⁽¹⁾	2,447	3,473	1,714
Total	150,831	188,314	111,921

(1) Chile, Japan, Malawi, Malaysia, Oman, Peru, UK, Singapore, Switzerland, mainland China and Taiwan.

(2) In 2021, Vale concludes the sale of Vale Nova Caledônia to Prony Resources.

(3) Calculated based on the new classification for third-party employees, with occasional and short-term employment in Brazil, adopted in 2022.

(4) Number of third-party employees in 2021 was adjusted from 141,147 to 188,314, based on the new classification described in item (3).

(5) The number of third-party employees in 2020 is reported based on the classification valid until 2021.

WAGES AND BENEFITS

Wages and benefits for Vale and its subsidiaries are generally established on a company-by-company basis. Our benefits policy is aligned with our attraction and retention strategy, in accordance with applicable laws and market practice in the countries where we operate. We provide an attractive and competitive benefits package ensuring health, well-being, protection and life quality. Among the main benefits offered are medical and dental assistance, life insurance, private pension plans and short-and long-term disability benefits.

We establish our wage and benefits programs for Vale S.A. and its subsidiaries, other than Vale Canada. In November 2022, we reached a one-year agreement with all Brazilian unions providing for a salary increase of 6.46%. The provisions of our collective bargaining agreements with unions also apply to our non-unionized employees.

Vale Canada also establishes wages and benefits for its unionized employees through collective bargaining agreements. No collective bargaining took place in 2022 as the 2021 collective bargaining agreements are still valid. For non-unionized employees, Vale Canada undertakes an annual review of salaries and benefits. We provide these employees and their dependents with other benefits, including a flexible health care benefit plan.

PENSION PLANS

Brazilian employees of Vale and of most of its Brazilian subsidiaries are eligible to participate in pension plans managed by Valia. Most of the participants in plans held by Valia are participants in a plan named "Vale Mais," which Valia implemented in 2000. This plan is primarily a defined contribution plan with a defined benefit feature relating to service prior to 2000 and another defined benefit feature to cover temporary or permanent disability, pension and financial protection to dependents in case of death. Valia also operates a defined benefit plan, closed to new participants since May 2000, with benefits based on years of service, salary and social security benefits. This plan covers retired participants and their beneficiaries, as well as a relatively small number of employees that declined to transfer from the old plan to the "Vale Mais" plan when it was established in May 2000.

Most employees within our energy transition metals operations participate in defined benefit pension plans and defined contribution pension plans. The defined benefit plans have been closed to new participants since 2009, and most new employees within our energy transition metals operations are eligible to participate in defined contribution pension plans.

PERFORMANCE-BASED COMPENSATION

All Vale parent-company employees may receive incentive compensation each year in an amount based on the performance of Vale, which can range from 0 to 200% of a market-based reference amount, depending on certain targets set, and the cash generation in each period. Similar incentive compensation arrangements are in place at our subsidiaries.

Qualifying management personnel are eligible to participate in the PSU and Matching Program. See description of these programs under *Management and Employees—Management compensation—Executive Committee*.

VI. ADDITIONAL INFORMATION

LEGAL PROCEEDINGS

We and our subsidiaries are defendants in numerous legal actions in the ordinary course of business, including civil, administrative, tax and labor proceedings. The most significant proceedings are discussed below. Except as otherwise noted below, the amounts claimed, and the amounts of our provisions are stated as of December 31, 2022. See note 28 to our consolidated financial statements for further information.

LEGAL PROCEEDINGS RELATED TO THE DAM COLLAPSE IN BRUMADINHO

We are engaged in several investigations and legal proceedings relating to dam collapse in Brumadinho, and other investigations and legal proceeding may be brought in the future. We have been actively seeking non-judicial alternatives to promote a more expedited reparation and remediation to the victims and to settle the various legal proceedings relating to the dam collapse. We reinforce our commitment to fair, swift and equitable reparation of all the affected parties, and will vigorously contest proceedings we believe are without merit.

a) Integral Reparation Agreement and other settlement agreements.

On February 4, 2021, we entered into the Integral Reparation Agreement with the Government of the State of Minas Gerais, the Public Defender Office of the State of Minas Gerais (*Defensoria Pública de Minas Gerais* – “DPMG”), public prosecutors of the State of Minas Gerais (*Ministério Público do Estado de Minas Gerais*—“MPMG”) and federal prosecutors (*Ministério Público Federal*—“MPF”) for the reparation and remediation of environmental and social damages resulting from the dam collapse.

Pursuant to this agreement, we settled the majority of the claims for socio-economic and socio-environmental damages brought by the State of Minas Gerais and the MPMG under public civil actions before the 2nd Public Treasury Court in the city of Belo Horizonte. Under these public civil actions, the authorities were claiming economic and environmental damages resulting from the dam collapse and sought a broad range of injunctions ordering us to take specific remediation and reparation actions. In July 2019, the court decided that we are liable for the damages caused by the dam collapse, and the Integral Reparation Agreement settled the quantification of damages. The Integral Reparation Agreement does not cover claims for individual damages and any unknown, future and subsequent environmental damages.

We have also entered into other settlement agreements with public authorities to establish frameworks for individual indemnification of the victims. An affected party or a group of affected parties has the option to pursue individual claims against us directly, or to settle its claims under an expedited out-of-court settlement process based on the framework we agreed with the authorities under these other settlement agreements. These other settlement agreements settled certain other judicial proceedings brought against us by public authorities. See *Overview—Business overview—Responses to the tailings dam collapse in Brumadinho*.

b) Public civil action and investigation under the Brazilian Anticorruption Law

We are a defendant in a public civil action brought by the MPMG against us, initially filed before a state court in the city of Brumadinho, claiming that we had concealed relevant information about the stability of the Brumadinho dam by presenting a false declaration of stability prior to the Brumadinho dam collapse. The MPMG alleges that this has adversely affected oversight by public authorities concerning the stability of the dam and allegedly allowed us to omit relevant information about the dam and its risks. The MPMG claims that this alleged conduct comprises interference with the oversight of public authorities that is prohibited under the Brazilian Anticorruption Law (Federal Law No. 12,846/2013) and seeks payment of fine and other sanctions.

In January 2021, the court in the city of Brumadinho declared that it had no jurisdiction over the case, and in June 2021 it sent the case records to the 1st Public Treasury Court in the city of Belo Horizonte. The MPMG appealed in order to move the proceeding back to the jurisdiction of the Brumadinho court, but the appeal was dismissed on January 31, 2023, and the remained at the 1st Public Treasury Court.

In August 2021, the 1st Public Treasury Court dismissed the preliminary injunction that had been granted by the Brumadinho court in May 2021, cancelling the decision that had determined that we posted a bond of approximately R\$7.9 billion. In September 2021, the MPMG appealed to revert the decision but, in June 2022, the Court of Appeals of the State of Minas Gerais dismissed the injunction request. As a result, we are currently not obliged to post the R\$7.9 billion bond. This legal proceeding is ongoing, and it is not possible at this time to determine a range of outcomes or to make reliable estimates of the potential exposure. We will continue to vigorously contest this action, which we believe is without merit.

In addition to the public civil action, we are being investigated by state and federal public authorities for alleged violations under the Brazilian Anticorruption Law in connection with inspection and monitoring activities of public authorities relating to the Brumadinho dam. In August 2022, the federal public authorities imposed a fine for the alleged conduct approximately R\$86.3 million (the minimum amount provided by law). The fine was imposed under Article 5 of Federal Law 12,846/2013 for alleged obstruction of inspection by public authorities, nonetheless, the decision recognized the non-existence of corruption acts and did not indicate any involvement or tolerance of our top management. We disagree with the decision that has imposed the above mentioned fine and we submitted a request for reconsideration to the Ministry of Transparency, Supervision and Control, for which a decision is pending. Investigation by state authorities is still ongoing.

c) Civil action in the United States

In April 2022, the SEC filed a lawsuit against us in the U.S. District Court for the Eastern District of New York, alleging that certain disclosures related to our dam safety management prior to the dam failure in Brumadinho violated U.S. securities laws. On March 28, 2023, we reached a settlement with the SEC to fully resolve this litigation. Under the agreement, without admitting or denying the settled claims (which referred to strict liability and negligence under Section 17(a)(2) and 17(a)(3) of the Securities Act, and 13(a) of the Exchange Act and Rules 12b-20, 13a-1, and 13a-16 thereunder), we will make payments totaling US\$56 million. The settlement resolves the litigation without judgment on the claims based upon intentional or reckless fraud under Section 10(b) of the Exchange Act and Rule 10b-5 thereunder and Section 17(a)(1) of the Securities Act. The settlement was approved by the court in April 2023.

d) Class action in the United States

We and certain of our current and former executive officers have been named defendants in putative securities class action suits, under U.S. federal securities laws, brought before federal courts in New York by holders of our securities. These complaints were consolidated through an amended complaint brought by the lead plaintiff in October 2019 before the United States District Court for the Eastern District of New York, captioned *In re: Vale S.A. Securities Litigation, No. 19 Civ. 526 (RJD) (E.D.N.Y.)*. The lead plaintiff alleges that we made false and misleading statements or omitted to make disclosures concerning the risks of the operations of the Brumadinho dam and the adequacy of the related programs and procedures. The lead plaintiff has not specified a number of alleged damages in the action.

In May 2020, our motion to dismiss was denied by the United States District Court for the Eastern District of New York. The proceeding is now in the discovery phase and several depositions have been taken.

In November 2021, seven related investment funds and their advisor affiliated with a privately owned asset manager (all of whom are currently part to the putative class discussed above) filed an "opt-out" complaint captioned *Orbis Global Equity LE Fund (Australia Registered) et al. v. Vale S.A. et al., No. 21 Civ. 6590 (E.D.N.Y.)*, that essentially mirrors the class action complaint in all material respects. In August 2022, our motion to dismiss, the plaintiff's opposition and our reply brief were filed with the court. A court order on our motion to dismiss is pending.

Given the preliminary status of the actions, it is not possible at this time to determine a range of outcomes or to make reliable estimates of the potential exposure. We will continue to vigorously contest these claims.

e) Criminal proceedings and investigations

In January 2020, the MPMG brought criminal charges against 16 individuals (including former executive officers of Vale and current and former employees) for a number of potential crimes, including homicide, and against Vale S.A. for alleged environmental crimes. These charges were accepted by the state criminal judge in the city of Brumadinho on February 14, 2020. In October 2021, the STJ annulled the decisions rendered by the state courts on the basis that the facts had to be tried by federal courts, and not state courts. The MPMG appealed to the Supreme Court of Justice (*Supremo Tribunal Federal* – “STF”) and, in December 2022, the STF confirmed that the case must be tried by a federal court, resulting in the annulment of all decisions rendered by the state court of the city of Brumadinho, including the acceptance of the criminal charges brought by the MPMG.

In September 2019, the federal police concluded an investigation on potential fraud and forgery of documents in connection with the certification of stability of the Brumadinho dam prior to the dam collapse and recommended that the MPF bring criminal actions against us and some of our employees. In November 2021, the federal police concluded an investigation on potential criminal liability for the Brumadinho dam collapse. Case records from both investigations have been sent to the MPF, which may or may not decide to prosecute.

Considering the decision of the STF ruling that federal courts have jurisdiction over the criminal case, on January 23, 2023, the MPF sustained all criminal charges that had been brought by the MPMG in the state proceeding, and, on January 24, 2023, the federal court accepted all the charges. The federal judge has not yet summoned the defendants to present their defenses. In March 2023, the MPMG filed a new appeal before the STF seeking to revert the court’s decision.

f) Public civil actions brought by labor unions

We are a defendant in three public civil actions brought by labor unions before a labor court in the city of Betim, Minas Gerais, claiming that such unions are the legitimate parties to defend the interest of certain employees and outsourced workers affiliated with the union and who were victims of the dam collapse. The unions request compensation payments ranging from R\$1.5 to R\$3 million for each deceased worker. The plaintiffs in one of the public civil actions also requested an injunction for the attachment of R\$471.6 million in our bank accounts, which request has been dismissed by the court. Initial decisions issued by the lower court had ordered us to pay R\$1 to R\$1.5 million per deceased worker.

In one of those lawsuits filed by a labor union representing 90 deceased workers, the Regional Labor Court considered that the claims had no grounds and rendered in our favor. Such decision became definitive in December 2022. There are two other public civil actions ongoing, which we believe are without merit, and we will continue to vigorously contest such lawsuits.

g) Investigations by the CVM

The CVM is conducting investigations relating to our disclosure of relevant information to shareholders, investors and the market in general, especially regarding the conditions and management of our dams. It is not yet possible to estimate the value or a range of potential loss.

h) Public civil action brought by federal prosecutors regarding our internal policies

We are a defendant in a public civil action brought by the MPF before the 14th Federal Court in the city of Belo Horizonte against us, the ANM and the CVM, requesting a judicial intervention on us, until we restructure and improve our internal policies relating to safety and prevention of disasters. The MPF claims that the court appoint a supervisor reporting directly to the court and with managing powers to report any pattern of behavior within Vale that would suggest contempt or carelessness towards environmental or human risks related to mining activities. The MPF has also

requested an injunction to suspend the distribution of our dividends. In November 2020, the ANM, the CVM and we presented defenses, asserting that the injunction and final request are unreasonable, since we have heavily invested in safety and disaster prevention, including with the implementation of new processes and committees. On March 5, 2021, the court dismissed the action, holding that the intervention requested by the MPF in the management and risk assessment of a company would be inadmissible. On April 29, 2021, the MPF appealed this decision. We, the ANM and the CVM filed a response to the appeal, and a decision on such response is still pending. We will continue to vigorously contest this action, which we believe is without merit.

i) Arbitration proceedings in Brazil filed by shareholders, a class association and foreign investment funds

We are a defendant in six arbitrations that have been filed before the arbitration chamber of B3 by: (i) 385 minority shareholders, (ii) a class association allegedly representing our minority shareholders, and (iii) foreign investment funds. In these six proceedings, the plaintiffs allege that we were aware of the risks associated with the Brumadinho dam, and failed to disclose it to the shareholders, which would be required under the Brazilian applicable laws and the rules of the CVM. Based on such argument, plaintiffs claim compensation for losses caused by the decrease in the value of our shares. In one of the proceedings filed by foreign funds, plaintiffs estimated the amount of the alleged losses to be approximately R\$1.8 billion. In the other proceeding by foreign funds, plaintiffs estimated the amount of the alleged losses to be approximately R\$3.9 billion. We disagree with these alleged estimated losses and believe that the claim is without merit. These proceedings are in early stages, and we will vigorously contest them.

j) Public civil actions relating to evacuation of communities

We are defendants in three public civil actions brought by the MPMG against us claiming a number of injunction reliefs and socioeconomic damages resulting from the evacuation of communities located in the self-rescue zones of certain of our dams located in Ouro Preto, Nova Lima and Barão de Cocais. Pursuant to settlement agreements celebrated or court decisions, we are required to make monthly emergency payments, and fund temporary housing, transportation, medicines, among other measures, to the affected individuals. In addition to the emergency payments and related measures, prosecutors claim substantial amounts of socioeconomic damages. On December 15, 2022, the public civil action related to the evacuation of Nova Lima (B3B4) was settled, and a new agreement was signed providing for the compensation and full reparation of the impacts suffered by the affected population and the Municipality of Macacos, in the estimated amount of R\$ 500 million. Indemnifications for individual damages, however, were excluded from the settlement, and may still be pursued using the parameter of the Term of Commitment with the Public Defendants of the State of Minas Gerais. The lawsuits for Ouro Preto and Barão de Cocais are still in progress.

On October 22, 2021, public prosecutors initiated a civil investigation, on the basis that we have allegedly violated or threatened to violate individual and collective human rights in its relations with the communities and the affected people in the city of Barão de Cocais, state of Minas Gerais, after the evacuation resulting from the elevation of the emergency level of Sul Superior dam, in the Gongo Soco Mining Complex. We have provided the information requested by the authorities, refuting the allegations, and we are currently awaiting new developments.

On January 26, 2022, the MPF filed a request for a provisional remedy against us, requesting that we present a temporary relocation plan for the indigenous community Pataxó, Paraxó Hã Hã Hãe, especially the Naô Xohã Village, and provide monthly payments of installation and maintenance allowance to the relocated families. On February 16, 2022, the federal court in the city of Belo Horizonte granted an injunction ordering the temporary relocation of the indigenous community Pataxó, Paraxó Hã Hã Hãe, and the provision of monthly payments by us until definitive settlement of the community. We filed an appeal against this decision which is pending. We will continue to vigorously contest this lawsuit, which we believe is without merits.

On April 24, 2022, the MPMG filed a public civil action claiming, among other requests, full repair of the alleged damages and socioeconomic impacts caused to the community of Itabira as a result of the "loss of stability" and the consequent increase in the risk of collapse of the Pontal Dam and its dikes. Among the various claims, the request for the freezing of R\$500 million in our accounts was denied, but other claims, including a request to prevent us from entering into new

individual agreements with the alleged victims, were granted. We and the MPMG filed an appeal against this decision. While the MPMGs appeal was denied, our appeal was partially granted, specifically regarding the possibility of entering into new individual compensation agreements with the alleged victims and the obligation to pay for the production of expert evidence at this procedural stage. We will continue to vigorously contest this action, which we believe is without merits.

k) Lawsuit brought by the municipality of Brumadinho

On December 2, 2021, the municipality of Brumadinho filed an action against us before the state court in Brumadinho, requesting compensation for property and extra-patrimonial damages suffered by the municipality, as well as moral damages. The municipality also requested in a preliminary injunction which is pending of judgment, the attachment of assets in the amount of R\$5 billion, as well as monthly payments of approximately R\$3.7 million to compensate alleged financial losses due to the drop in tax revenues following the collapse of the Brumadinho dam. On June 9, 2022, all of the preliminary requests were rejected, as well as the claim for free legal assistance. The municipality filed an interlocutory appeal, which was denied on March 9, 2023. We will continue to vigorously challenge this action, which we believe is without merits.

l) Other proceedings

We are a defendant in a number of investigations and proceedings brought by individuals, business entities, investors, associations, unions, legislative bodies, non-governmental organizations and other entities seeking remediation and compensation for environmental, property and personal damages resulting from the Brumadinho dam failure, including alleged violations of securities laws. These investigations and proceedings include requests for significant amounts in damages, injunctions, pre-judgment attachment of assets and seizure of our bank accounts. Most of them are in early stages, and we cannot reasonably estimate their impact.

Other investigations, arbitrations and proceedings relating to the collapse of the tailings dam in Brumadinho may be brought in the future.

LEGAL PROCEEDINGS RELATED TO THE COLLAPSE OF SAMARCO'S TAILINGS DAM

We are engaged in several legal proceedings relating to the collapse of Samarco's tailings dam in the city of Mariana, in the state of Minas Gerais.

a) Public civil action brought by federal prosecutors and framework agreements

We are a defendant in several legal proceedings brought by governmental authorities and civil associations claiming socioenvironmental and socioeconomic damages and a number of specific remediation measures as a result of the collapse of Samarco's Fundão dam. Following a decision of the Superior Court of Justice (*Superior Tribunal de Justiça*—"STJ"), these proceedings were consolidated before the 12th Federal Court of Belo Horizonte (currently, the 4th Federal Court of Belo Horizonte, following an internal reorganization). The two main proceedings were (i) the public civil action brought by the states of Minas Gerais and Espírito Santo, certain federal and state authorities and certain public entities in November 2015 and (ii) the public civil action brought by the MPF in March 2016.

We have entered into two main settlement agreements with the authorities for reparation and remediation of the damages resulting from the collapse of the Fundão dam.

- In March 2016, we, together with Samarco and BHP Brasil, entered into a framework agreement with the federal government, the state governments of Espírito Santo and Minas Gerais and certain other federal and state authorities (the "Framework Agreement" or *Termo de Transação e Ajustamento de Conduta*—"TTAC"). Under the Framework Agreement, Samarco, BHP Brasil and Vale created Fundação Renova, an independent foundation to implement reparation and remediation of damages resulting from the collapse of the Fundão dam. The Framework Agreement established 42 socioenvironmental and socioeconomic programs in the region impacted by the Fundão dam breach, and created a governance mechanism for implementation. The agreement has a 15-year term,

renewable for successive one-year periods until all the obligations thereunder have been performed.

- In June 2018, Vale, Samarco, BHP Brasil, the MPF, state prosecutors, public defenders and attorneys general, among other parties entered into another framework agreement to improve the governance mechanism of Fundação Renova and establish a process for potential revisions to the remediation programs provided under the Framework Agreement and establishing, among other things, a process for potential revisions to the remediation programs provided under the Framework Agreement based on the findings of experts to be hired by Samarco to advise the MPF (the "June 2018 Agreement" or *Termo de Ajuste de Conduta* – "TAC Governança"). The June 2018 Agreement terminated certain lawsuits, including public civil actions that had been filed by the Brazilian federal government and the states of Minas Gerais and Espírito Santo, and contemplates the future termination of other public civil actions upon agreement over the remediation programs that are current under review by experts.
- In January 2020, at the request of the parties, the 12th Federal Court authorized the commencement of specific proceedings to address certain topics considered priority and that were not resolved through the governance mechanisms of the framework agreements. For each of these priority topics, the court established specific obligations to be met by public authorities, Fundação Renova, Vale, Samarco and BHP Brasil. Subsequently, the court initiated additional proceedings and may initiate others in the future that may create new obligations to the parties.

In August 2020, the court approved the "*Agenda Integrada*" program, a settlement agreement among Fundação Renova, the states of Minas Gerais and Espírito Santo and an association of mayors of cities along the Doce river, providing for the allocation of approximately R\$882 million to investments in education, infrastructure, and health in the region impacted by the collapse of the Samarco dam.

In a specific proceeding, the court issued in July 2020 a decision providing guidelines for compensations to be paid to residents of the city of Baixo Guandu, followed by other decisions setting simplified parameters for the compensation of workers (mainly informal workers whose activities are difficult to prove), in at least 35 cities and villages in the states of Minas Gerais and Espírito Santo. These parameters have been reflected throughout other cities along the Doce river, following a court decision issued on October 30, 2021. As of December 31, 2021, 51,202 people had received payments in the states of Minas Gerais and Espírito Santo through this new simplified compensation mechanism. Subsequent court decisions have also determined the inclusion of new categories as eligible for compensation, as well as municipalities not covered for in the Framework Agreement, also expanding the system to the territory of Mariana, which already has its own indemnity matrix, agreed upon in the Public Civil Action filed by Minas Gerais State's Public Attorney's Office. Another decision also determined the payment of compensation for the temporary water deprivation caused by the collapse of the dam, as well as the possibility for people who were indemnified by Fundação Renova to submit claims for complementary indemnity based on the new simplified compensation mechanism. We have appealed and a decision is pending.

In October 2020, the MPF required the resumption of the public civil action due to a deadlock in the engagement of experts to assist the MPF in the review of the existing programs, as contemplated in the June 2018 Agreement. Due to the negotiations mediated by the National Council of Justice, the request has yet to be reviewed by the 4th Federal Court (formerly, 12th Federal Court). In July 2021, the MPF requested a new suspension of the proceedings to allow for the continuation of extrajudicial negotiations aiming at a settlement agreement. The Framework Agreement provided for a possibility of renegotiation of the Fundação Renova's reparation programs upon the completion of studies conducted by specialist engaged by the Public Prosecutor's Office. The negotiations began in April 2021, and in June 2021 a letter of principles was signed by the companies BHP Brasil, and Samarco and us, as well as by representatives of the Public Prosecutor's Office and other authorities involved. The goal with a potential settlement agreement is to provide a stable framework for the execution of reparation and compensation programs. Discussions regarding the renegotiation are still ongoing.

On February 24, 2021, public prosecutors of the State of Minas Gerais (*Ministério Público do Estado de Minas Gerais*— "MPMG") filed a public civil action against Samarco, BHP Brasil, Fundação Renova, and us, claiming moral damages in the amount of R\$10 billion and requesting an injunction for a judicial intervention on Fundação Renova and, after a transition period, the extinction of Fundação Renova. These requests are based on allegations by the prosecutors of Renova's lack of independence and autonomy, breach of the Framework Agreement and misuse of powers. The injunction has been denied by the court and we will continue to vigorously contest this action, which we believe has no

merit. The proceeding is currently suspended, due to a conflict with another proceeding relating to a potential restructuring of Fundação Renova's Internal Organization Management System.

In May 2021, the MPMG filed a public civil action against Renova, Samarco, BHP Brasil and us, claiming that Fundação Renova was deviating from its purpose and promoting false advertising, in an attempt to deceive those affected. These claims have been contested by the companies and the proceeding was suspended in view of the negotiations among the parties, mediated by the National Council of Justice. A preliminary injunction by the MPF in this case has already been denied by the court.

In October 2021, the MPMG initiated a proceeding seeking compensation of approximately R\$2.5 billion from Samarco, BHP Brasil and us, alleging that the companies have not fulfilled the obligations set forth in the June 2018 Agreement that established a process for indemnifying people affected in the city of Mariana. We objected and will continue to vigorously contest this action, which we believe is without merit. In July 2022, a favorable decision to us was issued dismissing the claim, due to MPMG's lack of standing to sue. The MPMG filed an appeal, to which we objected, and a decision is pending.

In March 2023, as part of a proceeding related to a potential increase on the number of territories recognized as affected by the collapse of Samarco's Fundão dam and covered by the TTAC, a federal court issued a decision ordering BHP Brasil and us to make judicial deposits in the total amount of R\$10.3 billion, to be divided between the companies. We will present our appeal in due time and will continue to vigorously contest this action, which we believe is without merit.

b) Criminal proceeding

In October 2016, the MPF filed criminal charges before the federal court of Ponte Nova, state of Minas Gerais, against us, certain of our employees and a former officer, among other corporate and individual defendants. The court has dismissed part of these charges but accepted charges of environmental crimes against us and one of our employees relating to an alleged omission in the provision of relevant information of environmental interest, false statements and fraud in a public filing, in connection with the alleged failure to disclose that tailings from our Alegria mine were discharged at the Fundão dam. A criminal proceeding against us and one of our employees is ongoing.

In March 2020, the court scheduled a number of hearings to collect defense witnesses' testimonies, but hearings were suspended due to the COVID-19 pandemic and have not yet been resumed. Certain hearings were held on February and March 2022, and also on March 2023, and new hearings have been schedule for April 2023. We cannot estimate when a final decision on the case will be issued. We will vigorously contest this action. If we are criminally convicted, we may be subject to penalties to be imposed by the court, in the proportion to the environmental damage caused and our responsibility. Potential sanctions include fines, suspension of activities, prohibition from entering into contracts with the public administration, pecuniary obligations to support environmental programs or projects, obligation to remediate environmental damages or maintain public spaces, and obligation to pay compensation to environmental or cultural public entities.

c) Tax proceeding

In September 2018, the federal tax authorities filed a request before a federal court in Belo Horizonte for an order to Vale's assets to secure the payment of Samarco's federal tax and social security debts, in the amount of approximately R\$11 billion (as of June 2018). In May 2019, a favorable decision was issued dismissing the claim without prejudice, due to lack of procedural interest. The General Attorney for the National Treasury (*Procuradoria Geral da Fazenda Nacional*—“PGFN”) filed an appeal to the local court, and a decision is pending.

d) Proceedings to Pierce the Corporate Veil

In the context of the Judicial Reorganization of Samarco, the MPMG and certain financial creditors of Samarco have commenced two proceedings before 2nd State Court for Corporate Matters of the city of Belo Horizonte (Samarco's bankruptcy court) seeking, among other requests, to freeze our assets (in the capacity of shareholder of Samarco),

extinguish the Judicial Reorganization, and pierce the corporate veil of Samarco in order to hold its shareholders, including us, liable for Samarco's prepetition debt. Samarco has approximately R\$50 billion in debt subject to judicial reorganization, of which approximately R\$24 billion are owed to its shareholders (BHP Brasil and us). In November 2022, both proceedings were dismissed by the 2nd court of the state of Minas Gerais. The MPMG has appealed against the decision and the appeal is pending trial. The financial creditors filed a motion for clarification against the decision which is, also pending trial by the lower instance court. We will vigorously contest the appeal which we believe is without merit. See *Information on the Company—Lines of Business—Other Investments—Other—Samarco*.

e) London Contribution claim

As a result of the collapse of Samarco's Fundão dam, BHP Group Limited ("BHP") and another BHP group company are defendants in a legal proceeding filed in 2018, in the courts of England and Wales (the "UK Claims"). BHP already filed the answer to defend the action. In connection with the UK Claims, In December 2022, BHP filed a contribution claim against us. We do not concede that we are subject to the jurisdiction of the English court and we will vigorously contest any alleged liability in connection with the UK Claims. We intend to object the lawsuit, especially in relation to the contentious jurisdiction of the court of England, considering the issues already dealt with in agreements signed in Brazil.

f) Other proceedings

We have been named as a defendant in a number of private actions, before different state and federal courts in the states of Minas Gerais and Espírito Santo, brought by individuals, business entities, municipalities and other entities seeking remediation and compensation for environmental, property and personal damages resulting from the Fundão dam collapse. These proceedings include requests for significant amounts in damages, injunctions, pre-judgment attachment of assets and seizure of our bank accounts. We have settled part of these suits and continue to defend in a number of these proceedings.

Samarco is engaged in several other investigations and proceedings claiming damages resulting from the dam collapse. Immediately after the dam collapse, the environmental authority of the state of Minas Gerais and the DNPM (currently, the ANM) commenced an investigation into the causes of the dam collapse and ordered the suspension of Samarco's operations pending the conclusion of these investigations.

LEGAL PROCEEDINGS REGARDING SAFETY REQUIREMENTS AT OTHER DAMS

We are involved in a number of other public civil actions in which public prosecutors and other authorities seek to suspend or restrict our operations or obtain injunctions compelling us to implement safety measures at other existing tailings dams. Most of these lawsuits were already dismissed as a consequence of several agreements we entered into with public prosecutors and the state of Minas Gerais, but some are still ongoing.

a) Maravilhas II and III litigation

In October 2017, before the collapse of the Brumadinho dam, public prosecutors of the State of Minas Gerais (*Ministério Público do Estado de Minas Gerais*—"MPMG") brought public civil actions challenging our environmental licenses for the construction of the Maravilhas III tailings dam, which is expected to support our operations in the Vargem Grande mining complex, in our Southern System. After the collapse of the Brumadinho dam, the MPMG filed a request for a preventive injunction seeking to discontinue the project, but the request was rejected by the court. This proceeding is still ongoing. If the construction of this dam is interrupted, our ability to resume operations in the mining complex of Vargem Grande could be adversely impacted.

In October 2018, before the collapse of the Brumadinho dam, the MPMG brought a public civil action related to Maravilhas II and III tailings dam seeking, among others requests, an injunction ordering us to refrain from disposing tailings in such dams. The injunction request was initially granted by the court, but in July 2019 the decision was reversed by the Court of Appeals of the State of Minas Gerais. This proceeding is still ongoing.

In April 2019, the MPMG brought a public civil action related to the Maravilhas II tailings dam, requesting injunctions ordering us to (i) refrain from disposing tailings, operating, constructing or making other interventions on the dam; (ii) refrain from increasing the risks of other structures in the mining complex where Maravilhas II is situated; and (iii) review technical studies and other documents related to the dam, and conduct an external audit on the structure. The injunction requests were granted by the state court of the city of Itabirito. The Maravilhas II tailings dam supports our operations in the Vargem Grande complex, which had been suspended since February 2019 and have partially resumed. These proceedings were partially dismissed following a settlement agreement signed by the parties in September 2019. No agreement has been reached regarding the prohibition of measures that could potentially increase the risks of the structure, and the proceeding remains ongoing.

b) Forquilha V

In December 2021, the MPMG filed a public civil action requesting an injunction to halt the operations of Forquilha V dam, which is part of the Fabrica mining complex, until the review and approval by the public authorities of a new Emergency Action Plan. The suspension of these activities would severely impact the operation of the Fabrica mining complex. These proceedings are in early stages, and the request is still pending judgement. We will vigorously contest this action, which we believe is without merit.

LEGAL PROCEEDINGS SEEKING SUSPENSION OF CERTAIN OPERATIONS IN THE STATE OF PARÁ

Since 2012, the MPF and associations representing indigenous peoples Xikrin do Cateté and Kayapó, located in the state of Pará, have brought various legal proceedings against us seeking monetary compensation and a broad range of injunctive reliefs as a result of alleged irregularities in the licensing process for certain of our operations or alleged impact of our iron ore and energy transition metals mining activities on these communities. These legal proceedings involved our Onça Puma nickel operations, S11D iron ore operations, Salobo copper operations, and Alemão copper project.

In December 2021, we entered into the definitive agreement with the Xikrin do Cateté people, and in February 2022, we entered into the definitive agreement with the Kayapó community, pursuant to which we agreed to provide certain social and economic compensation to these communities. The agreement with the Xikrin community was approved by the court responsible for the Onça Puma, S11D and Salobo projects. In October 2022, the agreement with the Xikrin community was approved by the court responsible for the Onça Puma, S11D and Salobo actions. In March 2023, the agreement with the Xikrin community was approved by the court responsible for the Alemão Projects action. Approval is still pending for the Ferro Carajás project.

In August 2022, the Xikrin indigenous community of TI Bacajá appealed the decision. We presented our counterarguments and a decision on the appeal is now pending.

We continue to negotiate with the MPF the terms of the environmental compensation and environmental programs in connection with Onça Puma litigation.

LEGAL PROCEEDINGS SEEKING CANCELLATION OF LICENSES OR SUSPENSION OF OPERATIONS IN THE STATE OF MINAS GERAIS AND ESPÍRITO SANTO

a) Mar Azul, Tamanduá and Capão Xavier litigation

In June 2020, a civil association that represents owners of properties located in the proximities of the Mar Azul, Tamanduá and Capão Xavier mines brought a public civil action against the state of Minas Gerais, the ANM and us, before a federal court in the state of Minas Gerais, requesting the cancellation of our mining and environmental licenses to operate the Mar Azul, Tamanduá and Capão Xavier mines in our Southern System. Plaintiff also filed for an injunction to suspend such environmental licenses and, consequently, our operations at these mines, alleging, among other matters, that our mining activities at these mines are contaminating water springs in the region. We submitted a response to this request for injunction and the lower court issued a decision declaring the court's lack of jurisdiction

and submitted the case to the Belo Horizonte state court. The plaintiff filed an appeal, which was rejected. The case was sent to the State court. We will continue to vigorously contest this action, which we believe is without merit. Our mining operations at the Mar Azul and Tamanduá mines are currently suspended, and the production at the Capão Xavier mine is approximately 6.5 million metric tons on an annual basis.

b) Viga litigation

In September 2020, the municipality of Jeceaba, state of Minas Gerais, filed a public civil action before the local court against us. Under this proceeding, the court has granted an injunction determining that we refrain from (i) disposing tailings in Dam 7, a tailings dam located at our Viga mine in the Southern System, without the required location and operating permits, and (ii) carrying out works at Dam 7 without the required construction permit. In December 2020, the location and operating permits for Dam 7 were issued in a preliminary decision subject to immediate appeal on a separate claim. In November 2021, we entered into a settlement agreement with the municipality of Jeceaba, ratified by the court, pursuant to which such municipality agreed to issue the required construction permit for Dam 7, partially resolving the civil action's claims, as we now have the required permit to carry out works at Dam 7. The public civil action is still ongoing, regarding the other requests regarding the disposing of tailings in Dam 7 about compensatory measures and safety standards of the structure, as well as compensation claims.

c) Pelletizing plant 8 - Tubarão litigation

In September 2019, a civil association brought a public civil action against us, before a state court in Vitória, state of Espírito Santo, claiming that the licensing process for the expansion of our operations at the Tubarão Complex failed to fulfill formal requirements and consider environmental impacts; and established emission parameters different than the ones that had been set forth in the relevant Environmental Impact Study. In this proceeding, the plaintiff filed for an injunction seeking the suspension of Tubarão Complex operating license. We filed our defense and in October 2020, and the court rejected plaintiff's request for the injunction. The court has also appointed an expert to prepare a technical report.

d) EFVM railroad litigation

In March 2021, the Legislative Assembly of the State of Minas Gerais filed a public civil action before the 13th Federal Court of Minas Gerais alleging that the third amendment to the concession agreement of the Vitória-Minas Railroad ("EFVM"), which renewed the EFVM's concession, is null and void, and requesting an injunction to either: (i) suspend the effectiveness of the third amendment to the concession agreement, or (ii) suspend the payment by us to the Federal Government, until a final decision. In April 2021, the court issued a decision favorable to us, extinguishing the lawsuit based on the merits. The plaintiff filed an appeal and a decision on the appeal is pending.

Also in March 2021, an NGO also filed a public civil action before the 15th Federal Court of Minas against the Federal Government and ANTT requesting the suspension of the effectiveness of the third amendment to the EFVM concession agreement, regarding the payment of the concession fee, together with the restatement of the relevant contractual provisions aiming to convert the amount of the fee into an investment budget for the railroad, specifically in the states of Minas Gerais and Espírito Santo. The preliminary injunction was denied and the lawsuit was dismissed. An appeal has not yet been filed, but the decision may still be reversed.

e) Environmental agreement relating to Tubarão Port

In 2018, we entered into an environmental agreement with the MPF, the public prosecutors of the State of Espírito Santo (*Ministério Público do Estado do Espírito Santo* – "MPES") and environmental authorities of the State of Espírito Santo (*Secretaria de Estado de Meio Ambiente e Recursos Hídricos* – "SEAMA" and *Instituto Estadual de Meio Ambiente e Recursos Hídricos* – "IEMA") to enhance control over atmospheric emissions at Tubarão Port and pelletizing plants. In November 2021, we filed a request for an extension of the deadline to meet certain targets under the agreement until 2024, considering that the initial targets had been impacted by the COVID-19 pandemic. Our extension request has not been analyzed. In addition, in July 2022, we were notified by the MPES of alleged non-compliance with certain targets

set forth in the agreement, and at the request of the MPES we are validating an action plan together with IEMA. If our extension request is not granted or if the relevant authorities do not validate our action plan, our operations at the Tubarão Complex may be impacted.

f) Public Health System lawsuit

In September 2013, an individual filed a collective action against us and another steel company before a federal court in the state of Espírito Santo, claiming that the companies are responsible for air pollution in the metropolitan region of the city of Vitória that causes respiratory and cardiovascular diseases and, therefore, generates expenses for the Brazilian Public Health System (SUS), that should be reimbursed by those companies. In this lawsuit, the plaintiff filed for an injunction to compel the companies to submit technical studies regarding the alleged connection between the air pollution and the diseases, as well as expenses with health treatments and the cost of infrastructure and medication. The plaintiff is requesting that the companies indemnify the SUS for expenses arising from the treatment of illnesses supposedly caused by the atmospheric pollution.

In November 2022, the federal court found that there was no legal federal interest in the case, and the case records were remitted to the state court in Vitória. In March 2023, we were summoned, and we have not yet presented our respective defenses.

ITABIRA SUITS

We are a defendant in two separate actions brought by the municipality of Itabira, in the Brazilian state of Minas Gerais. In the first action (a public civil action), filed in August 1996, the municipality of Itabira alleges that our Itabira iron ore mining operations have caused environmental and social harm, and claims damages with respect to the alleged environmental degradation of the site of one of our mines, as well as the immediate restoration of the affected ecological complex and the performance of compensatory environmental programs in the region. The damages sought, as adjusted from the date of the claim, amount to approximately R\$10.456 billion. An expert report favorable to us has been issued, but the court granted the municipality's request for additional expert evidence. The preparation of this additional expert evidence is pending and the action is suspended until conclusion.

In the second action, filed in September 1996, the municipality of Itabira claims the right to be reimbursed for expenses it has incurred in connection with public services rendered as a consequence of our mining activities. The damages sought, as adjusted from the date of the claim, amount to approximately R\$10.434 billion. This proceeding was suspended for a settlement negotiation but has resumed its normal course as the parties have not reached an agreement, and the evidence production phase will follow. We believe these suits are without merits and will continue to vigorously contest them.

MINISTRY OF LABOR PROCEEDING

In February 2015, following an inspection in the facilities of a company that provided transportation services to us between our mines Mina do Pico and Mina de Fábrica in the state of Minas Gerais, the Ministry of Labor determined that this transportation company had failed to comply with certain obligations relating to health, safety, overtime and other labor matters. By adopting a broad interpretation of the law, the Ministry of Labor concluded that its employees were working in conditions similar to slavery. Upon learning of the findings, we promptly remediated the problems and we eventually terminated the agreement with the transportation company. Nevertheless, the Ministry of Labor commenced two administrative proceedings against us, one alleging illegal outsourcing and another alleging that the illegally outsourced employees were working in conditions similar to slavery. In December 2018, the regional labor court upheld our annulment action and confirmed that the outsourcing of the transportation services in this case was lawful. However, in March 2019 the courts confirmed administrative decision that determined that our service provider had employees in conditions similar to slavery. We have appealed this decision and will continue to vigorously contest this action.

OTHER LABOR PROCEEDINGS

In 2014, a labor union representing railroad workers in the state of Minas Gerais filed a public civil action against us requesting an injunction to order us to replace the single-conductor operating system (one conductor per train) with a dual-conductor system, among other requests, based on health and safety work conditions, subject to the imposition of a fine to be determined by the court. After initially obtaining a favorable decision, the Labor Court of Appeals and the Superior Labor Court (“TST”) ruled against us. We have appealed to STF and a decision is currently pending.

In 2017, a labor union representing railroad workers in the state of Maranhão and the Labor Prosecutor's Office in the state of Maranhão (“MPT-MA”) also filed public civil actions against us, requesting an injunction to order us to replace the single-conductor operating system with a dual-conductor system, among other requests, also based on health and safety work conditions. The action in Maranhão are being processed jointly and are at early stages, pending the production of expert evidence and subsequent judgment.

OTHER ENVIRONMENTAL CRIMINAL PROCEEDINGS

In May 2020, public prosecutors of the State of Minas Gerais (*Ministério Público do Estado de Minas Gerais*—“MPMG”) presented criminal charges against us and one of our employees alleging that we have committed environmental crimes through an environmental intervention carried out in our mineral development center located in the city of Santa Luzia, state of Minas Gerais, without legal authorization, which led to the suppression of seventy-one tree specimens. The criminal charges were accepted by the court in June 2020, and we submitted our written defenses. We believe this proceeding is without merit and we will vigorously contest this action.

CLAIMS INVOLVING OUR PARTICIPATIVE SHAREHOLDERS’ DEBENTURES (*DEBENTURES PARTICIPATIVAS*)

At the time of the first stage of our privatization in 1997, we issued Brazilian law governed debentures known in Brazil as “*debêntures participativas*” to our then-existing shareholders.

Our participative shareholders' debentures are governed by a debenture deed, which provides that premium payments are due once sales volumes at reference assets attain specified thresholds. We have made all payments in compliance with applicable provisions of the debenture deed and the privatization prospectus (*edital*). Certain holders of our participative shareholders' debentures have brought claims against us, alleging that premium payments should have been triggered by production volumes, rather than sales volumes. If successful, these claims would affect the timing of premium payments, and may require us to recognize one-time payments to the claimants based on the initial premium payments that were allegedly owed and not paid. We believe that these claims are meritless, and do not recognize any obligation to make premium payments prior to the time specifically provided by the debenture deed. We have in the past, and intend to continue to, vigorously defend our position with respect to these claims through all available means.

TAX PROCEEDINGS

We and our subsidiaries are defendants in numerous tax proceedings. The most significant proceedings are discussed below. Except as otherwise noted, the amounts stated below are the total amounts claimed under the proceedings (including remote, possible and probable losses), stated as of December 31, 2022. We recognize provisions for probable losses, for which a reliable estimate can be made, based on reports and technical assessments and on management’s assessment. See note 8.d, 8.e and 28 to our consolidated financial statements for further information.

a) CFEM-related proceedings

We are engaged in numerous administrative and judicial proceedings related to the mining royalty known as CFEM. For more information about CFEM, see *Information on the Company—Regulatory matters—Royalties and other taxes on mining activities*. These proceedings arise from assessments by the ANM (former “DNPM”), which main discussions involve the deduction of taxes, insurance and transportation costs indicated in the corresponding invoice of CFEM payments, in addition to CFEM charges on pellet sales and the revenues from sales made by our foreign subsidiaries.

The aggregate amount claimed in the pending assessments is approximately R\$9.56 billion, including interest and penalties through December 31, 2022.

We are contesting these claims using all the available means under Brazilian law, including challenges in administrative tribunals and in the judicial courts. We have received some favorable and unfavorable decisions, and such decisions have not yet become final.

b) ICMS tax assessments and legal proceedings

We are engaged in several administrative and court proceedings related to charges of Goods and Services Tax (“ICMS”) and corresponding fines by the tax authorities of different Brazilian states. In these proceedings, the main allegations of the tax authorities are: (i) undue tax deduction; (ii) failure to comply with certain accessory obligations; (iii) tax’s incidence on the transportation of goods between the same taxpayer’s establishments; (iv) incidence of ICMS on electricity purchases, (v) differences of ICMS tax rates (DIFAL), and (vi) ICMS incidence on our own transportation activities. As of December 31, 2022, the aggregate amount claimed in these proceedings was approximately R\$3.8 billion.

Regarding the transportation of the iron ore, the tax authorities of the State of Minas Gerais contend that we should have paid ICMS and corresponding fines. We understand that this activity is not subject to ICMS because the ore is transported by us to our own facilities. In December 2018, the judicial court issued a final decision in our favor concerning the tax assessment covering activities in 2009 and 2010. Regarding activities occurred in 2011, 2012 and 2013, the approximate amount in dispute is R\$1.2 billion (included in the amount mentioned above). The State of Minas Gerais has filed appeals which are pending judgement in superior courts. We also expect a favorable outcome in this case.

There is a criminal proceeding involving former officers of our subsidiary MBR, alleging the practice of ICMS tax evasion with respect to ore re-sieving activity in MBR port facilities. We have already presented our defense and a decision is pending. We believe that the allegations are without merit.

c) Income Tax Litigation

c.1) Litigation on Brazilian taxation of foreign subsidiaries

In 2003, we filed for a *writ of mandamus* to prevent Brazilian corporate income tax (*Imposto sobre a Renda das Pessoas Jurídicas*—“IRPJ”) and social contributions on the net income (*Contribuição Social sobre o Lucro Líquido*—“CSLL”) taxation on the profits of our non-Brazilian subsidiaries and affiliates.

The Brazilian Federal Government has filed various administrative and judicial proceedings against us claiming that we must pay IRPJ and CSLL on the profits of our non-Brazilian subsidiaries and affiliates in relation to the 1996 and 2008 fiscal years.

In 2013, we significantly reduced the amount in dispute by participating in the REFIS-TBU, a federal tax settlement program for payment of amounts relating to IRPJ and CSLL on profits of subsidiaries abroad from 2003 to 2012 fiscal years. Under the REFIS-TBU, we paid R\$5.9 billion in 2013, and we have been paying the remaining R\$16.3 billion in monthly installments, bearing interest at the SELIC rate. SELIC is a variable interest rate, established by the Brazilian central bank, used to update federal tax obligations in Brazil. As of December 31, 2022, the remaining balance was R\$11.43 billion, to be paid in 70 further installments.

The discussion regarding the period between 1996 to 2002, and the tax impacts in 2005, which had not been included in REFIS, was resolved in our favor in a final decision of the Federal Tax Court of the state of Rio de Janeiro. This decision determined the full cancellation of the debt in the amount of R\$2.3 billion (as of December 2019).

In 2014, the STJ issued us a favorable decision in the proceeding that had been initiated by us in 2003. The Brazilian Federal Government filed an appeal before the Supreme Court of Justice (*Supremo Tribunal Federal* – “STF”), which was rejected in March 2021. The Brazilian Federal Government filed a new appeal, and a decision is pending.

c.2) Litigation related to the deduction of CSLL from the income tax base

In 2004, a final decision of the STJ granted us the right to deduct the amounts we had paid as CSLL from our taxable income. In 2006, the Brazilian federal government filed an action (*ação rescisória*) against us, seeking to overturn the 2004 decision. After multiple appeals, in November 2019, the Federal Court of Appeals (*Tribunal Regional Federal*—“TRF”) reversed the 2004 decision. Despite our appeals, we have decided not to deduct the CSLL from our taxable income for the year 2018 and subsequent years. We and the federal government have filed appeals, and final decision is pending.

In November 2020, we received an assessment of IRPJ relating to deductions of CSLL from our taxable income for the years 2016 and 2017. As of December 31, 2022, the total amount in dispute was R\$2.61 billion, in addition to a R\$548 million reduction in our tax losses (the tax impact of which is R\$137 million). We believe that this collection is without merits and that the penalties are undue. We filed an administrative appeal, which was partially granted to reduce the amount of the tax assessment. Both parties have filed additional appeals, and a final decision is pending.

In December 2021, we received a tax assessment for the collection of IRPJ relating to deductions of CSLL from our taxable income for the 2011 to 2013 fiscal years. As of December 31, 2022, the total amount in dispute was R\$5.95 billion, in addition to a R\$3.2 billion reduction in our tax losses (the tax impact of which is R\$802 million). In 2022, following our appeal, we obtained a favorable decision at the first administrative level, however a final decision is still pending. We believe this charge is without merits, as the claim is time-barred.

In February 2023, the STF issued a decision ruling that a final and unappealable decisions rendered with respect to a taxpayer cannot prevail over subsequent decisions rendered by the STF that apply to all taxpayers. This judgement has an impact of R\$813 million, regarding the proceeding related to the period of 2016 and 2017. The other assessment disclosed (2011 to 2013) is still subject to discussion.

For more information on uncertain tax positions, see note 8.e to our consolidated financial statements.

c.3) Assessment related to interest on shareholders' equity

We received tax assessments for the collection of IRPJ and CSLL for the 2017 and 2018 fiscal years. The tax authorities disregarded the deduction of interest on shareholder's equity (*Juros sobre Capital Próprio*—“JCP”) on the grounds of alleged violation of the accrual basis of accounting and non-compliance with certain deductibility requirements. As of December 31, 2022, the total amount in dispute was R\$6.02 billion, in addition to a R\$2.05 billion reduction of our tax losses (the tax impact of which is R\$699 million). We are challenging these assessments before the administrative court. Although a favorable administrative decision was issued with respect to 2018, an unfavorable one was issued for 2017. Both parties have appealed, and final decisions are still pending.

c.4) Transfer pricing tax assessment

We received tax assessments charging IRPJ and CSLL for the period of 2015 to 2017. Tax authorities claim that we have unduly deducted intermediation costs from the transfer pricing basis related to iron, ore pellets, copper and manganese sales to our foreign controlled company. As of December 31, 2022, the total amount in dispute is R\$4.32 billion, in addition to a R\$5.54 billion reduction of our tax losses in 2015, 2016, and 2017 (the tax impact of which is R\$1.88 billion). We are challenging these assessments before the administrative court. After unfavorable decisions at the first administrative level, we have appealed, and final decisions are pending.

In 2022, we received a similar assessment for the collection of IRPJ and CSLL for the year 2017 related to one of our subsidiaries, in the amount R\$231.3 million. We may receive similar tax assessments for other fiscal years. For more information on uncertain tax positions, see note 8.e to our consolidated financial statements.

c.5) Proceeding related to income tax paid abroad

We are a party in an administrative proceeding charging IRPJ in the amount of R\$ 2.29 billion (as of December 31, 2022) due to the partial approval of the tax offset for the year 2016. Tax authorities allege that we have failed to comply with the applicable rules relating to the offset in Brazil of income taxes paid abroad. We believe that this charge is without merit, and we are contesting it at the administrative level. Our appeal has been partially granted in the first administrative instance, and we will contest the part that has been unfavorable to us. For more information on uncertain tax positions, see note 8.e to our consolidated financial statements.

c.6) Proceeding on expenses deductions involving Renova

In December 2021, we received a tax assessment charging IRPJ and CSLL in relation to the 2016 fiscal year. The tax authorities allege that the deductions of expenses relating to Fundação Renova are improper, as such expenses are not necessary for our own operations. As of December 31, 2022, the total amount in dispute is R\$126 million, in addition to a R\$72 million reduction of our tax losses (the tax impact of which is R\$24 million). We have appealed and the decision at the first administrative level was unfavorable, however a final decision is still pending. We understand that this assessment is without merits, since we are strictly liable for these obligations, which arise from the Samarco Framework Agreement or TTAC and from our status of shareholder of Samarco. We may receive similar assessments until a final decision is issued. For more information on uncertain tax positions, see note 8.e to our consolidated financial statements.

c.7) Assessment related to goodwill deduction

Between 2018 and 2022, we received tax assessments for the collection of IRPJ and CSLL related to the periods between 2013 and 2018, charged in connection with the deduction of goodwill amortization expenses. The goodwill was originally recorded in the acquisition of subsidiaries that were later merged into us. As per Brazilian tax law, the goodwill amortization expenses can be deducted from the IRPJ and CSLL tax bases if the invested entities are merged into their investor. Tax authorities sustain that we have failed to comply with certain applicable rules relating to the goodwill amortization.

We are discussing the charges at the administrative level and the amount under discussion is R\$ 2.70 billion as of December 31, 2022, in addition to a R\$1.08 billion reduction of our tax losses (the tax impact of which is R\$ 320 million).

d) Assessments and legal proceedings related to PIS/COFINS tax credits

We have received several tax assessments from the Brazilian federal tax authority contending that we incorrectly claimed PIS and COFINS tax credits. PIS and COFINS are taxes imposed by the Brazilian government on our gross revenues. Brazilian tax legislation allows taxpayers to use PIS and COFINS tax credits, such as those related to the acquisition of inputs for the production process and other items. Tax authorities claim, mainly, that (i) some credits were not related to the production process, and (ii) we have not submitted adequate evidence of the right to use the tax credits. We are contesting these assessments in the administrative and judicial levels. The total amount in dispute is R\$9 billion as of December 31, 2022.

e) Fines resulting from the rejection of federal tax offsets

We are engaged in several assessments from the federal tax authorities imposing fines of 50% on the amount of the rejected offsets to pay federal tax debts. The federal tax authorities allege that these offsets were made with improper tax credits. We are challenging these assessments and the tax offset rejection in other proceedings. In March 2023, the STF decided in the leading case applicable to all taxpayers that the fines are unconstitutional. After this STF decision, we expect that these fines will be cancelled. As of December 31, 2022, the total amount of fines imposed under these assessments was R\$2.7 billion.

f) Criminal litigation on ISS on port services at TIG

In July 2021, state prosecutors in the state of Rio de Janeiro initiated a criminal lawsuit against former MBR officers before a criminal court in the municipality of Mangaratiba in connection with alleged tax evasion of service taxes (*Imposto Sobre Serviço - "ISS"*) levied by the municipality of Mangaratiba on port services of cargo movement at the Terminal Ilha Guaíba ("TIG"), located in Mangaratiba, in the state of Rio de Janeiro. In February 2023, one of the former officers was summoned and he have already presented his defense. The lawsuit is at an early stage, currently waiting for the summon of the others former directors to present their written defense to seek the case dismissal. We believe this proceeding is without merit.

g) Other tax proceedings

See note 28 to our consolidated financial statements for additional information about these and other tax proceedings in which we are involved, including certain administrative and judicial proceedings relating to the collection of ISS by Brazilian municipalities.

UPDATES ON OTHER PROCEEDINGS

As reported in our annual report on Form 20-F for prior years, we were involved in a lawsuit relating to the Apolo project licensing and de-characterization of B3/B4. Following the submission of our defense, the plaintiff agreed with our arguments, requesting our removal from the action as defendant. The request was granted by the court, dismissing the action with respect to the requests made against us.

As also previously reported, we were involved in two public civil actions filed in March 2022 by the labor prosecutor's office of the state of Pará before the labor court of Marabá and Parauapebas. The lawsuits were related to work safety measures and access to Self-Rescue Zones of the Mirim and Pera Jusante dams, in the Carajás complex, and also requested compensation for damages. We have entered into agreements that have settled both lawsuits, whereby we committed to various obligations and the payment of R\$5 million.

BYLAWS

COMPANY OBJECTIVES AND PURPOSES

Our corporate purpose is defined by our bylaws to include:

- the exploration of mineral deposits in Brazil and abroad by means of research, extraction, processing, industrialization, transportation, shipment and commerce of mineral goods;
- the building and operation of railways and the provision of our own or unrelated-party rail traffic;
- the building and operation of our own or unrelated-party maritime terminals, and the provision of shipping activities and port services;
- the provision of logistics services integrated with cargo transport, including inflow management, storage, transshipment, distribution and delivery, all within a multimodal transport system;
- the production, processing, transport, industrialization and commercialization of any and all sources and forms of energy, including the production, generation, transmission, distribution and commercialization of our own products, derivatives and sub products;
- engagement, in Brazil or abroad, in other activities that may be of direct or indirect consequence for the achievement of our corporate purposes, including research, industrialization, purchases and sales, importation and exportation, the development, industrialization and commercialization of forest resources and the provision of services of any kind whatsoever; and
- the establishment or participation, in any fashion, in other companies, consortia or associations directly or indirectly related to our business purpose.

COMMON SHARES AND GOLDEN SHARES

Set forth below is certain information concerning our authorized and issued share capital and a brief summary of certain significant provisions of our bylaws and Brazilian corporate law. This description does not purport to be complete and is qualified by reference to our bylaws (an English translation of which we have filed with the SEC) and to Brazilian corporate law.

Our bylaws authorize the issuance of up to 7 billion common shares based solely on the approval of the Board of Directors without any additional shareholder approval.

The Brazilian government holds 12 golden shares of Vale. Our bylaws do not provide for the conversion of golden shares into common shares. In addition, the golden shares do not have any preference upon our liquidation and there are no redemption provisions associated with the golden shares.

Voting Rights

The golden shares are preferred shares that entitle the holder to veto any proposed action relating to the following matters:

- a change in our name;
- a change in the location of our head office;
- a change in our corporate purpose as regards mining activities;
- any liquidation of the Company;
- any disposal or winding up of activities in any of the following parts of our iron ore mining integrated systems: mineral deposits, ore deposits, mines, railways, or ports and maritime terminals;
- any change in the bylaws relating to the rights afforded to the classes of capital stock issued by us; and
- any change in the bylaws relating to the rights afforded the golden shares.

Under Brazilian corporate law and applicable CVM regulations, shareholders representing at least 5% of our voting capital have the right to demand that a cumulative voting procedure be applied in any specific shareholder's meeting.

When cumulative voting is applied, each common share has as many votes as there are board members and each holder of common shares has the right to cast all of its vote on one candidate of our Board of Directors or to distribute its votes among several candidates. See —*Shareholders' meetings* below for more information on the exercise of the voting rights of each share.

Shareholders' meetings

Our Ordinary General Shareholders' Meeting is convened by April of each year for shareholders to resolve upon our financial statements, distribution of profits, election of Directors and Fiscal Council Members, and compensation of senior management. Extraordinary General Shareholders' Meetings are convened by the Board of Directors as necessary in order to decide all other matters relating to our corporate purposes and to pass such other resolutions as may be necessary.

Pursuant to Brazilian corporate law, shareholders voting at a general shareholders' meeting have the power, among other powers, to:

- amend the bylaws;
- elect or dismiss members of the Board of Directors and members of the Fiscal Council at any time;
- establish the remuneration of senior management and members of the Fiscal Council;
- receive annual reports by management and accept or reject management's financial statements and recommendations including the allocation of net profits and the distributable amount for payment of the mandatory dividend and allocation to the various reserve accounts;
- authorize the issuance of convertible and secured debentures;
- suspend the rights of a shareholder in default of obligations established by law or by the bylaws;
- accept or reject the valuation of assets contributed by a shareholder in consideration for issuance of capital stock;
- pass resolutions to reorganize our legal form, to merge, consolidate or split us, to dissolve and liquidate us, to elect and dismiss our liquidators and to examine their accounts; and
- authorize management to file for bankruptcy or to request a judicial restructuring.

Pursuant to CVM recommendations, all general shareholders' meetings, including the annual shareholders' meeting, require no fewer than 30 days' notice to shareholders prior to the scheduled meeting date. Where any general shareholders' meeting is adjourned, 8 days' prior notice to shareholders of the reconvened meeting is required. Pursuant to Brazilian corporate law, a summary of this notice to shareholders is required to be published no fewer than three times, in a newspaper with general circulation in the city where we have our registered office, in Rio de Janeiro, with the simultaneous disclosure of the entire documents on the internet website of such newspaper. We have currently designated *Valor Econômico* as the newspaper for this purpose. Such notice must contain the agenda for the meeting and, in the case of an amendment to our bylaws, an indication of the meeting's subject matter. In addition, under our bylaws, the holder of the golden shares is entitled to a minimum of 15 days' prior formal notice to its legal representative of any general shareholders' meeting to consider any proposed action subject to the veto rights accorded to the golden shares.

A shareholders' meeting may be held if shareholders representing at least one-quarter of the voting capital are present, except, subject to other exceptions, for meetings convened to amend our bylaws, which require a quorum of at least two-thirds of the voting capital. If no such quorum is present, notice must again be given in the same manner described above, and a meeting may then be convened without any specific quorum requirement, subject to the minimum quorum and voting requirements for certain matters, as discussed below.

Except as otherwise provided by law, resolutions of a shareholders' meeting are passed by a simple majority vote, abstentions not being taken into account. Under Brazilian corporate law, the approval of shareholders representing at least one-half of the issued and outstanding voting shares is required for the types of action described below, as well as, in the case of the first two items below, a majority of issued and outstanding shares of the affected class:

- creating a new class of preferred shares with greater privileges than the golden shares or changing a priority, preference, right, privilege or condition of redemption or amortization of the golden shares;
- reducing the mandatory dividend;
- changing the corporate purposes;
- merging us with another company or consolidating or splitting us;
- participating in a centralized group of companies as defined under Brazilian corporate law;
- dissolving or liquidating us; and
- canceling any ongoing liquidation of us.

Whenever the shares of any class of capital stock are entitled to vote, each share is entitled to one vote. Annual shareholders' meetings must be held by April 30 of each year. Shareholders' meetings are called, convened and presided over by the chairperson or, in case of his absence, by the vice-chairperson of our Board of Directors. In the case of temporary impediment or absence of the chairperson or vice-chairperson of the Board of Directors, the shareholders' meetings may be chaired by a director or other person especially appointed by the chairperson of the Board of Directors.

A shareholder may be represented at a general shareholders' meeting by a proxy appointed in accordance with applicable Brazilian law not more than one year before the meeting, who must be a shareholder, a company officer, a lawyer or a financial institution. If the proxy document is in a foreign language, it must be accompanied by corporate documents or a power of attorney, as applicable, each duly translated into Portuguese by a sworn translator. Notarization and consularization of proxies and supporting documents is not required. Proxies and supporting documents in English or Spanish do not require translation.

Holders of our ADRs are not entitled to vote directly in our shareholders meetings. Holders of ADRs should exercise their voting right pursuant to the depository agreement. For more information see Exhibit 2 to this annual report.

Redemption rights

Our common shares and golden shares are not redeemable, except that a dissenting shareholder is entitled under Brazilian corporate law to obtain redemption upon a decision made at a shareholders' meeting approving any of the items listed above, as well as:

- any decision to transfer all of our shares to another company in order to make us a wholly owned subsidiary of such company, a stock merger;
- any decision to approve the acquisition of control of another company at a price which exceeds certain limits set forth in Brazilian corporate law; or
- in the event that the entity resulting from (i) a merger, (ii) a stock merger as described above or (iii) a spin-off that we conduct fails to become a listed company within 120 days of the general shareholders' meeting at which such decision was taken.

The right of redemption triggered by shareholder decisions to merge, consolidate or to participate in a centralized group of companies may only be exercised if our shares do not satisfy certain tests of liquidity, among others, at the time of the shareholder resolution. The right of redemption lapses 30 days after publication of the minutes of the relevant general shareholders' meeting, unless the resolution is subject to confirmation by the holder of golden shares (which must be made at a special meeting to be held within one year), in which case the 30-day term is counted from the publication of the minutes of the special meeting.

We would be entitled to reconsider any action giving rise to redemption rights within 10 days following the expiration of such rights if the redemption of shares of dissenting shareholders would jeopardize our financial stability. Any redemption pursuant to Brazilian corporate law would be made at no less than the book value per share, determined on the basis of the last balance sheet approved by the shareholders; provided that if the general shareholders' meeting giving rise to redemption rights occurred more than 60 days after the date of the last approved balance sheet, a shareholder would be entitled to demand that his or her shares be valued on the basis of a new balance sheet dated within 60 days of such general shareholders' meeting.

Preemptive rights

Each of our shareholders has a general preemptive right to subscribe for shares in any capital increase, in proportion to his or her shareholding. A minimum period of 30 days following the publication of notice of a capital increase is assured for the exercise of the right, and the right is transferable. Under our bylaws and Brazilian corporate law, and subject to the requirement for shareholder approval of any necessary increase to our authorized share capital, our Board of Directors may decide not to extend preemptive rights to our shareholders, or to reduce the 30-day period for the exercise of preemptive rights, in each case with respect to any issuance of shares, debentures convertible into shares or warrants in the context of a public offering.

Tag-along rights and mandatory tender offers

In accordance with Novo Mercado listing rules and our bylaws:

- in case of a transfer of control, the purchaser must conduct a tender offer to purchase any and all of our common shares for the same price paid for the voting shares representing control;
- in case of a proposed delisting from the Novo Mercado segment of B3, the controlling shareholder must conduct a public offer to acquire any and all of our common shares for a price corresponding to the economic value of the shares, as determined in an independent appraisal valuation; and
- any shareholder who acquires 25% of our outstanding capital stock must, within 30 days after the date in which such shareholder achieved the 25% stake, make a tender offer for any and all of our common shares (*oferta pública para aquisição*) for a price equal to the greatest of (i) the economic value of the shares, (ii) 120% of the weighted average price of our common shares in the 60 trading days preceding the announcement of the tender offer and (iii) 120% of the highest price paid by the purchaser in the 12 months before achieving the 25% stake.

Calculation of distributable amount

At each Annual shareholders' meeting, the Board of Directors is required to recommend, based on the executive officers' proposal, how to allocate our earnings for the preceding fiscal year. For purposes of Brazilian corporate law, a company's net income after income taxes and social contribution taxes for such fiscal year, net of any accumulated losses from prior fiscal years and amounts allocated to employees' and management's participation in earnings represents its "net profits" for such fiscal year. In accordance with Brazilian corporate law, an amount equal to our net profits, as further reduced by amounts allocated to the legal reserve, to the fiscal incentive investment reserve, to the contingency reserve or to the unrealized income reserve established by us in compliance with applicable law (discussed below) and increased by reversals of reserves constituted in prior years, is available for distribution to shareholders in any given year. Such amount, the adjusted net profits, is referred to herein as the distributable amount. We may also establish discretionary reserves, such as reserves for investment projects.

Brazilian corporate law provides that all discretionary allocations of net profits, including discretionary reserves, the contingency reserve, the unrealized income reserve and the reserve for investment projects, are subject to approval by the shareholders voting at the annual meeting and can be transferred to capital or used for the payment of dividends in subsequent years. The fiscal incentive investment reserve and legal reserve are also subject to approval by the shareholders voting at the annual meeting and may be transferred to capital but are not available for the payment of dividends in subsequent years.

The sum of certain discretionary reserves may not exceed the amount of our paid-in capital. When such limit is reached, our shareholders may vote to use the excess to pay in capital, increase capital or distribute dividends.

Our calculation of net profits and allocations to reserves for any fiscal year are determined on the basis of the unconsolidated financial statements of our parent company, Vale S.A., in *reais*, prepared in accordance with Brazilian corporate law. Our consolidated financial statements have been prepared in accordance with IFRS using U.S. dollars as the reporting currency and, although our allocations to reserves and dividends will be reflected in these financial

statements, investors will not be able to calculate such allocations or required dividend amounts from our consolidated financial statements in U.S. dollars.

Mandatory dividend

The Brazilian corporate law and our bylaws require us to distribute to our shareholders, in the form of dividends or interest on shareholders' equity, an annual amount equal to not less than 25% of the distributable amount, referred to as the mandatory dividend, unless the Board of Directors advises our shareholders at our general shareholders' meeting that payment of the mandatory dividend for the preceding year is not advisable in light of our financial condition. To date, our Board of Directors has never determined that payment of the mandatory dividend was not advisable. The Fiscal Council must review any such determination and report it to the shareholders. In addition to the mandatory dividend, our Board of Directors may recommend to the shareholders payment of dividends from other funds legally available therefore. Any payment of interim dividends will be netted against the amount of the mandatory dividend for that fiscal year. The shareholders must also approve the recommendation of the Board of Directors with respect to any required distribution. The amount of the mandatory dividend is subject to the size of the legal reserve, the contingency reserve, and the unrealized income reserve. The amount of the mandatory dividend is not subject to the size of the discretionary tax incentive reserve. See *Additional Information—Bylaws—Common shares and golden shares—Calculation of distributable amount*.

Distributions classified as interest on equity

Brazilian companies are permitted to pay limited amounts to shareholders and treat such payments as an expense for Brazilian income tax purposes. Our bylaws provide for the distribution of interest on shareholders' equity as an alternative form of payment to shareholders. The interest rate applied is limited to the Brazilian long-term interest rate, or TJLP, for the applicable period. The deduction of the amount of interest paid cannot exceed the greater of (1) 50% of net income (after the deduction of the provision of social contribution on net profits and before the deduction of the provision of the corporate income tax) before taking into account any such distribution for the period in respect of which the payment is made or (2) 50% of the sum of retained earnings and profit reserves. Any payment of interest on shareholders' equity is subject to Brazilian withholding income tax. See *Additional Information—Taxation—Brazilian tax considerations*. Under our bylaws, the amount paid to shareholders as interest on shareholders' equity (net of any withholding tax) may be included as part of any mandatory and minimum dividend. Under Brazilian corporate law, we are obligated to distribute to shareholders an amount sufficient to ensure that the net amount received, after payment by us of applicable Brazilian withholding taxes in respect of the distribution of interest on shareholders' equity, is at least equal to the mandatory dividend.

Form and transfer of shares

Our common shares and golden shares are in book-entry form registered in the name of each shareholder. The transfer of such shares is made under Brazilian corporate law, which provides that a transfer of shares is effected by our transfer agent, Banco Bradesco, upon presentation of valid share transfer instructions to us by a transferor or its representative. When common shares are acquired or sold on a Brazilian stock exchange, the transfer is effected on the records of our transfer agent by a representative of a brokerage firm or the stock exchange's clearing system. Transfers of shares by a foreign investor are made in the same way and are executed by the investor's local agent, who is also responsible for updating the information relating to the foreign investment furnished to the Central Bank of Brazil.

The B3 operates a central clearing system through *Companhia Brasileira de Liquidação e Custódia* ("CBLC"). A holder of our shares may participate in this system and all shares elected to be put into the system will be deposited in custody with CBLC (through a Brazilian institution that is duly authorized to operate by the Central Bank of Brazil and maintains a clearing account with CBLC). The fact that such shares are subject to custody with the relevant stock exchange will be reflected in our registry of shareholders. Each participating shareholder will, in turn, be registered in the register of our beneficial shareholders that is maintained by CBLC and will be treated in the same way as registered shareholders.

PARTICIPATIVE SHAREHOLDERS' DEBENTURES

At the time of the first stage of our privatization in 1997, we issued Brazilian law governed debentures known in Brazil as "*debêntures participativas*" to our then-existing shareholders. The terms of the debentures were established to ensure that our pre-privatization shareholders, including the Brazilian government, would participate alongside us in potential future financial benefits that we derive from exploiting certain mineral resources that were not taken into account in determining the minimum purchase price of our shares in the privatization. In accordance with the debentures deed, holders have the right to receive semi-annual payments equal to an agreed percentage of our net revenues (revenues less value-added tax, transport fee and insurance expenses related to the trading of the products) from certain identified mineral resources that we owned at the time of the privatization, to the extent that we exceed defined thresholds of sales volume relating to certain mineral resources, and from the sale of mineral rights that we owned at that time. Our obligation to make payments to the holders will cease when all the relevant mineral resources are exhausted, sold or otherwise disposed of by us.

We made available for withdrawal by holders of participative shareholders' debentures US\$371 million in 2022, US\$418 million in 2021, and US\$183 million in 2020. See note 22 to our consolidated financial statements for a description of the terms of the debentures.

EXCHANGE CONTROLS AND OTHER LIMITATIONS AFFECTING SECURITY HOLDERS

Under Brazilian corporate law, there are no restrictions on ownership of our capital stock by individuals or legal entities domiciled outside Brazil. However, the right to convert dividend payments and proceeds from the sale of common shares into foreign currency and to remit such amounts outside Brazil is subject to restrictions under foreign investment legislation, which generally requires, among other things, that the relevant investment be registered with the Central Bank of Brazil. These restrictions on the remittance of foreign capital abroad could hinder or prevent the depositary bank and its agents for the common shares represented by ADSs from converting dividends, distributions or the proceeds from any sale of common shares or rights, as the case may be, into U.S. dollars and remitting such amounts abroad. Delays in, or refusal to grant any required government approval for conversions of Brazilian currency payments and remittances abroad of amounts owed to holders of ADSs could adversely affect holders of ADRs.

Under CMN Resolution 4,373 of 2014 ("Resolution 4,373"), foreign investors, defined to include individuals, legal entities, mutual funds and other collective investment entities, domiciled or headquartered outside Brazil, may invest in almost all financial assets and engage in almost all transactions available in the Brazilian financial and capital markets, provided that they:

- i. appoint at least one representative in Brazil, with powers to perform actions relating to its investment,
- ii. complete the appropriate foreign investor registration form,
- iii. register as a foreign investor with the CVM, and register its foreign investment with the Central Bank of Brazil, and
- iv. appoint a custodian, duly licensed by the Central Bank of Brazil, if the Brazilian representative in item (i) is not a financial institution.

Resolution 4,373 specifies the manner of custody and the permitted means for trading securities held by foreign investors under the resolution. The offshore transfer or assignment of securities or other financial assets held by foreign investors pursuant to Resolution 4,373 is prohibited, except for transfers resulting from a corporate reorganization, or occurring upon the death of an investor by operation of law or will.

Resolution 4,373 also provides for the issuance of depositary receipts in foreign markets in respect of shares of Brazilian issuers. It provides that the proceeds from the sale of ADSs by holders of ADRs outside Brazil are not subject to Brazilian foreign investment controls and holders of ADSs who are not residents of a low-tax jurisdiction (*país com tributação favorecida*), as defined by Brazilian law, will be entitled to favorable tax treatment.

An electronic registration has been issued to the custodian in the name of the depositary with respect to the ADSs. Pursuant to this electronic registration, the custodian and the depositary are able to convert dividends and other distributions with respect to the underlying shares into foreign currency and to remit the proceeds outside Brazil. If a holder exchanges ADSs for common shares, the holder must, within five business days, seek to obtain its own electronic registration with the Central Bank of Brazil under Law 4,131 of 1962 and Resolution 4,373. Thereafter, unless the holder has registered its investment with the Central Bank of Brazil, such holder may not convert into foreign currency and remit outside Brazil the proceeds from the disposition of, or distributions with respect to, such common shares.

Under Brazilian law, whenever there is a serious imbalance in Brazil's balance of payments or reasons to foresee a serious imbalance, the Brazilian government may impose temporary restrictions on the remittance to foreign investors of the proceeds of their investments in Brazil, and on the conversion of Brazilian currency into foreign currencies. Such restrictions may hinder or prevent the custodian or holders who have exchanged ADSs for underlying common shares from converting distributions or the proceeds from any sale of such shares, as the case may be, into U.S. dollars and remitting such U.S. dollars abroad. In the event the custodian is prevented from converting and remitting amounts

owed to foreign investors, the custodian will hold the *reais* it cannot convert for the account of the holders of ADRs who have not been paid. The depositary will not invest the *reais* and will not be liable for interest on those amounts. Any *reais* so held will be subject to devaluation risk against the U.S. dollar.

TAXATION

The following summary contains a description of the principal Brazilian and U.S. federal income tax consequences of the ownership and disposition of common shares or ADSs. You should know that this summary does not purport to be a comprehensive description of all the tax considerations that may be relevant to a holder of common shares or ADSs.

Holders of common shares or ADSs should consult their own tax advisors to discuss the tax consequences of the purchase, ownership and disposition of common shares or ADSs, including, in particular, the effect of any state, local or other national tax laws.

Although there is at present no treaty to avoid double taxation between Brazil and the United States, both countries' tax authorities have been having discussions that may result in the execution of such a treaty. In this regard, the two countries signed a Tax Information Exchange Agreement on March 20, 2007, which the Brazilian government approved in May 2013. We cannot predict whether or when such a treaty will enter into force or how, if entered into, such a treaty will affect the U.S. holders, as defined below, of common shares or ADSs.

BRAZILIAN TAX CONSIDERATIONS

The following discussion summarizes the principal Brazilian tax consequences of the acquisition, ownership and disposition of common shares or ADSs by a holder not deemed to be domiciled in Brazil for purposes of Brazilian taxation ("Non-Resident Holder"). It is based on the tax laws of Brazil and regulations thereunder in effect on the date hereof, which are subject to change (possibly with retroactive effect). This discussion does not specifically address all of the Brazilian tax considerations applicable to any particular Non-Resident Holder. Therefore, Non-Resident Holders should consult their own tax advisors concerning the Brazilian tax consequences of an investment in common shares or ADSs.

Shareholder distributions

For Brazilian corporations, such as Vale, distributions to shareholders are classified as either dividend or interest on shareholders' equity.

Dividends

Amounts distributed as dividends will generally not be subject to Brazilian withholding income tax if the distribution is paid only from profits for the corresponding year, as determined under Brazilian tax principles. Dividends paid from profits generated before January 1, 1996 may be subject to Brazilian withholding income tax at varying rates depending on the year the profits were generated. Dividends paid from sources other than profits as determined under Brazilian tax principles may be subject to withholding tax.

Interest on shareholders' equity

Amounts distributed as interest on shareholders' equity are generally subject to withholding income tax at the rate of 15%, except where:

- i. the beneficiary is exempt from tax in Brazil, in which case the distribution will not be subject to withholding income tax;
- ii. the beneficiary is located in a jurisdiction that does not impose income tax or where the maximum income tax rate is lower than 17% (a "Low Tax Jurisdiction") or where internal legislation imposes restrictions on the disclosure of the shareholding structure or the ownership of the investment, as listed by the Brazilian federal tax authority in which case the applicable withholding income tax rate is 25%; or

- iii. the effective beneficiary is resident in Japan, in which case the applicable withholding income tax rate is 12.5%.

Interest on shareholders' equity is calculated as interest rate on the sum of the following accounts: (i) share capital, (ii) capital reserves, (iii) profits reserves, (iv) treasury stocks and (v) accumulated losses. The interest rate applied may not exceed the TJLP, the benchmark Brazilian long-term interest rate. In addition, the amount of distributions classified as interest on shareholders' equity may not be more than the greater of (1) 50% of net income (after the deduction of social contribution on net profits but before taking into account such payment of interest and the provision for corporate income tax) for the period in respect of which the payment is made and (2) 50% of the sum of retained earnings and profit reserves.

Payments of interest on shareholders' equity are deductible for the purposes of corporate income tax and social contribution on net profit, to the extent of the limits described above. The benefit of a distribution by way of interest on shareholders' equity is a reduction in the Company's corporate tax charge by an amount equivalent to 34% of such distribution.

Taxation of capital gains

Taxation of Non-Resident Holders on capital gains depends on the status of the holder as either:

- (i) a holder that is not resident or domiciled in a Low Tax Jurisdiction, or in a jurisdiction where internal legislation imposes restrictions on the disclosure of shareholding structure or the ownership of the investment, and that has registered its investment in Brazil in accordance with Resolution 4,373 (a "4,373 Holder"), or (ii) a holder of ADSs; or
- any other Non-Resident Holder.

Investors identified in items (i) or (ii) are subject to favorable tax treatment, as described below.

Capital gains realized by a Non-Resident Holder from the disposition of "assets located in Brazil" are subject to taxation in Brazil. Common shares qualify as assets located in Brazil, and the disposition of such assets by a Non-Resident Holder may be subject to income tax on the gains assessed, in accordance with the rules described below, regardless of whether the transaction is carried out with another non-Brazilian resident or with a Brazilian resident.

There is some uncertainty as to whether ADSs qualify as "assets located in Brazil" for this purpose. Arguably, the ADSs do not constitute assets located in Brazil and therefore the gains realized by a Non-Resident Holder on the disposition of ADSs to another non-Brazilian resident should not be subject to income tax in Brazil. However, it is not certain that the Brazilian courts will uphold this interpretation of the definition of "assets located in Brazil" in connection with the taxation of gains realized by a Non-Resident Holder on the disposition of ADSs. Consequently, gains on a disposition of ADSs by a Non-Resident Holder (whether in a transaction carried out with another Non-Resident Holder or a person domiciled in Brazil) may be subject to income tax in Brazil in accordance with the rules applicable to a disposition of shares.

Although there are arguments to the contrary, the deposit of common shares in exchange for ADSs may be subject to Brazilian income tax if the acquisition cost of the shares being deposited is lower than the average price, determined as either:

- the average price per common share on the Brazilian stock exchange in which the greatest number of such shares were sold on the day of deposit; or
- if no common shares were sold on that day, the average price on the Brazilian stock exchange in which the greatest number of common shares were sold in the 15 trading sessions immediately preceding such deposit.

The positive difference between the average price of the common shares calculated as described above and their acquisition cost will be considered to be a capital gain subject to income tax in Brazil. In some circumstances, there are

grounds to conclude that such taxation is not applicable with respect to any a 4,373 Holder, provided such holder is not located in a Low Tax Jurisdiction.

The withdrawal of common shares by holders in exchange for ADSs is not subject to Brazilian income tax, subject to compliance with applicable regulations regarding the registration of the investment with the Central Bank of Brazil.

For the purpose of Brazilian taxation, the income tax rules on gains related to disposition of common shares vary depending on:

- the domicile of the Non-Resident Holder;
- the method by which such Non-Resident Holder has registered his investment with the Central Bank of Brazil; and
- how the disposition is carried out, as described below.

The gain realized as a result of a transaction on a Brazilian stock exchange is the difference between: (i) the amount in Brazilian currency realized on the sale or disposition and (ii) the acquisition cost, without any adjustment for inflation, of the securities that are the subject of the transaction.

Under the applicable rules, any gain realized by a Non-Resident Holder on a sale or disposition of common shares carried out on the Brazilian stock exchange is:

- exempt from income tax where the Non-Resident Holder (i) is a 4,373 Holder; and (ii) is not located in a Low Tax Jurisdiction;
- subject to income tax at a rate of 15% where the Non-Resident Holder (i) is not a 4,373 Holder and (ii) is not resident or domiciled in a Low Tax Jurisdiction; or
- subject to income tax at a rate of 25% where the Non-Resident Holder (i) is not a 4,373 Holder and (ii) is resident or domiciled in a Low Tax Jurisdiction.

The above summary applies to different investment scenarios. The understanding of tax authorities may change from time to time and you should consult your tax advisors with regard to the application of the rates to your specific case.

The sale or disposition of common shares carried out on the Brazilian stock exchange is subject to withholding tax at the rate of 0.005% on the sale value. This withholding tax can be offset against the eventual income tax due on the capital gain. A 4,373 Holder that is not resident or domiciled in a Low Tax Jurisdiction is not subject to this withholding tax.

Since January 1, 2017, the capital gains realized by Non-Residents Holders and individuals resident in Brazil are subject to income tax (i) at progressive rates ranging from 15% to 22.5%, where the Non-Resident Holder is not a 4,373 Holder and is not resident or domiciled in a Low Tax Jurisdiction or (ii) at a rate of 25% where the Non-Resident Holder is resident or domiciled in a Low Tax Jurisdiction.

With respect to transactions arranged by a broker that are conducted on the Brazilian non-organized over-the-counter market, a withholding income tax at a rate of 0.005% on the sale value is levied on the transaction and can be offset against the eventual income tax due on the capital gain.

In the case of a redemption of common shares or ADSs or a capital reduction by a Brazilian corporation, the positive difference between the amount received by any Non-Resident Holder and the acquisition cost of the common shares or ADSs being redeemed is treated as capital gain and is therefore generally subject to income tax at the progressive rate from 15% to 22.5%, while the 25% rate applies to residents in a Low Tax Jurisdiction.

Any exercise of pre-emptive rights relating to our common shares will not be subject to Brazilian taxation. Any gain realized by a Non-Resident Holder on the disposition of pre-emptive rights relating to common shares in Brazil will be subject to Brazilian income taxation in accordance with the same rules applicable to the sale or disposition of common shares.

Tax on foreign exchange and financial transactions

Foreign exchange transactions

Brazilian law imposes a tax on foreign exchange transactions, or an IOF/Exchange Tax, due on the conversion of *reais* into foreign currency and on the conversion of foreign currency into *reais*. Currently, for most foreign currency exchange transactions, the rate of IOF/Exchange Tax is 0.38%.

The outflow of resources from Brazil related to investments held by a Non-Resident Holder in the Brazilian financial and capital markets is currently subject to IOF/Exchange Tax at a zero percent rate. In any case, the Brazilian government may increase such rates at any time, up to 25%, with no retroactive effect.

Transactions involving securities

Brazilian law imposes a tax on transactions involving securities, or an IOF/Securities Tax, including those carried out on the Brazilian stock exchange. The rate of IOF/Securities Tax applicable to transactions involving publicly traded securities in Brazil is currently zero. The rate of IOF/Securities Tax applicable to a transfer of shares traded on the Brazilian stock exchange to back the issuance of depositary receipts has also been zero since December 24, 2013. However, the Brazilian Government may increase such rates at any time up to 1.5% of the transaction amount per day, but the tax cannot be applied retroactively.

Other Brazilian taxes

There are no Brazilian inheritance, gift or succession taxes applicable to the ownership, transfer or disposition of common shares or ADSs by a Non-Resident Holder, except for gift and inheritance taxes which are levied by some states of Brazil on gifts made or inheritances bestowed by a Non-Resident Holder to individuals or entities resident or domiciled within such states in Brazil. There are no Brazilian stamp, issue, registration, or similar taxes or duties payable by holders of common shares or ADS.

U.S. FEDERAL INCOME TAX CONSIDERATIONS

This summary does not purport to be a comprehensive description of all the U.S. federal income tax consequences of the acquisition, holding or disposition of the common shares or ADSs. This summary applies to U.S. holders, as defined below, who hold their common shares or ADSs as capital assets and does not apply to special classes of holders, such as:

- certain financial institutions,
- insurance companies,
- brokers or dealers in securities or foreign currencies,
- tax-exempt organizations,
- securities traders who elect to account for their investment in common shares or ADSs on a mark-to-market basis,
- persons holding common shares or ADSs as part of hedge, straddle, conversion or other integrated financial transactions for tax purposes,
- holders whose functional currency for U.S. federal income tax purposes is not the U.S. dollar,
- partnerships or other holders treated as "pass-through entities" for U.S. federal income tax purposes (or partners therein), or
- persons owning, actually or constructively through attribution rules, 10% or more of our voting shares or the total value of all classes of shares.

This discussion is based on the Internal Revenue Code of 1986, as amended to the date hereof, administrative pronouncements, judicial decisions and final, temporary and proposed Treasury Regulations, all as in effect on the date hereof. These authorities are subject to differing interpretations and may be changed, perhaps retroactively, so as to

result in U.S. federal income tax consequences different from those discussed below. There can be no assurance that the U.S. Internal Revenue Service (the "IRS") will not challenge one or more of the tax consequences discussed herein or that a court will not sustain such a challenge in the event of litigation. This summary does not address the Medicare tax on net investment income, the alternative minimum tax, U.S. federal estate and gift taxes, or any aspect of state, local or non-U.S. tax law.

YOU SHOULD CONSULT YOUR TAX ADVISORS WITH REGARD TO THE APPLICATION OF THE U.S. FEDERAL INCOME TAX LAWS TO YOUR PARTICULAR SITUATIONS AS WELL AS ANY TAX CONSEQUENCES ARISING UNDER THE LAWS OF ANY STATE, LOCAL OR NON-U.S. TAXING JURISDICTION.

This discussion is also based, in part, on representations of the depositary and the assumption that each obligation in the deposit agreement and any related agreement will be performed in accordance with its terms.

For purposes of this discussion, you are a "U.S. holder" if you are a beneficial owner of common shares or ADSs that is, for U.S. federal income tax purposes:

- a citizen or resident alien individual of the United States,
- a corporation created or organized in or under the laws of the United States or of any political subdivision thereof, or
- otherwise subject to U.S. federal income taxation on a net income basis with respect to common shares or ADSs.

The term U.S. holder also includes certain former citizens of the United States.

In general, if you are the beneficial owner of American depositary receipts evidencing ADSs, you will be treated as the beneficial owner of the common shares represented by those ADSs for U.S. federal income tax purposes. Deposits and withdrawals of common shares by you in exchange for ADSs will not result in the realization of gain or loss for U.S. federal income tax purposes. Your tax basis in such common shares will be the same as your tax basis in such ADSs, and the holding period in such common shares will include the holding period in such ADSs.

Taxation of dividends

The gross amount of a distribution paid on ADSs or common shares, including distributions paid in the form of payments of interest on shareholder's equity for Brazilian tax purposes, out of our current or accumulated earnings and profits (as determined for U.S. federal income tax purposes) generally will be taxable to you as foreign source dividend income and generally will not be eligible for the dividends-received deduction allowed to corporate shareholders under U.S. federal income tax law. The amount of any such distribution will include the amount of Brazilian withholding taxes, if any, withheld on the amount distributed. To the extent that a distribution exceeds our current and accumulated earnings and profits, such distribution will be treated as a nontaxable return of capital to the extent of your basis in the ADSs or common shares, as the case may be, with respect to which such distribution is made, and thereafter as a capital gain.

We do not expect to maintain calculations of our earnings and profits in accordance with U.S. federal income tax principles. You therefore should expect that distributions generally will be treated as dividends for U.S. federal income tax purposes.

You generally will be required to include dividends paid in *reais* in income in an amount equal to their U.S. dollar value calculated by reference to an exchange rate in effect on the date such distribution is received by the depositary, in the case of ADSs, or by you, in the case of common shares. If the depositary or you do not convert such *reais* into U.S. dollars on the date they are received, it is possible that you will recognize foreign currency loss or gain, which generally would be treated as ordinary loss or gain from sources within the United States, when the *reais* are converted into U.S. dollars. If you hold ADSs, you will be considered to receive a dividend when the dividend is received by the depositary.

The U.S. dollar amount of dividends received by certain non-corporate taxpayers, including individuals, will be subject to taxation at the preferential rates applicable to long-term capital gains if the dividends are “qualified dividends.” Subject to certain exceptions for short-term and hedged positions, dividends paid on the ADSs will be treated as qualified dividends if (i) the ADSs are readily tradable on an established securities market in the United States and (ii) the Company was not, in the year prior to the year in which the dividend was paid, and is not, in the year in which the dividend is paid, a passive foreign investment company (“PFIC”). The ADSs are listed on the New York Stock Exchange and will qualify as readily tradable on an established securities market in the United States so long as they are so listed. Based on Vale’s audited financial statements and relevant market and shareholder data, Vale believes that it was not treated as a PFIC for U.S. federal income tax purposes with respect to its 2021 or 2022 taxable years. In addition, based on Vale’s audited financial statements and its current expectations regarding the value and nature of its assets, the sources and nature of its income, and relevant market and shareholder data, Vale does not anticipate becoming a PFIC for its 2023 taxable year.

Based on existing guidance, it is not entirely clear whether dividends received with respect to common shares will be treated as qualified dividends (and therefore whether such dividends will qualify for the preferential rates of taxation applicable to long-term capital gains), because the common shares are not themselves listed on a U.S. exchange. You should consult your own tax advisors regarding the availability of the reduced dividend tax rate in light of your own particular circumstances.

Subject to generally applicable limitations and conditions, you may be entitled to a credit against your U.S. federal income tax liability, or a deduction in computing your U.S. federal taxable income, for Brazilian income taxes withheld by us at the appropriate rate applicable to the U.S. holder. These generally applicable limitations and conditions include new requirements recently adopted by the U.S. Internal Revenue Service (“IRS”) and any Brazilian tax will need to satisfy these requirements in order to be eligible to be a creditable tax for a U.S. holder. The application of these requirements to the Brazilian tax on dividends, including distributions paid in the form of payments of interest on shareholder’s equity for Brazilian tax purposes, is uncertain and we have not determined whether these requirements have been met. If the Brazilian tax is not a creditable tax or the U.S. holder does not elect to claim a foreign tax credit for any foreign income taxes paid or accrued in the same taxable year, the U.S. Holder may be able to deduct the Brazilian tax in computing such U.S. Holder’s taxable income for U.S. federal income tax purposes. Dividend distributions will constitute income from sources without the United States and, for U.S. holders that elect to claim foreign tax credits, generally will constitute “passive category income” for foreign tax credit purposes. The availability and calculation of foreign tax credits and deductions for foreign taxes depend on their particular circumstances and involve the application of complex rules to those circumstances. You should consult your own tax advisors concerning the implications of these rules in light of your particular circumstances.

Taxation of capital gains

Upon a sale or exchange of common shares or ADSs, you generally will recognize a capital gain or loss for U.S. federal income tax purposes equal to the difference, if any, between the amount realized on the sale or exchange and your adjusted tax basis in the common shares or ADSs, in each case, as determined in U.S. dollars. This gain or loss will be long-term capital gain or loss if your holding period in the common shares or ADSs exceeds one year. The net amount of long-term capital gain recognized by individual U.S. holders generally is subject to taxation at preferential rates. Your ability to use capital losses to offset income is subject to limitations. U.S. holders should consult their own tax advisors about how to account for proceeds received on the sale or exchange of common shares that are not paid in U.S. dollars.

Any gain or loss generally will be U.S. source gain or loss for U.S. foreign tax credit purposes. Under the new foreign tax credit requirements recently adopted by the IRS, any Brazilian tax imposed on the sale or other disposition of the shares generally will not be treated as a creditable tax for U.S. foreign tax credit purposes. If the Brazilian tax is not a creditable tax, the tax would reduce the amount realized on the sale or other disposition of the shares even if you have elected to claim a foreign tax credit for other taxes in the same year. You should consult your own tax advisor regarding the application of the foreign tax credit rules to your investment in, and disposition of, ADSs or common shares.

If a Brazilian tax is withheld on the sale or disposition of common shares or ADSs, the amount realized by a U.S. holder will include the gross amount of the proceeds of such sale or disposition before deduction of the Brazilian tax. See — *Brazilian tax considerations* above.

Foreign financial asset reporting

Certain U.S. holders that own “specified foreign financial assets” with an aggregate value in excess of US\$50,000 on the last day of the taxable year or US\$75,000 at any time during the taxable year are generally required to file an information statement along with their tax returns, currently on IRS Form 8938, with respect to such assets. “Specified foreign financial assets” include any financial accounts held at a non-U.S. financial institution, as well as securities issued by a non-U.S. issuer that are not held in accounts maintained by financial institutions. Higher reporting thresholds apply to certain individuals living abroad and to certain married individuals. Regulations extend this reporting requirement to certain entities that are treated as formed or availed of to hold direct or indirect interests in “specified foreign financial assets” based on certain objective criteria. The understatement of income attributable to “specified foreign financial assets” in excess of US\$5,000 extends the statute of limitations with respect to the tax return to six years after the return was filed. U.S. holders who fail to report the required information could be subject to substantial penalties. You are encouraged to consult with your own tax advisors regarding the possible application of these rules, including the application of the rules to your particular circumstances.

Information reporting and backup withholding

Information returns may be filed with the IRS in connection with distributions on the common shares or ADSs and the proceeds from their sale or other disposition. You may be subject to U.S. federal backup withholding tax on these payments if you fail to provide your taxpayer identification number or comply with certain certification procedures or otherwise establish an exemption from backup withholding. If you are required to make such a certification or to establish such an exemption, you generally must do so on IRS Form W-9.

Backup withholding is not an additional tax. The amount of any backup withholding from a payment to you will be allowed as a credit against your U.S. federal income tax liability and may entitle you to a refund, provided that the required information is timely furnished to the IRS.

A holder that is a non-U.S. corporation or a non-resident alien individual may be required to comply with certification and identification procedures in order to establish its exemption from information reporting and backup withholding.

CONTROLS AND PROCEDURES

EVALUATION OF DISCLOSURE CONTROLS AND PROCEDURES

Our management, with the participation of our chief executive officer and chief financial officer, has evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2022. There are inherent limitations to the effectiveness of any system of disclosure controls and procedures, including the possibility of human error and the circumvention or overriding of the controls and procedures. Accordingly, even effective disclosure controls and procedures can only provide reasonable assurance of achieving their control objectives.

Our chief executive officer and chief financial officer have concluded that as of December 31, 2022 our disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, were effective to provide reasonable assurance that information required to be disclosed by us in the reports filed or submitted under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the applicable rules and forms, and that it is accumulated and communicated to our management, including our chief executive officer and chief financial officer, as appropriate to allow timely decisions regarding required disclosure.

MANAGEMENT'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act). Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that: (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company; (ii) provide reasonable assurance that transactions are recorded to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of our assets that could have a material effect on the financial statements. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of the effectiveness to future periods are subject to the risk that controls may become inadequate and that the degree of compliance with the policies or procedures may deteriorate.

Our management has assessed the effectiveness of Vale's internal control over financial reporting as of December 31, 2022 based on the criteria established in "Internal Control—Integrated Framework (2013)" issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on such assessment and criteria, our management has concluded that our internal control over financial reporting was effective as of December 31, 2022.

AUDIT OF THE EFFECTIVENESS OF INTERNAL CONTROL OVER FINANCIAL REPORTING

The effectiveness of our internal control over financial reporting as of December 31, 2022 has been audited by PricewaterhouseCoopers Auditores Independentes Ltda., an independent registered public accounting firm, as stated in their report which appears herein.

CHANGES IN INTERNAL CONTROL OVER FINANCIAL REPORTING

Our management identified no change in our internal control over financial reporting during our fiscal year ended December 31, 2022 that has materially affected or is reasonably likely to materially affect our internal control over financial reporting.

CORPORATE GOVERNANCE

Under NYSE rules, foreign private issuers are subject to more limited corporate governance requirements than U.S. domestic issuers. As a foreign private issuer, we must comply with four principal NYSE corporate governance rules: (1) we must satisfy the requirements of Exchange Act Rule 10A-3 relating to Audit Committees; (2) our chief executive officer must promptly notify the NYSE in writing after any executive officer becomes aware of any non-compliance with the applicable NYSE corporate governance rules; (3) we must provide the NYSE with annual and interim written affirmations as required under the NYSE corporate governance rules; and (4) we must provide a brief description of any significant differences between our corporate governance practices and those followed by U.S. companies under NYSE listing standards. The table below briefly describes the significant differences between our practices and the practices of U.S. domestic issuers under NYSE corporate governance rules.

Since 2018, we also report our compliance with the Code of Best Practices for Corporate Governance of the Brazilian Corporate Governance Institute (*Instituto Brasileiro de Governança Corporativa – “IBGC”*), as required by Brazilian regulations. The code is based on the “comply or explain” principle, and we currently fully comply with 96% of the practices recommended by the IBGC and partially comply with 1.85% of practices recommended by the code.

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
303A.01	A listed company must have a majority of independent directors.	We fully comply with this requirement. Our bylaws provide for a Board of Directors consisting of 11 to 13 members and require that at least seven directors be independent. Since the election of the members of the Board of Directors in our 2021 annual shareholders’ meeting, we have eight independent directors.
303A.03	The non-management directors of a listed company must meet at regularly scheduled executive sessions without management.	We do not have any management directors. Our directors meet at regularly scheduled sessions without management.
303A.04	A listed company must have a nominating/corporate governance committee composed entirely of independent directors, with a written charter that covers certain minimum specified duties.	<p>We have a Nomination and Governance Committee, composed of a majority of independent directors.</p> <p>According to its charter, such committee is responsible, among other matters, for:</p> <ul style="list-style-type: none"> - recommending internal policies and rules regarding the nomination of members of the Board of Directors, Advisory Committees and our Chairman, in compliance with the applicable legal requirements and best corporate governance practices; - assessing the evolution and continuous improvement of our corporate governance practices, also regarding the structure, duties, size and composition of the Board of Directors and the Advisory Committees, aiming at a balance of experiences, knowledge and diversity in the profile of its members; - reviewing our governance system on a yearly basis; - recommending the appropriate profile of applicants for member of the Board of Directors and Advisory Committees, and that best suits our needs, according to

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
		<p>the criteria and guidelines set forth in the internal policies and norms on the topic;</p> <ul style="list-style-type: none"> - assessing potential applicants for the position of Director and member of the Advisory Committees, according to the criteria and guidelines set forth in our internal policies and norms, for further analysis by the Board of Directors, and potential election by our general shareholders' meeting; - assessing potential candidates to replace any individuals in a situation of impediment and vacancy in the positions of Director and member of the Advisory Committees according to our bylaws and internal policies; - assessing the independence of Directors, indicating and justifying any circumstances that may affect this condition; - recommending the succession plan of the Board of Directors, which shall be submitted for approval by the end of the term of office, so as to maintain the balance of experiences, the knowledge and diversity of profile of its members; - assessing the performance of the Board of Directors and the Advisory Committees; - recommending the selection, remuneration, annual performance assessment, succession plan and removal of the General Corporate Governance Secretary; - recommending the strategy and guidelines for our corporate governance documents, including our corporate policies, bylaws, Code of Conduct and the internal regulations of the Advisory Committees and the Board of Directors, among others, without prejudice of the technical analyses of other advisory committees, according to their competences; - recommending the remuneration model of the Board of Directors and the Advisory Committees, and the proposal for distribution of the global annual amount regarding the remuneration of these bodies; - recommending the annual budget of the Board of Directors and the Advisory Committees, which shall include, among others, the resources for engagement of external experts to assist the Directors with the performance of their duties, and to implement continued education programs; - preparing and submitting to the Board of Directors the annual work plan of the committee; and - preparing and submitting to the Board of Directors, the report on the performance of the committee.

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
		According to its charter, the Nomination and Governance Committee and Governance shall be composed of three to five members, including the Chairperson of our Board of Directors and a majority of independent members.
303A.05	A listed company must have a compensation committee composed entirely of independent directors, with a written charter that covers certain minimum specified duties.	<p>We do not have a compensation committee composed entirely of independent directors.</p> <p>However, we have a People and Compensation Committee, which is an advisory committee to the Board of Directors, composed only by members of the Board of Directors. The number of independent members shall be at least equal to the number of non-independent members. This committee is responsible for, among other attributions:</p> <ul style="list-style-type: none"> - assessing and recommending long-term strategies on personnel as proposed by the Executive Committee to the Board of Directors; - assessing and recommending the Remuneration strategy for the Executive Committee and proposal for distribution of overall annual amount for management remuneration, including the remuneration of the Board of Directors and its Advisory Committees; and - defining the performance assessment goals for the Executive Committee and other Officers directly reporting to the CEO, and their monitoring.
303A.06	Listed companies must have an audit committee that complies with the requirements of Rule 10A-3 under the Exchange Act.	We have an Audit and Risks Committee that complies with Rule 10A-3 under the Exchange Act. Since December 21, 2022, following the amendment of our bylaws and change in the composition of our audit committee, we no longer rely on a previously applicable Rule 10A-3 exemption. Our Audit and Risks Committee is currently composed of three independent directors.
303A.07	The audit committee must have at least three members, and these members must comply with the independence requirements of Section 303A.02 of the NYSE Listed Company Manual; the audit committee must have a written charter compliant with the requirements of Section 303A.07(b) of the NYSE Listed Company Manual; and listed companies must have an internal audit function.	<p>Our Audit and Risks Committee is currently composed of three independent directors. We also comply with the listing rules of the Novo Mercado segment of B3 S.A. – Brasil, Bolsa, Balcão (“Novo Mercado Rules”) and Brazilian corporate laws and regulations. Under our bylaws and the Audit and Risks Committee’s charter, and pursuant to the Novo Mercado Rules, our Audit and Risks Committee shall have three to five members, and: (i) all members must be independent directors, (ii) at least one member must have demonstrated experience in corporate accounting matters, and such member shall be appointed as “Financial Expert” upon his/her nomination.</p> <p>The responsibilities of the Audit and Risks Committee are set forth in its charter. Under our bylaws, the charter must give the Audit and Risks Committee responsibility for the matters required under Novo Mercado listing rules, as well as responsibility for:</p> <ul style="list-style-type: none"> - having means and establishing procedures to be used by the company to receive, process and handle accusations, complaints and information about (a) non-compliance with

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
303A.08	Shareholders must be given the opportunity to vote on all equity-compensation plans and material revisions thereto, with limited exemptions set forth in the NYSE rules.	<p>legal and normative provisions applicable to the company, in addition to internal regulations and codes, (b) accounting issues, (c) internal controls, and (d) audit matters; as well as ensuring specific procedures to guarantee confidentiality and to protect whistleblower anonymity and the rights of the investigated party;</p> <ul style="list-style-type: none"> - providing its opinion and assistance to the Board of Directors in the hiring, compensation and removal of independent auditor services; - supervising the work of internal auditors, the area of internal controls and the area responsible for preparing the company's financial statements; - supervising and evaluating the work of the external auditors, in order to evaluate their independence, the quality of services provided and the suitability of services provided related to the needs of the company, and telling the company's management at any point to retain compensation of the external auditors; and - monitoring and mediating disagreements between management and the independent auditors regarding the company's financial statements and the application of accounting principles, monitoring difficulties found by the auditors during the audit process, among others. <p>We have an internal audit function.</p>
303A.09	A listed company must adopt and disclose corporate governance guidelines that cover certain minimum specified subjects.	We have not published consolidated corporate governance guidelines. Notwithstanding, our bylaws, the internal rules of our Board of Directors and advisory committees, our Chief Executive Officer Succession Policy and/or our Nomination Policy address matters related to director qualification standards, director access to management and, as necessary and appropriate, independent advisors, Chief Executive Officer and management succession and annual performance of the Board.
303A.10	A listed company must adopt and disclose a code of business conduct and ethics for directors, officers and employees, and promptly disclose any waivers of the code for directors or executive officers.	We have adopted a Code of Conduct, which applies to our directors, officers and employees, interns, suppliers, and to our subsidiaries in Brazil and abroad, as well as to any person acting on behalf of Vale or its subsidiaries. We report each year in our annual report on Form 20-F any waivers of the code of conduct granted for directors or executive officers. Our code of conduct has a scope that is similar, but not identical, to that required for a U.S. domestic company under the NYSE rules.

Section	NYSE corporate governance rule for U.S. domestic issuers	Our approach
303A.12	<p>a) Each listed company CEO must certify to the NYSE each year that he or she is not aware of any violation by the company of NYSE corporate governance listing standards.</p> <p>b) Each listed company CEO must promptly notify the NYSE in writing after any executive officer of the listed company becomes aware of any non-compliance with any applicable provisions of this Section 303A.</p> <p>c) Each listed company must submit an executed Written Affirmation annually to the NYSE. In addition, each listed company must submit an interim Written Affirmation as and when required by the interim Written Affirmation form specified by the NYSE.</p>	We are subject to (b) and (c) of these requirements, but not (a).

CODE OF CONDUCT

We have a Code of Conduct that applies to the members of our Board of Directors and our Executive Committee, including the chief executive officer and the chief financial officer, our employees, interns, suppliers, and to our subsidiaries in Brazil and abroad, as well as and any person acting on behalf of Vale or its subsidiaries.

Our Code of Conduct gathers the fundamental principles that underpin our business, and is part of Vale's Ethics & Compliance Program, which is monitored by the Audit and Risks Committee, the Conduct and Integrity Committee and the Audit and Compliance Department. Our Code of Conduct is a principle-based document, which connects directly with our company's purpose and values.

We have published the Code of Conduct on our website, at: <https://vale.com/code-of-conduct>. We have not granted any implicit or explicit waivers from any provision of our Code of Conduct since its adoption.

Whistleblower Channel

Any breaches of our policies and standards can be reported by anyone, including employees, contractors, suppliers, members of affected communities and other stakeholders, via our Whistleblower Channel, which is available in 8 languages. Our Whistleblower Channel is managed by our Audit and Compliance Department, an independent department that reports directly to the Board of Directors. Our Whistleblower Channel is structured to guarantee confidentiality and to protect whistleblower anonymity and the rights of the investigated party.

Since April 2022, our employees and contractors in Brazil also have access to a channel operated by a specialized and independent team to listen, understand and guide anyone reporting sexual harassment or discrimination. By calling this line, the person may decide whether or not to register an allegation, which is then investigated by our Whistleblower Channel team.

In 2022, our Whistleblower Channel received 6,736 reports and closed 6,600 cases, of which (i) 13.1% referred to consultations and reports that were not investigated due to lack of information or pertinence to the scope of the Whistleblower Channel, (ii) 26.6% were complaints, which were answered by the Whistleblower Channel, but did not lead to an investigation, and (iii) 60.3% were allegations that led to investigations, which confirmed violations of Vale's Code of Conduct in 46.6% of these cases.

All confirmed violations triggered correction plans, which are presented by managers and approved by the Whistleblower Channel. As a general rule, these plans contain measures to promote process improvements, training initiatives and feedback to employees. Depending on the seriousness of the allegations, employees involved may be subject to administrative measures, such as warnings, suspensions or terminations. Suppliers involved in serious violations of the Code of Conduct are also subject to punitive measures, such as fines or contract termination.

Investigations by Vale's Whistleblower Channel in 2022 resulted in 2,941 corrective actions and disciplinary measures, including 171 terminations of employment.

Further information on the Whistleblower Channel is disclosed in our Ethics & Compliance annual report, available in our website, at <https://www.vale.com/web/esg/ethics-compliance-and-tax-transparency>. Information in our website is not incorporated by reference in this annual report on Form 20-F.

PRINCIPAL ACCOUNTANT FEES AND SERVICES

The following table summarizes the fees for professional services and other services rendered to us by our independent auditors PricewaterhouseCoopers Auditores Independentes Ltda. ("PwC") in 2022 and 2021.

	<i>Year ended December 31,</i>	
	<i>2022</i>	<i>2021</i>
	<i>(US\$ thousand)</i>	
Audit fees	5,435	5,860
Audit-related fees	69	81
Total fees	5,504	5,941

"Audit fees" are the aggregate fees of PwC for the audit of our annual financial statements, the audit of the statutory financial statements of our subsidiaries, and reviews of interim financial statements and attestation services that are provided in connection with statutory and regulatory filings or engagements. They also include fees for services that only the independent auditor reasonably can provide, including the provision of comfort letters and consents in connection with statutory and regulatory filings and the review of documents filed with the SEC and other capital markets or local financial reporting regulatory bodies. "Audit-related fees" are fees charged by PwC for assurance and related services that are reasonably related to the performance of the audit or review of our financial statements and are not reported under "Audit fees."

INFORMATION FILED WITH SECURITIES REGULATORS

We are subject to various information and disclosure requirements in those countries in which our securities are traded, and we file financial statements and other periodic reports with the CVM, B3 and the SEC.

Brazil. Vale's Common Shares are listed on B3 in São Paulo, Brazil. As a result, we are subject to the information and disclosure requirements of Brazilian Corporate Law, as amended. We are also subject to the periodic disclosure requirements of CVM rules applicable to listed companies and to B3's "Novo Mercado" Corporate Governance Requirements. Our CVM filings are available from the CVM at <http://www.cvm.gov.br> or from B3 at <http://www.b3.com.br>. In addition, they may be accessed at our website, <http://www.vale.com>.

United States. As a result of our ADSs being listed on the New York Stock Exchange, we are subject to the information requirements of the Securities Exchange Act of 1934, as amended, and accordingly file reports and other information with the SEC. Reports and other information filed by us with the SEC available to the public from the SEC at <http://www.sec.gov>. In addition, as with all of our security filings, they may be accessed at our website, <http://www.vale.com>. Such filings and other information on our website are not incorporated by reference in this annual report on Form 20-F. You may also inspect Vale's reports and other information at the offices of the New York Stock Exchange, 11 Wall Street, New York, New York 10005, on which Vale's ADSs are listed. For further information on obtaining copies of Vale's public filings at the New York Stock Exchange, you should call (212) 656-5060.

EXHIBITS

<u>Exhibit Number</u>	
1	Bylaws of Vale S.A., as of December 22, 2022
2	Description of Securities registered under Section 12 of the Exchange Act
4.1	Framework Agreement, dated March 2, 2016, by and among Vale S.A., BHP Billiton Brasil Ltda, Samarco Mineração S.A., the Federal Government of Brazil, the states of Espírito Santo and Minas Gerais and certain other public authorities in Brazil (incorporated by reference to Exhibit 4.12 to BHP Billiton Ltd.'s annual report on Form 20-F dated September 21, 2016 (File Nos. 001-09526 and 001-31714, Accession No. 0001193125-16-715037))
4.2	Integral Reparation Agreement, dated February 4, 2021, by and among Vale S.A., the Government of the State of Minas Gerais, the Public Defender Office of the State of Minas Gerais, public prosecutors of the State of Minas Gerais and federal prosecutors (incorporated by reference to Exhibit 4.1 to Vale's annual report on Form 20-F dated March 23, 2021 (File Nos. 001-15030, Accession No. 0001047469-21-000687)).
8	List of subsidiaries
12.1	Certification of Chief Executive Officer of Vale pursuant to Rules 13a-14 and 15d-14 under the Securities Exchange Act of 1934
12.2	Certification of Chief Financial Officer of Vale pursuant to Rules 13a-14 and 15d-14 under the Securities Exchange Act of 1934
13.1	Certification of Chief Executive Officer and Chief Financial Officer of Vale, pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
15.1	Consent of PricewaterhouseCoopers Auditores Independentes Ltda. (PCAOB ID 1351)
15.2	Consents of Qualified Persons for Technical Report Summary for Sudbury Operations
17.1	Guarantors and Issuers of Guaranteed Securities
96.1	Technical Report Summary for Sudbury Operations (incorporated by reference to our current report Form 6-K dated April 12, 2023 (file Nos. 001-15030. Accession No.))
101	Interactive Data File
104	Cover Page Interactive Data File

The amount of long-term debt securities of Vale or its subsidiaries authorized under any individual outstanding agreement does not exceed 10% of our total assets on a consolidated basis. Vale hereby agrees to furnish the SEC, upon its request, a copy of any instruments defining the rights of holders of its long-term debt or of its subsidiaries for which consolidated or unconsolidated financial statements are required to be filed.

GLOSSARY

Alumina	Aluminum oxide. It is the main component of bauxite, and extracted from bauxite ore in a chemical refining process. It is the principal raw material in the electro-chemical process from which aluminum is produced.
Aluminum	A white metal that is obtained in the electro-chemical process of reducing aluminum oxide.
Austenitic stainless steel.....	Steel that contains a significant amount of chromium and sufficient nickel to stabilize the austenite microstructure, giving to the steel good formability and ductility and improving its high temperature resistance. They are used in a wide variety of applications, ranging from consumer products to industrial process equipment, as well as for power generation and transportation equipment, kitchen appliances and many other applications where strength, corrosion and high temperature resistance are required.
B3.....	B3 S.A.—Brasil, Bolsa, Balcão (formerly BM&FBOVESPA), a stock exchange located in São Paulo, Brazil.
Bauxite	A rock composed primarily of hydrated aluminum oxides. It is the principal ore of alumina, the raw material from which aluminum is made.
Beneficiation	A variety of processes whereby extracted ore from mining is reduced to particles that can be separated into ore-mineral and waste, the former suitable for further processing or direct use.
CFR.....	Cost and freight. Indicates that all costs related to the transportation of goods up to a named port of destination will be paid by the seller of the goods.
Class 2	Low purity nickel, containing higher levels of deleterious elements and predominantly iron-bearing, that is primarily destined to the stainless steel market.
Coal.....	Coal is a black or brownish-black solid combustible substance formed by the decomposition of vegetable matter without access to air. The rank of coal, which includes anthracite, bituminous coal (both are called hard coal), sub-bituminous coal, and lignite, is based on fixed carbon, volatile matter, and heating value.
Cobalt.....	Cobalt is a hard, lustrous, silver-gray metal found in ores, and used in the preparation of magnetic, wear-resistant, and high-strength alloys (particularly for jet engines and turbines). Its compounds are also used in the production of inks, paints, catalysts and battery materials.
Coke.....	Coal that has been processed in a coke oven, for use as a reduction agent in blast furnaces and in foundries for the purposes of transforming iron ore into pig iron.
Coking coal	Hard coking coal is the highest value segment of the metallurgical coal market segments (see metallurgical coal) because of its high strength factors to form a strong coke.
Concentration.....	Physical, chemical or biological process to increase the grade of the metal or mineral of interest.
Copper	A reddish brown metallic element. Copper is highly conductive, both thermally and electrically. It is highly malleable and ductile and is easily rolled into sheet and drawn into wire.
Copper anode	Copper anode is a metallic product of the converting stage of smelting process that is cast into blocks and generally contains 99% copper grade, which requires further processing to produce refined copper cathodes.
Copper cathode.....	Copper plate with purity higher than or equal to 99.9% that is produced by an electrolytic process.
Copper concentrate	Material produced by concentration of copper minerals contained in the copper ore. It is the raw material used in smelters to produce copper metal.
Cut-off grade.....	Cut-off grade is the grade (i.e., the concentration of metal or mineral in rock) that determines the destination of the material during mining. For purposes of establishing "prospects of economic extraction," the cut-off grade is the grade that distinguishes material deemed to have no economic value (it will not be mined in underground mining or if mined in surface mining, its destination will be the waste dump) from material deemed to have economic value (its ultimate destination during mining will be a processing facility). Other terms used in similar fashion as cut-off grade include "net smelter return," "pay limit," and "break-even stripping ratio".

CVM.....	The <i>Comissão de Valores Mobiliários</i> (Brazilian Securities and Exchange Commission).
DWT.....	Deadweight ton. The measurement unit of a vessel's capacity for cargo, fuel oil, stores and crew, measured in metric tons of 1,000 kg. A vessel's total deadweight is the total weight the vessel can carry when loaded to its maximum permitted load line.
Electrowon copper cathode.....	Refined copper cathode is a metallic product produced by an electrochemical process in which copper is recovered from an electrolyte and plated onto an electrode. Electrowon copper cathodes generally contain 99.99% copper grade.
Ferroalloys.....	Manganese ferroalloys are alloys of iron that contain one or more other chemical elements. These alloys are used to add these other elements into molten metal, usually in steelmaking. The principal ferroalloys are those of manganese, silicon and chromium.
FOB.....	Free on board. It indicates that the purchaser pays for shipping, insurance and all the other costs associated with transportation of the goods to their destination.
Gold.....	A precious metal sometimes found free in nature, but usually found in conjunction with silver, quartz, calcite, lead, tellurium, zinc or copper. It is the most malleable and ductile metal, a good conductor of heat and electricity and unaffected by air and most reagents.
Grade.....	The proportion of metal or mineral present in ore or any other host material.
Hematite Ore.....	Hematite is an iron oxide mineral, but also denotes the high-grade iron ore type within the iron deposits.
Inferred Mineral Resource.....	Is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. The level of geological uncertainty associated with an inferred mineral resource is too high to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Because an inferred mineral resource has the lowest level of geological confidence of all mineral resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability, an inferred mineral resource may not be considered when assessing the economic viability of a mining project, and may not be converted to a mineral reserve.
Indicated Mineral Resource.....	Is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of adequate geological evidence and sampling. The level of geological certainty associated with an indicated mineral resource is sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Because an indicated mineral resource has a lower level of confidence than the level of confidence of a measured mineral resource, an indicated mineral resource may only be converted to a probable mineral reserve.
Iron ore pellets.....	Agglomerated ultra-fine iron ore particles of a size and quality suitable for particular iron making processes. Our iron ore pellets range in size from 8 mm to 18 mm.
Itabirite ore.....	Itabirite is a banded iron formation and denotes the low-grade iron ore type within the iron deposits.
Limonite.....	An iron and aluminium oxides rich horizon formed by decomposition of pre-existing rocks within a surface weathering environment.
Lower Class I.....	High purity nickel, containing lower levels of deleterious elements, that is used in low premium applications (e.g., foundry).
Lump ore.....	Iron ore or manganese ore with the coarsest particle size in the range of 6.35 mm to 50 mm in diameter, but varying slightly between different mines and ores.
Manganese ore.....	A hard brittle metallic element found primarily in the minerals pyrolusite, hausmannite and manganite. Manganese ore is essential to the production of virtually all steels and is important in the production of cast iron.

Measured Mineral Resource.....	Is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of conclusive geological evidence and sampling. The level of geological certainty associated with a measured mineral resource is sufficient to allow a qualified person to apply modifying factors, as defined in this section, in sufficient detail to support detailed mine planning and final evaluation of the economic viability of the deposit. Because a measured mineral resource has a higher level of confidence than the level of confidence of either an indicated mineral resource or an inferred mineral resource, a measured mineral resource may be converted to a proven mineral reserve or to a probable mineral reserve.
Metallurgical coal.....	Coal used in the production of steel, comprising multiple segments, including hard coking coal (see hard coking coal), semi-hard coking coal, semi-soft coking coal, all used to produce coke to feed a blast furnace; and, PCI (pulverized coal injection) coal used for direct injection fuel source into the blast furnace (see PCI). A bituminous hard coal with a quality that allows the production of coke. Normally used in coke ovens for metallurgical purposes.
Mineral deposit(s).....	A mineralized body that has been intersected by a sufficient number of closely spaced drill holes and/or underground/surface samples to support sufficient tonnage and grade of metal(s) or mineral(s) of interest to warrant further exploration-development work.
Mineral reserve	Is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted.
Mineral resource.....	Is a concentration or occurrence of materials of economic interest in or on the Earth's crust in such form, grade or quality, and quantity that there are reasonable prospects for economic extraction. A mineral resource is a reasonable estimate of mineralization, taking into account relevant factors such as cut-off grade, likely mining dimensions, location or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable. It is not merely an inventory of all mineralization drilled or sampled.
Mt.....	Million metric tons.
Mtpy	Million metric tons per year.
Nickel.....	A silvery white metal that takes on a high polish. It is hard, malleable, ductile, somewhat ferromagnetic, and a fair conductor of heat and electricity. It belongs to the iron-cobalt group of metals and is chiefly valuable for the alloys it forms, such as stainless steel and other corrosion-resistant alloys.
Nickel laterite.....	Deposits are formed by intensive weathering of olivine-rich ultramafic rocks such as dunite, peridotite and komatiite.
Nickel matte.....	An intermediate smelter product that must be further refined to obtain pure metal.
Nickel pig iron.....	A low-grade nickel product, made from lateritic ores, suitable primarily for use in stainless steel production. Nickel pig iron typically has a nickel grade of 1.5-6% produced from blast furnaces. Nickel pig iron can also contain chrome, manganese, and impurities such as phosphorus, sulfur and carbon. Low-grade ferro-nickel (FeNi) produced in China through electric furnaces is often also referred to as nickel pig iron.
Nickel sulfide	Formed through magmatic processes where nickel combines with sulfur to form a sulfide phase. Pentlandite is the most common nickel sulfide ore mineral mined and often occurs with chalcopyrite, a common copper sulfide mineral.
Ntk.....	Net ton (the weight of the goods being transported excluding the weight of the wagon) kilometer.
Open-pit mining.....	Method of extracting rock or minerals from the earth by their removal from an open pit. Open-pit mines for extraction of ore are used when deposits of commercially useful minerals or rock are found near the surface; that is, where the overburden (surface material covering the valuable deposit) is relatively thin or the material of interest is structurally unsuitable for underground mining.
Oxides	Compounds of oxygen with another element. For example, magnetite is an oxide mineral formed by the chemical union of iron with oxygen.
Palladium	A silver-white metal that is ductile and malleable, used primarily in automobile-emissions control devices, and electrical applications.

PCI.....	Pulverized coal injection. Type of coal with specific properties ideal for direct injection via the tuyeres of blast furnaces. This type of coal does not require any processing or coke making, and can be directly injected into the blast furnaces, replacing lump cokes to be charged from the top of the blast furnaces.
Pelletizing.....	Iron ore pelletizing is a process of agglomeration of ultra-fines produced in iron ore exploitation and concentration steps. The three basic stages of the process are: (i) ore preparation (to get the correct fineness); (ii) mixing and balling (additive mixing and ball formation); and (iii) firing (to get ceramic bonding and strength).
PGMs.....	Platinum group metals. Consist of platinum, palladium, rhodium, ruthenium, osmium and iridium.
Phosphate.....	A phosphorous compound, which occurs in natural ores and is used as a raw material for primary production of fertilizer nutrients, animal feeds and detergents.
Pig iron.....	Product of smelting iron ore usually with coke and limestone in a blast furnace.
Platinum.....	A dense, precious, grey-white transition metal that is ductile and malleable and occurs in some nickel and copper ores. Platinum is resistant to corrosion and is used primarily in jewelry, and automobile-emissions control devices.
Precious metals.....	Metals valued for their color, malleability, and rarity, with a high economic value driven not only by their practical industrial use, but also by their role as investments. The widely-traded precious metals are gold, silver, platinum and palladium.
Primary nickel.....	Nickel produced directly from mineral ores.
Probable mineral reserves.....	Is the economically minerable part of an indicated and, in some cases, a measured mineral resource.
Proven mineral reserves.....	Is the economically minerable part of a measured mineral resource and can only result from conversion of a measured resource.
Real, reais or R\$.....	The official currency of Brazil is the <i>real</i> (singular) (plural: <i>reais</i>).
ROM.....	Run-of-mine. Ore in its natural (unprocessed) state, as mined, without having been crushed.
Saprolite.....	Clay-rich horizon formed by decomposition of pre-existing rocks within a surface weathering environment.
Secondary or scrap nickel.....	Stainless steel or other nickel-containing scrap.
Seaborne market.....	Comprises the total ore trade between countries using ocean bulk vessels.
Silver.....	A ductile and malleable metal used in photography, coins and medal fabrication, and in industrial applications.
Sinter feed (also known as fines).....	Iron ore fines with particles in the range of 0.15 mm to 6.35 mm in diameter. Suitable for sintering.
Sintering.....	The agglomeration of sinter feed, binder and other materials, into a coherent mass by heating without melting, to be used as metallic charge into a blast furnace.
Slab.....	The most common type of semi-finished steel. Traditional slabs measure 10 inches thick and 30-85 inches wide (and average 20 feet long), while the output of the recently developed "thin slab" casters is two inches thick. Subsequent to casting, slabs are sent to the hot-strip mill to be rolled into coiled sheet and plate products.
Stainless steel.....	Alloy steel containing at least 10% chromium and with superior corrosion resistance. It may also contain other elements such as nickel, manganese, niobium, titanium, molybdenum, copper, in order to improve mechanical, thermal properties and service life. It is primarily classified as austenitic (200 and 300 series), ferritic (400 series), martensitic, duplex or precipitation hardening grades.
Thermal coal.....	A type of coal that is suitable for energy generation in thermal power stations, cement plants and other coal fired ovens/kilns in general industry.
Tpy.....	Metric tons per year.
Troy ounce.....	One troy ounce equals 31.103 grams.

GLOSSARY

Underground mining	Mineral exploitation in which extraction is carried out beneath the earth's surface.
Upper Class I.....	High purity nickel, containing lower levels of deleterious elements, that is used in high premium applications (<i>e.g.</i> , plating and super alloys).
U.S. dollars or US\$	The United States dollar.

SIGNATURES

The registrant hereby certifies that it meets all of the requirements for filing on Form 20-F and that it has duly caused and authorized the undersigned to sign this annual report on its behalf.

VALE S.A.

By: /s/ Eduardo de Salles Bartolomeo

Name: Eduardo de Salles Bartolomeo

Title: Chief Executive Officer

By: /s/ Gustavo Duarte Pimenta

Name: Gustavo Duarte Pimenta

Title: Executive Vice-President of Finance and Investor Relations

Date: April 12, 2023